ivory, and wood with wonderful accuracy. It received the highest praises in the official report of the experiments, and well merits, if it does not receive, the best award in the gift of the Institute.

THE CHAMPION SPRING MATTRESS,

manufactured by Messrs. F. C. Beach & Co., 141 Duane street, New York, deserves notice as one of the best of the many entered for exhibition. It is composed wholly of metal, no wooden slats or frames being used. It is therefore very durable. Helical steel springs are used, so connected as to make a perfectly elastic soft and level bed. This mattress is remarkably light, its largest size weighing but twenty-five pounds, and it rolls up like a blanket, is easily moved and transported. Just the thing for housekeepers. The springs are inlaid with a waterproof fire enamel so that the bed is serviceable in any climate.

THE SAWYER PLAITING MACHINE

will doubtless prove a valuable invention to manufacturers of shirts and similar garments made with numerous plaits. The device consists of two cylinders, in the lower one of which a heated iron bar is placed. As the cloth is passed between, a sharp steel blade is caused to rise and form a plait or fold of any desired width, which is smoothed perfectly flat by the action of the rollers.

THE AMERICAN WOOD PANELING MACHINE

is a novelty that cuts panels in hard or soft wood with remarkable accuracy. The board to be operated upon is placed on a table, which is so arranged as to be easily movable in any direction. On the plank, by a simple means of adjustment, are attached pieces which give shape to the panel and which guide the cutting instrument. The latter works vertically and its operating blade resembles an auger point, only constructed somewhat on the principle of solid cutters for sash molding; so that, when caused to revolve and pressed down upon the board, which is moved under it, it cuts a molded groove. By allowing the instrument to remove certain portions of the wood, either a raised or a sunk panel may be made, leaving nothing further to be done beyond smoothing the work by hand in the ordinary manner.

NEW PLAN FOR A LOCAL FIRE DEPARTMENT.

The town of Easthampton, Mass., has an excellent plan for a local fire department, which may be advantageously copied by communities who cannot raise funds sufficient to introduce regular water works, or do not desire to maintain steam fire engines in connection with a reservoir. In the above mentioned town, the Valley Machine Company, there doing business, are building a large bucket plunger steam pump with a capacity for discharging 500 gallons per minute, from which pipes have been laid through the streets, connecting with hydrants placed at suitable distances apart. These pipes are always kept full of water by means of a small auxiliary pump, and in addition to their fire purpose serve to supply the hotel of the place. The large pump, which, we may here add, was invented and patented by William Wright, for many years master mechanic in the Woodruff & Beach Iron Works at Hartford, Conn., is to be connected with a boiler in one of the manufacturing establishments of the town, where steam is always kept up, so that a stream of water can be obtained in a moment, in case of fire, by merely coupling the hose to a hydrant.

The citizens of Easthampton, in lieu of devoting a large sum yearly to the maintenance of a fire department, in addition to defraying the expense of the above described machine, set aside an amount annually for the extension of the pipes, so that each year a broader area is protected.

SCIENTIFIC AND MECHANICAL POSSIBILITIES.

Gas wells in various localities indicate that immense deposits of coal oil and petroleum exist in the earth, which may be at great depths; and New England may yet count it among her treasures, and large and enduringdeposits, which few now dream of, be found. We may burn it for fuel as well as for illumination; by its use steam boats may cross the ocean, and locomotives fly by its aid. We are just beginning to learn the power of this new servant that man has awakened from the sleep of ages. The country also abounds in limestone, sandstone and bituminous shales, which, by scientific and mechanical aid, may afford an almost never ending supply of this wonderful material.

And notwithstanding the seemingly advanced state of the means of transportation, it is inadequate to the present wants of man. Steamboats and railroads do not even meet the wants of our own country. New England and the Middle States want Western and Southern products; and, *vice versâ*, the West and South want Eastern products at cheaper rates. Can the possibility of aerial navigation be doubted? Every year is bringing us nearer to the practical solution of this great problem.

If a light motive power is required, science may yet discover a cheap method of separating aluminum from our clay, some of which contains as much as 30 lbs. of this most wonderful material to the tun. This metal is three times stronger than steel and as light as chalk. On the very surface of the earth, we daily walk over a material from which the machinery for a motive power may be constructed of about one tenth the weight of iron or steel. In the oxygen of the atmosphere is abundant fuel which may yet be used to rarify the air for a motive power; other powers also exist in Nature, which will, no doubt, yet become the servants of man. One discovery opens vast and expansive avenues, leading to unexplored regions where munificent creative Nature hold in store rich treasures which the scientific hand may drag from her dark *arcana*.

