A substitute for fulminating mercury is employed in the needle guns in Germany. It consists of a mixture of equal parts of chlorate of potassium and sulphide of antimony. As both of these substances are largely employed in medicine it is highly desirable they should not be combined in the same prescription. A mixture of sulphur and chlorate of potassium will also explode by friction or percussion. When a solution of sulphur in carbon disulphide is poured upon finely divided chlorate the mixture will often explode spontaneously when the solvent has evaporated, if not, the touch of a feather is sufficient to produce a violent detonation. Chlorate of potassium and red phosphorus form a safe and powerful mixture for ignition by percussion, known as Armstrong's mixture.

In addition to the above explosives there are many compounds known only in chemical laboratories, which, either from their danger, uncertainty, or danger of preparation have not been made public.

From the above we see that an explosive may be a solid, liquid, or gas, and its explosion may result either from its dissociation or combustion.

They may be divided according to their effects into slow and rapid, although these terms are only relative. Gunpowder burns so slowly as to be well adapted as propulsive for projectiles, while nitro-glycerine decomposes so rapidly as to be useful only for bursting and rending, and should have well reserved for it the name of "rend rock." Guncotton has been used especially in the compressed form, for artillery, and picrate powder was used in France as substitute for gunpowder.

CURIOUS CAPILLARY PHENOMENA.

When a drop of water falls on a surface which does not absorb it, it is well known that it assumes a special form—that of a plano-convex lens. If above such a drop of water there be suspended, by means of a thread having no twist in it, a fine needle, the point of the latter, being repelled by the edges or attracted by the center of the convexity, at length remains stationary at the latter spot. There is, then, on the surface of this convex drop a point where the forces of tension are in equilibrium. But the above mode of experimenting is too imperfect to allow a serious study of the phenomenon, since the tension of the convex surface has to overcome the weight of the needle in order to swerve it from the vertical. M. Coutance, says the *Revue Industrielle*, has suggested an ingenious method of surmounting the difficulty by making the needle stationary and rendering the drop movable. A small piece of glazed note-paper is floated on water, and on the surface of this is placed a large and very convex drop of water. The paper, thus freighted, moves about under the slightest influence. Pushed gently toward the fixed point, it begins to move as soon as the latter touches the edge of the drop, and the two elements always arrange themselves in such a way that the needle point occupies the center of the convexity; thus proving the existence of a center of equilibrium for the tensile forces of the liquid surface. By means of this ingenious method of experimenting, we are enabled to determine points of equilibrium in drops of liquid having most varied outlines, but of a convex surface. For instance, a curved liquid surface, having the outline of an isosceles triangle, will, when presented by its apex, so displace itself that the needle, on traversing it, stops exactly at the center of gravity.

One of the most curious means of showing the equilibrium of tensile forces in these variously shaped liquids with curved surfaces is this: Draw a helicoidal figure on glazed paper with a moistened pencil. This will represent the circumvolutions of the snail's shell. Now carefully fill in the figure with water so that its surface shall have a broadly convex form. Then push the attenuated apex of the figure toward the fixed needle. As soon as contact takes place, leave the whole to itself. Then, all at once, the paper will be seen to gyrate, and the needle will traverse the whole spiral and stop just before reaching the broad base of the latter.

Here, then, we have the forces of tension of liquid surfaces shown by a physical phenomenon. The use of glazed paper in these experiments is attended with some inconvenience, because it absorbs water. It is better, therefore, to use cork or wax. In all these movable convex surfaces, the point of the fixed needle always locates itself at the exact center of the figure. Suppose, for instance, a convex figure having the outlines of France be made on the surface of the paper or wax; when it is placed in contact with the needle point, the latter will fix itself in the center of the country, *i. e.*, at a spot which would correspond to a point a little to the east of Bourges. To determine the center of a country by means of capillarity might, at first sight, seem an impossibility; but, as will be seen, the question is capable of being scientifically resolved. As to the practical applications of phenomena like these, it would be as yet difficult to cite them: but it is certainly remarkable to see revealed to our eyes, by means of these experiments, those forces whose operation our intelligence alone is powerless to understand, and whose laws can now be studied, analyzed, and translated into algebraic language.

A QUICK TRIP FROM GALVESTON.—The quickest recorded passage from Galveston, Texas, to this port, was completed July 6, by the steamship Rio Grande. Her actual running time from Galveston bar to Upper Quarantine, New York harbor, was 5 days 19 hours 28 minutes; distance, as shown by the ship's log, 1,935 nautical miles

PANAMA HATS.

