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A GOLD lacquer closely resembling the real Chinese article is made by first melting to a perfectly fluid mixture 2 parts copal and 1 part shellac. To this add 2 parts good boiled oil. Remove the vessel from the fire, and gradually mix in 10 parts oil of turpentine. To give color, add a solution of gum guttæ in turpentine for yellow, or of dragon's blood for red, a sufficient quantity of coloring material being used to give the desired shade.

FLUOSILICIC ACID IN THE ARTS.

One of the compounds of silicon with hydrogen and fluorine, known as hydrofluosilicic acid, $H_2 Si F_6$, seems likely to become at some future time as useful and well known as it is now rare and untalked-of. It is not a new substance, but has long been used in analytical laboratories for precipitating potassium, one of the most difficult salts to precipitate; and also it is used for separating barium from calcium and strontium. About eight years ago, Tessié du Motay and E. Karcher attempted its manufacture on a commercial scale at Grossblittersdorf; but the Franco-Prussian war interrupted the business, which has never been revived. Their process consisted in smelting together in a shaft furnace, by means of a cold blast, a dry mixture of sand, clay, fluorspar, and fine coke. The gases evolved, consisting chiefly of nitrogen, carbonic oxide, carbonic acid, and fluoride of silicon, were passed through water in a condensing apparatus, when the fluoride of silicon was decomposed into silicic acid and hydrofluosilicic acid. The acid solution was either introduced into commerce in that form, or employed in preparing silico-fluoride of potassium and sodium. This process was quite imperfect, and, until a better one is devised, the manufacture of fluosilicic acid on a large scale is not likely to be revived. In the first place, not all the fluoride of silicon is decomposed by the water, and this involves a waste; secondly, some hydrofluoric acid is formed, which cannot be expelled, and this interferes with its usefulness in decomposing the chlorides of potassium and sodium. Finally, the silico-fluorides of potassium and sodium, when formed, are not completely decomposed by heat into fluoride of silicon and alkaline fluorides.

That it is highly desirable to devise a cheap and perfect method of manufacturing fluosilicic acid will be seen when we mention some of the uses to which it is applicable, although some of these are of less value to us than to our German neighbors. This is especially true in regard to the manufacture of fluoride of potassium from the Stassfurt brines, rendering its separation from the troublesome magnesium very easy. It can also be employed to separate sodium from sea water. The alkaline silico-fluorides are decomposed by heat into fluoride of silicon gas, which is utilized, and alkaline fluorides, which are easily converted into caustic alkalies by means of quicklime. Kessler has also patented a process for making soda from table salt, in which carbonate of lime is used. The fluoride of calcium produced may be used over again in making the fluosilicic acid, in place of fluorspar.

But there are many other uses to which fluosilicic acid may be put beside the preparation of caustic alkalies. It has been proposed to use it for decomposing bones, phosphorites, and sombrerites, in the manufacture of artificial fertilizers; while fluosilicate of potassium is itself a very suitable form in which to introduce this alkali into the soil.

Fluosilicic acid has been used in the manufacture of beet sugar, as it is able to precipitate the alkaline salts contained in the molasses, which hinder the separation of the crystallizable sugar. Their precipitation by this acid was first proposed by Von Kletzinsky and afterwards by Marix.

Combe and Wright recommend its use in the manufacture of glass and porcelain. They propose to replace the lime by silicofluoride of calcium, either alone or with the barium salt, in the manufacture of glass; and instead of carbonate of potash they would take the silicofluoride of potassium. Still more important is the substitution of fluosilicic acid for boracic acid in the lime, alumina, and other compounds used in English stoneware. Silico fluorides could scarcely be used for glass on account of the evolution of fluoride of silicon vapor when fused.

It may also be mentioned that it has been proposed and used in making artificial stone, for fixing stereochromatic colors, in making tartaric acid, as a substitute for this acid, as a mordant in dyeing and calico printing (in place of the drug bath), for whitening pins, for removing the lime from beet juice in making sugar, and many other uses. It produces an incomparably beautiful patina on brass, bronze, zinc, and German silver. A French manufacturer uses its sodium salt to make hard alloys rich in silicon. T. Christy has taken a patent in England for its use in the manufacture of ammonia from gas liquor.