He who engages his mind, his time, or his fortune in the development of scientific means for bringing forth from Nature's rich stores that which will add to the enjoyment, happiness and comfort of man is entitled to the greatest honors that can possibly be bestowed by an appreciative world. J. E. E.

REMARKABLE MAGNETIC STORMS AND AURORAS IN EUROPE.

On October 14 and 15 last, a brilliant aurora borealis was observed in Paris. At Brest, at 10h. 34m. on the evening of the 14th, the magnetic storm burst. M. Sureau, who was at the time closely watching the needle of the galvanometer, which was gently oscillating between 2 and 3 degrees, saw it leap suddenly to 25 degrees. All the working apparatus was suddenly attacked, and all the sounding machinery instantly set in motion, making a deafening noise, while the electromagnets were strongly excited. It was also remarked that the currents acting on the telegraphic wires of Brest were directed from west to east. During October 16, 17 and 18, the disturbances in the telegraphs became general throughout France and probably through the greater part of Europe. The telegraphic service in France was thrown into complete disorder, necessitating the forwarding of the telegrams for Italy through the mails. These perturbations, which lasted three days, were, says *Les Mondes*, of a totally different character from those of the 14th and 15th of the same month. They were nothing more than instantaneous contacts, derangements analogous to those produced by mixing the wires; there were no longer the prolonged contacts and well defined waves which accompanied the polar auroras.

With the disturbances throughout nearly the whole of Europe appeared violent storms with thunder and lightning, which, in connection with a great barometric depression in Spain and in the southwestern portions of the continent, together with an exceptionally chilly temperature, have been remarked as extraordinary cosmic phenomena.

STEAM TRACTION.

Professor R. W. Thurston, of the Stevens Institute, delivered recently an interesting address before the Polytechnic branch of the American Institute. He showed conclusively that for heavy truckage on common roads and streets, the steam traction engine may be used with an economy of seventy-five per cent over the cost of employing horses. In other words, steam carts can be employed at only one fourth of the present expense of horse carts. During the subsequent conversation, the subject of steam street cars and carts was talked over, and one of the members expressed the opinion that the reason why horses were frightened at the steamers was because the animals were superstitious. They saw the machines were without horses, and instantly assumed that the movement was the work of the devil.

SCIENTIFIC AND PRACTICAL INFORMATION.

THE ELLIS VAPOR ENGINE.

A correspondent signing himself "Diameter," takes exception to a sentence in the letter signed J. A. H. E., on page 244 of our current volume, in which the writer says: "The theory that heat is converted into power in an engine, and thereby used up and lost, does not prove true in practice, as the experiments of Mr. Ellis fully show." J. A. H. E.'s pen must have slipped a little here. The Ellis engine is intended to save some of the heat that would otherwise be wasted. The difference of pressure—that is, of the heat—between the steam in the first cylinder and the bisulphide vapor in the second is a measure of the work done in the first cylinder, and the abstracted heat is converted into work. But as long as any heat remains in the vapor, more work can be obtained from it; and when all the heat is gone, no more work can be obtained. There is nothing in the Ellis engine to combat the theory of the convertibility of forces, and we do not think J. A. H. E. would maintain that there is.

DRYING AND COLORING NATURAL FLOWERS.

When blue or violet flowers are exposed to the smoke of a lighted pipe or cigar, a very surprising change of color takes place, the flowers becoming a magnificent green resembling Schweinfurt green, without any injury being done to the form of the flowers; and the deeper the original color, the darker is the green. Candy tuft (*Iberis umbellata*) and night violet (*Hesperis matronalis*) take an especially beautiful color. This phenomenon is caused by the small quantity of ammonia present in tobacco smoke, which converts blue and violet into green in the same manner as solutions of the alkalies do. The smoke blown from the mouth will not produce the same effect, because the ammonia is absorbed by the saliva of the mouth. Unfortunately this beautiful appearance does not last long; the flowers which have been exposed to the slightly increased temperature of the burning cigar wilt and become of a dirty yellowish brown color. The experiment is much more satisfactory when weak ammoniacal gas is used. To do this, insert the flower in the tube of a glass funnel in such a manner that the rim of the funnel projects an inch above the flower. A few drops of ammonia are dropped on a plate, and the funnel containing the flower is inverted over it; in a few minutes the most beautiful change of color takes place. Nearly all blue, violet, and light carmine flowers are changed to a magnificent Schweinfurt green. Dark carmine red pinks are colored black, the carmine flowers of *Lichnis coronata* become dark violet, while all white flowers turn sulphur-yellow. Variegated flowers show the most striking changes of color, the white petals turning yellow, and the red petals on the same flowers, green. If red fuchsias with white calices are treated with ammonia, the calix becomes yellow, and the red part, green and blue. After the change of color has taken place, put the flowers at once into fresh water, and they will retain their beautiful colors from two to four hours, according to the amount of ammonia taken up. Gradually, however, their former colors return, the green leaves passing through blue to the original color, without wilting. Lovers of flowers can in this way produce, as it were by magic, a *flora* which does not exist in Nature.