Now that the summer season is on us, it may not be uninteresting to the reader to learn something about the origin and manufacture of Panama hats. This is given by Dr Seeman, in an interesting article on the vegetation of the Isthmus of Panama, in the *Journal of Botany*. An indigenous production, he says, deserving of especial notice, is the "Jipijapa" (*Carludovica palmata*, R. and P.), a palm-like plant, of whose unexpanded leaves the far-famed "Panama hats" are plaited. This species of *Carludovica* is distinguished from all others by being terrestrial, never climbing, and bearing fan-shaped leaves. The leaves are from six to fourteen feet high, and their lamina about four feet across. The spathe appears toward the end of the dry season, in February and March. In the Isthmus the plant is called "Portorico," and also "Jipijapa," but the latter appellation is the more common, and is diffused all along the coast as far as Peru and Chili; while in Ecuador a whole district derives its name from it. The plant is common in Panama and Darien, especially in half shady places, but its geographical range is by no means confined to them. It is found all along the western shores of New Granada and Ecuador; and has been found even at Salango, where, however, it seems to reach its most southern limit, thus extending over twelve degrees of latitude from north to south. The Jipijapa, or Panama hats, are principally manufactured in Veraquas and Western Panama. Not all, however, known in commerce by that name are plaited in the Isthmus; by far a greater proportion being made in Manta, Monte Christi, and other parts of Ecuador. The hats are worn almost in the whole American continent and the West Indies, and would probably be equally used in Europe did not their high price (varying from $2 to $150) prevent their importation. They are distinguished from all others by consisting only of a single piece, and by their lightness and flexibility. They may be rolled up and put into the pocket without injury. In the rainy season they are apt to get black, but by washing with soap and water, besmearing them with lime juice, or any other acid, and exposing them to the sun, their whiteness is easily restored. So little is known about these hats, that it may not be out of place to give an account of their manufacture. The "straw" (paja), previous to plaiting, has to undergo several processes. The leaves are gathered before they unfold, all their ribs and coarser veins removed, and the rest, without being separated from the base of the leaf, is reduced to shreds. After having been exposed to the sun for a day, and tied into a knot, the straw is immersed in boiling water until it becomes white. It is then hung up in a shady place, and subsequently bleached for two or three days. The straw is now ready for use, and in this state sent to different places, especially to Peru, where the Indians manufacture from it those beautiful cigar cases, which sometimes bring as high as $30 each. The plaiting of the hats is very troublesome. It commences at the crown and finishes at the brim. The hats are made on a block, which is placed upon the knees, and requires to be constantly pressed with the breast. According to their quality, more or less time is occupied in their completion—the coarser ones may be finished in two or three days, while the finest may take as many months. The best times for plaiting are the morning hours and the rainy season, when the air is moist. In the middle of the day and in dry clear weather, the straw is apt to break, and this, when the hat is finished, is betrayed by knots, and much diminishes the value.

THE PROTECTION OF WOODWORK.

It not unfrequently happens, when a frame structure is hastily erected, and in our country they are always hastily erected, especially bridges, that a good oil paint is properly applied, and yet in a comparatively short time it begins to peel off more or less completely, making it necessary to repaint them. What is still more unfortunate, some timber, which has had a good coat of oil or tar paint that did not peel off, begins to decay in a short time, so that the original intention of the paint is not fulfilled, but, on the contrary, the paint itself seems to hasten its destruction.

These and similar circumstances lead people to distrust paint as a wood protector, and from different quarters we hear the assertion that unpainted wood will last longer than it would if painted.

This view, says Engineer Sauerwein, requires modification. In judging this matter we must ask how long was it from the time the wood was felled until it was painted, and was it dry or not, for these unfortunate cases have only occurred in wood which were painted too soon.

It is well known that the sap of wood contains substances like albumen, gelatine, gum, etc., which easily undergo decomposition, and under certain circumstances, such as favor fermentation, and in warm damp air, are able to destroy very rapidly the stronger woody fibers. The more sap there is in the wood, that is to say the greener it is, and the sooner the evaporation of this sap is stopped by an airtight cover, the quicker the fermentation will set in, and with it the destruction of the woody fiber.

These circumstances are correctly understood by practical men, who prescribe that the timber be felled in winter, and try to obtain a free circulation of air through the structure.