It seems as if fluosilicic acid, notwithstanding the service it has already rendered, is not attracting the attention it deserves either from chemists or manufacturers. Let America take hold of the problem and show the old world what she can do with this curious and useful acid. On a small scale in the laboratory, it is made by mixing together pulverized fluorspar and fine sand, adding oil of vitriol, and heating. The gaseous fluoride of silicon thus formed is passed into water, precautions being taken to prevent the tube from choking up with precipitated silica. The products are pure gelatinous silica and a solution of hydrofluosilicic acid.

THE BAOBAB AS A FIBER PLANT.

The baobab (*Adansonia digitata*) has long been known as one of the giants of the vegetable kingdom. It has lately become an important source of fiber for papermaking. The fitness of its inner bark for this purpose was demonstrated some years ago, but it is only within the past decade that it has begun to rank as an important article of commerce. By the natives of Africa the bark is put to various uses: Twisted into string and rope, it is used for all sorts of purposes, and in untwisted strips it serves to secure loads and to bind together the poles employed in making their huts. Finer pieces are pulled out so as to resemble coarse netting; and the edges being sewn together, they make handy bags for cotton, gum, grain, and the like. Coffee and ground nuts are brought down from the interior to the coast in very strong bags woven from thin strips of the bark.

The bark is obtained by first chopping off the softer outer bark of the tree with a hatchet, after which the inner bark is stripped off in large sheets. The pieces are beaten with a stick to soften them, and shaken to get rid of some of the pithy matter which they carry. The sap is then dried out in the sun, and then the fiber is pressed into bales for shipping. The smaller trees produce the finest and softest fibers. The bark is taken off all round the tree, which does not appear to suffer much injury. A fresh layer of bark grows and is thick enough to be taken off in six or eight years. Mr. J. J. Monteiro, who has the credit of adding this valuable fiber to the resources of the paper trade, tells some amusing stories of the difficulty he experienced in developing the business of collecting the fiber. By paying liberally, he induced some of the natives to take hold of the new work at last, and matters went on tolerably smoothly until a season of drouth came on. The fetich men declared that the "big iron"—his hydraulic press—had fetiched the rain and prevented its appearance. The matter was discussed throughout the country; and at a general meeting of the people of the neighboring towns, it was decided to apply the usual tests to the big iron, and, if it proved to be a sorcerer, to destroy the press and throw it into the sea. It is the custom in those parts to try all cases of supposed witchcraft by subjecting the suspected to the ordeal of poison. For this purpose they use *casca*, the bark of a large tree, the *erythrophlæum Guineensis*, which acts either as a violent emetic or as a purgative, innocence or guilt being determined by the manner of its action.

In the case of the press, the application of this simple and, to them, perfectly satisfactory test was seriously interfered with by the absence of any stomach or insides to the big iron, for the poison to take effect on. After much deliberation it was resolved to employ a substitute in the person of a slave to the king. To this unwilling representative of the big iron the *casca* was duly administered, and luckily acted as an emetic; so the press was declared innocent of bewitching the rain. Still the rain held off, and grave suspicions arose as to the sufficiency of the trial. To resolve all doubts, the poor slave had to undergo the ordeal a second time, fortunately with the same result, and the press was never more suspected of complicity with evil spirits.

THE SECRETS OF MAKING VIENNA BREAD.

One of the most practical and useful works which has recently emanated from the government printing office, at Washington, is Professor E. N. Horsford's report on the subject of Vienna bread. Professor Horsford was a member of the United States Scientific Commission to the Vienna Fair of 1873; and the present book is the result of careful and exhaustive research, the aim and object of which was to unearth the secret of the world-famed bread peculiar to the Austrian capital. There is something very appetizing in his description of the *Kaiser Semmel*, as the bread is there termed. It is "a smooth, irregularly rounded small wheaten flour loaf, of uniform weight. It presents a rich reddish brown crust and a delicately shaded yellowish, almost white, interior. It is always light, evenly porous, free from acidity in taste or aroma, faintly sweet without the addition of saccharine matter to the flour or dough, slightly and pleasantly fragrant, palatable without butter or any form of condiment, and never cloying upon the appetite."