If the ammonia be allowed to act on the flowers for one or two hours, they acquire a permanent dirty chamois color, without wilting or losing shape, even when dried. Asters, which have no odor, acquire a sweet aromatic odor as soon as saturated with ammonia.

To give blue, violet, or red asters a beautiful red color, so that they can be dried to be used in winter for wreaths, it has heretofore been customary to immerse them in, or sprinkle them with, dilute nitric acid. This method did not produce very perfect flowers, because the wax in the petals of the flower prevented the acid attacking them equally. This produces irregularity in color, and when dry the form of the flower is also irregular, so that many of them are wasted, being unfit for use. These disadvantages are overcome by using hydrochloric acid vapors. Any wooden box can be used for the purpose. The box should first be provided with strings on which to hang the asters, and a piece of glass inserted on opposite sides of the box to watch the change of color. Then suspend the asters by pairs or double pairs, with the stems tied together, and in such a manner that the flowers hang down. On the bottom of the box are placed one or two plates of ordinary hydrochloric acid, according to the size of the box and number of flowers, and the box is closed. Small flowers are evenly colored in two hours, larger ones require four to six hours exposure to the acid. Red and blue asters become carmine red without injury to their form. It is necessary to examine the box from time to time, and to remove the flowers as soon as the change of color is completed.

After being removed from the box, the flowers are suspend ed in a similar manner in an airy but shaded room to dry. When dry, they are preserved in a dark dry place.

PURIFICATION OF DRINKING WATER.

Some time in 1871, Dr. Bischoff, Jr., took out an English patent for removing organic matter from drinking water by using a filter of spongy iron prepared by heating hydrated oxide of iron with carbon. This iron sponge not only purifies the vilest sewage water from organic matter, but also precipitates any copper present. It has, however, been found to possess this disadvantage, that the water so purified contains so much iron that it soon turns brown, and the iron separates in a copious precipitate in the form of the hydrated oxide of iron. This threatens to limit the usefulness of the discovery.

SOLDERING IRON AND STEEL.

Dr. Sieburger publishes the following methods for soldering iron and steel:

If large and thick pieces of iron and steel are to be joined, sheet copper or brass is placed between the perfectly clean surfaces to be united, which are then tightly wired together. The joint is covered with wet clay free from sand, and dried slowly near the fire. When the mud is dry, the joint is heated by a blast to a white heat and cooled, suddenly if iron, slowly if steel. When brass is used, it requires less heat, of course, than copper.

For objects of moderate size, hard brass solder is made by fusing together 8 parts of brass and 1 part tin. Soft brass solder is composed of 6 parts brass, 1 part zinc, and 1 part tin.

For soldering small iron or steel articles, a hard silver solder composed of equal parts of fine silver and malleable brass is used, the mass being protected by borax. Soft silver solder differs from this only in the addition of $\frac{1}{16}$ part tin.

Very fine and delicate articles are soldered either with pure gold or a gold solder composed of 1 part gold, 2 parts silver, 3 parts copper.

A CHEAP FIREPROOF SAFE.

A correspondent sends us a suggestion for a cheap fireproof safe, which he proposes to construct as follows: "Sink a well, six or eight feet deep, in the basement, and place in it a round or square boiler tube which should rise a little above the surface. In this tube place another, a little smaller and shorter, so that there will be space (at least two inches all round) between the two. Close the inner tube with a watertight door packed with a soft rubber ring, and let water fill the space and flow over the inner tube. Let there be an inch pipe from the bottom of the inner tube, leading under the walls of the building and rising out of the ground. The external end of the pipe will serve to admit air to the inner tube, and should be covered to prevent the admission of dust. Let a waste pipe lead from the top of the outer tube, and arrange a cock so that the water over the door of the inner tube may be drawn off. Fix two guide rods to the inner tube, and let an elevator with shelves pass up and down the rods, to lower your books into the well. The elevator when loaded can be counterbalanced with a weight. When you have placed your books on the shelves and lowered them into the well, close the door and let the water flow in till the whole is covered. As long as there is water in the outer tube, the inner one cannot become hotter than 212°. It will be easy to arrange so that the water can be turned on or let off without descending to the basement."

THE steam canal boat Success, built on Captain Goodwin's plan, illustrated not long ago in the SCIENTIFIC AMERICAN, lately arrived in this city from Buffalo, after a profitable and successful trip—her first voyage.