They think they avoid the disadvantages above mentioned if they, further, demand "seasoned wood," because it is clear that there is less danger of decomposition in such wood than in fresh or green stuff. But here we at once stumble on this difficulty, namely, of determining what degree of dryness in the wood to be tested seems most advantageous for its use, and the time required for this is much longer than generally supposed. The appearance of the wood is very seldom a reliable guide, and people are accustomed to think that the wood is much drier than it really is. The comparatively important changes which the wood undergoes during the first year from shrinkage enable us to measure approximately the time necessary to destroy the last evil effects of its interior life. Not until it has reached this stage, which requires four to six years, unless artificial seasoning is resorted to, is the timber benefited by covering it with a protecting coat of paint. At this time the paint must have a beneficial effect in protecting the wood, for it prevents atmospheric moisture penetrating into the wood to serve as a reagent to decompose the albumen, which is now dried and coagulated as well as less abundant.

Owing to the position of the lumber yards and the urgency for materials to build with it is seldom possible to obtain well seasoned lumber and wood. Sauerwein, therefore, proposes the following process:

The most rational and sensible process for large, heavy timbers is the impregnation, as for railroad ties, with chloride of zinc under six to eight atmospheres of pressure, where this can be done. (Fresh green wood is best for this.) No arguments are necessary in defense of the value of this method; it cannot be too strongly recommended, nor is the expense great—about $1 per cubic meter. When there is no opportunity for impregnation the woodwork should be left two or four years unpainted.

In my experience, says Sauerwein, wood tar is better than coal tar, because it penetrates into the wood more easily, and, containing a larger amount of antiseptic substances, its effect is more permanent. Although wood tar is considerably dearer it is to be preferred. Its color being somewhat similar to wood color it can be used on small unimportant buildings. Its cost is only one-fourth that of oil paint and can be applied by a common workman.

Planed and worked surfaces should be merely oiled (three times) not painted. Besides having a better appearance, this oil varnish is necessary to prevent cracking and drawing of thin parts like doors and windows. It does not interfere with the gradual drying out of the wood.

After the expiration of three to five years the oiling may be replaced by a protecting coat of paint to prevent water from penetrating into the wood work. It should be added that it seems advantageous to mix about one part of elutriated chalk with three parts of the white lead which is used with the special color for all oil paints. This seems to make the paint adhere better to the wood, as shown by experience.

Without going into the subject of oil paints the author cautions the public against the many new fangled and highly extolled paints and substitutes. They are generally much dearer, he says, and at best are only equal to ordinary linseed oil paint made with equal care from well selected pure material. The chief effect of a good oil paint depends on the purity of the materials used, especially of the oil and white lead or zinc white, whether it is finely ground and thoroughly mixed, and the paint carefully applied in good weather.

THE BARTHOLDI STATUE OF LIBERTY.

The completion of the subscription for the statue of Liberty on Bedloe's Island, New York harbor, was celebrated by a grand banquet in Paris, July 7. M. Laboulaye presided. Among the principal guests were M. Ferdinand de Lesseps; M. Lepère, late Minister of the Interior; General Pittie, Chef de la Maison Militaire of President Grevy; Oscar de Lafayette; Henri Martin, the historian; Victorien Sardou; General Noyes; Consul General Walker; and M. Bartholdi, the sculptor of the statue.

An address to the people of the United States—signed by the French participants at the banquet, and indorsed by 181 towns, represented by votes of municipal councilors, forty conseils-generaux, ten chambers of commerce of the most important towns, and 100,000 subscribers—announces that the statue will be finished in 1883, and erected on a monumental pedestal on Bedloe's Island. The preparation of a suitable foundation devolves, we believe, upon the American public. It is to be hoped that there will be no delay in completing the work. The placing and inauguration of the statue may form an appropriate feature of our World's Fair celebration in 1883.

49th Exhibition of the American Institute.

The annual exhibition of the American Institute, of the city of New York, will open September 15. The Board of Managers announce a novel and very promising feature, namely, an exhibition of the work of amateurs and apprentices in all branches of mechanical, industrial, and decorative art. Such exhibits will be admitted free of charge, and premiums are offered for the best. To pass upon exhibits of this character the Institute proposes to add to the corps of judges ladies who are proficient in art work, in which department are embraced sculpture, painting, drawing, bric-a-brac, fancy work, embroidery, decorated china, wood carving, sawing, and all other artistic handwork calculated to adorn American homes.

NEW CANAL IN CHILI.—The *Chilian Times* announces the completion of the Canal de la Merced. The canal is seventy-five miles long, and has been twenty-five years in construction. It is considered one of the most important works executed in Chili. It has cost about $400,000.