The reverse, the Professor might have added, on one hand, of the dyspepsia-breeding, doughy compound which passes for bread in many a country home, and of the attenuated, alum-treated, tasteless loaf which is produced in many a city bakery. It seems, however, that these gastronomic abominations are not necessary evils, and that, despite the repeated efforts which have been made to imitate Vienna bread out of Vienna, which have uniformly failed, a way does exist of producing it in all its delicacy. And that way is very simple, as the reader will see by the following:

The first requisite is to procure as good flour as the Vienna bakers have. Good flour can only be made from pure sound wheat, and by good milling. This means in general flinty wheat reduced by the process of high or half high milling, and a selection of the products of the milling, not to exceed one half the total weight of the wheat ground. Good fresh middlings flour, Professor Horsford says, would compare favorably with the average Hungarian flour used in Vienna.

The next requirement is fresh pressed yeast. This is already made in the United States. It is not difficult to manufacture, since it is made by skimming the froth from beer mash in active fermentation. This contains the upper yeast, which must be repeatedly washed with cold water until only the pure white yeast settles clear from the water. This soft tenacious mass, after the water has been drawn off, is gathered into bags, and subjected to hydraulic pressure until there remains a semi-solid, somewhat brittle, dough-like substance, still containing considerable water. This is the pressed yeast, which will keep for eighty days in summer and for an indefinite time on ice. For use it should be of recent preparation and sweet, so that it will yield only alcohol and carbonic acid as products of fermentation.

Next follows the very important operation of mixing. Into the middle of a zinc-lined trough, about 2½ feet wide and 8 feet long, semicylindrical in form, the Vienna baker empties his flour sacks. Then, into a pail holding about five gallons, equal parts of milk and water are poured, and left to stand until the mixture attains the temperature of the room, between 70° to 80° Fah. It is then poured into one end of the trough and mixed with the bare hand with a small portion of the flour to form a thin emulsion. The press yeast is

next crumbled finely in the hands, and added in the proportion of three and a half ounces to every three quarts of liquid, and then one ounce of salt in same proportion is diffused through the mixture. The trough is now covered and left undisturbed for three quarters of an hour. Then follows the incorporation of the flour from the neighboring heap; and as this is the last of the ingredients, we may write the recipe as a whole, thus: Flour 8 pounds: milk and water 3 quarts: pressed yeast 3½ ozs.: salt 1 oz.

The mass of dough, being left quiet for two hours and a half, becomes a smooth, tenacious, puffed mass, of yellowish color, which yields to indentation without rupture and is elastic. It is now weighed into pound masses, and each lump is then cut by machinery into twelve small pieces, each of three quarters of a inch in thickness. Of each one of these, the corners are brought together in the center and pinched to secure them. Then the lump is reversed and placed on a long dough board for further fermentation, until the whole batch is ready for the oven. Before being introduced into the latter, the rolls are again reversed and restored to their original position, having considerably increased in volume, to be still farther enlarged in the oven to at least twice the volume of the original dough. In the oven they do not touch each other, and the baking occupies about fifteen minutes. To glaze the surface they are touched in the process of baking with a sponge dipped in milk, which, besides imparting to them a smooth surface, increases the brilliancy of the slightly reddish cinnamon color and adds to the grateful aroma of the crust. No peculiar form of oven is required, the only necessary point being that the receptacle shall be capable of maintaining a temperature of about 500° Fah.

THE UTILIZATIONS OF MICA.

A correspondent encloses us a sheet of very clear mica, and asks us for what the material may be employed. Of late, large quantities of mica have been mined in Mitchell and adjoining counties, in North Carolina, which are proving very remunerative. The material is got out in sheets of from two by three to fifteen inches square, according to patterns furnished by dealers, and the best price is given for dark or brandy-colored mica. In obtaining these sheets, of course, immense quantities of scraps and fragments must be made, and it is mainly with regard to these waste bits that the utilizations above to relate. The first employment which suggests itself as worthy of a wider field than it now possesses is the substitution of mica for glass in spectacles worn by workmen, especially stone and metal workers, to protect their eyes from chips and splinters. As already made in Germany, these mica glasses are concaved in the shape of watch glasses, and are about one twenty-fifth of an inch in thickness. They are mounted in simple brass wire frames, and are made sufficiently large to fit closely around the eye sockets. The advantages gained by this utilization are greater than would at first be imagined. Mica spectacles cannot be broken. Pounding with a sledge hammer merely flattens them, nor does molten metal poured on the mica affect it. The shower of pointed iron particles which issues from lathes merely rebounds from the elastic mica glasses. In weight, mica spectacles are about half as heavy as glass ones; and when a pure material is used, the mica, with the exception of a slight grayish tint, which is rather agreeable to the eye, is fully as transparent as glass.

Another use for mica is its application, when previously colored or metalized, to ornamental purposes. From its unalterable nature, the material preserves gilding, silvering or coloring from deterioration; and from its diaphaneity, the articles so treated will preserve all their brilliancy. The process of treating mica, devised by Murray, of Paris, is as follows: The mineral is first cut to the desired thickness, then coated with a thin layer of fresh isinglass diluted in water, and the gold or other surface applied, after which it is allowed to dry. A copper pattern of the desired design is next placed on the reverse side of the sheet, and any superfluous parts of the gilding are removed by means of a small brush, the design remaining on the parts not brushed. Colors are then laid on as desired, and the whole is coated with a solution of liquid glue, diluted in spirits of wine, which is applied for the purpose of rendering the mica pliable. The sheet is then fastened with glue permanently in position; and where several sheets are to be secured together, the junction can be rendered imperceptible by first gluing with Venetian glue and then going over the joints with a hot iron.

Puscher, of Nuremberg, has also suggested several ways of converting mica sheets into very elegant ornamentation. For one application the thin plates are first purified by treatment with strong sulphuric acid, and then silvered by the ordinary process adopted with looking glass. The mica thus acquires a beautiful silver luster, and it may easily be cut into any shape for inlaying work. The flexibility of the mica will, of course, allow of its being applied to irregular surfaces. When a sheet of mica is heated to full redness for a time, in a clay muffle, it loses most of its flexibility, and is changed considerably in appearance. Under reflected light, it has a dead silver white look; but viewed by transmitted light, it is seen covered with gray spots. This latter appearance is lost when two or three pieces are superposed. The mica, after heating, is also a beautiful material for inlaying work; it should be cut into the desired shapes prior to the heating process. Another very pretty effect is obtained by scattering small fragments of mica on freshly poured clear sheets of gelatin, and varnishing it with a dark-colored solution of gelatin. Finely ground mica, on colored gelatin, also shows handsome effects; and when mixed with a solution of gum arabic, it makes a good silver ink. The gelatin combination is used for inlaying buttons.

Another beautiful application of mica is in the production of bronze-like colors, which bear the names brocades crystal colors, and mica bronzes. The mineral is to this' end well crushed, boiled in hydrochloric acid, then washed in water, and assorted according to the size of the laminæ. Mica scales thus obtained exhibit a glass-like luster, combined with a silver white appearance. Among the advantages of these brocades are that they are indifferent to sulphurous exhalations, are very light in weight, and in some colors are even more brilliant than the metal bronzes. They may be fixed upon all kinds of articles of metal, wood, glass, plaster of Paris, and paper board, so that they are well adapted to the preparation of artificial flowers, fancy papers, sealing wax, and for use in tapestry, furniture-making, and painting: in fact, they may be applied to all purposes now filled by ordinary bronze powders. In fixing these brocades, the articles are first painted in bronze color; if silver is to be imitated, a ground of white lead is suitable. Either oil or glue color may be used, the latter fixed with a mixture of 4 parts glue and 1 part glycerin. Upon this coat, when hard, the binding material for the brocade is spread, and after fifteen minutes the latter is sifted over. As a binding material, a paste consisting of 4 parts boiled starch and 1 part glycerin is recommended. If the ground is formed by an oil paint, the binding material for the brocade should be constituted of pale copal varnish, upon which, when only pitchy, the powder is sifted. When finally varnished, articles treated as above assume a very beautiful appearance.

When small particles of mica silver are spread over articles coated with asphalt varnish, the result is a good imitation of granite. The crystal colors are also suitable for calico-printing; and fabrics to which they are applied surpass in brilliancy the heavy bronze and glass dust fancy fabrics of Lyons. Such colors have been used to decorate porcelain and glassware, the articles undergoing a second heating up to the fusing point of their glazing. By suitable dyes, the material is easily colored to a variety of hues.

Mica has been used instead of glass on board war vessels, in localities where glass would be broken by the concussion due to the firing of heavy guns. It is also employed for roofing purposes, and in several patented processes forms a water and fireproof covering for strata of rubber, tar, canvas, felt, and similar materials.

THE INTERNATIONAL EXHIBITION OF 1876---PROGRESS OF THE MACHINERY DEPARTMENT.

The commencement of the period of hustle and tussle, such as has been more than once predicted in these columns, is at hand; and Machinery Hall and its offshoots are now a very pandemonium of iron, wood, brick, stone, and mortar, in every conceivable shape and position. Heaped up in the most indiscriminate manner may now be seen monstrous castings and forgings, belonging to such mighty engines as steam hammers, rolling mills, etc.; and they lie about the floor in a manner as though some Titan, in mockery of all human effort, had carelessly dropped the ponderous objects in this way to thwart the toiling mites who tug at them all the day to bring them into place; and one might pass on in the full conviction that busy man had here overreached himself in his attempt to master these unwieldy masses and bring order out of such a chaos by the 10th of May, if it were not for those modern and veritable titanic aids, the steam cranes, three of which are now constantly at work lifting and moving heavy objects into place. One of these machines picks up a 10 tun piece of iron and whirls about upon its vertical axis with it, to deposit it where wanted, or moves off to the desired spot with the piece of metal hanging from its extended arm, with all the ease imaginable. Much of this kind of material as there now is upon the floor, car load upon car load continues to arrive almost hourly. As an earnest of what may be expected within the next two weeks, it may be stated that eighty car loads of material arrived upon the grounds on Saturday last. In view of such facts, we may well believe that, before the whole is in its destined place, many figurative corns will be trod upon and some peculiarly centennial anathemas be added to the language. Mixed up with such ponderous objects as the foregoing may be seen, here and there, a fancy little show case occupying its half dozen square feet of floor, and others of greater size and pretensions looming up in all their majesty of polish, gilding, and ornate carving; and one is led to wonder how their present high state of finish is to be preserved amid an assemblage which may be described as the furniture of some huge smithy.

Some of the "early birds"—to whom we give all credit—have their exhibits finished, and they can look on at their more tardy *confrères* with all the complacency of a man with an umbrella among his friends caught out in a heavy shower without any. Among these is a rather peculiar exhibit—and one which will become quite a prominent landmark in the hall—made by J. H. Mitchell, of Philadelphia. It consists of a column erected upon an ornamental pedestal of brick, the whole being about thirty feet in hight. The plinth, base, a section of the shaft at about every four inches, and the members of the capital, are each made of a separate grindstone, the whole being proportioned so as to form a very handsome column of the Doric order of architecture, every piece—of which there are thirty-six—being a real grindstone, except the plinth and the upper member of the capital, both of which are, of course, square, and could not therefore well be used for grinding purposes. These stones are of all shades of color, and come from all parts of the world where such material is found; altogether, this column makes a conspicuous and curious object.

Another of the American exhibitors who has taken time by the forelock is the firm of J. P. Morris & Co., of this city, who have now erected, at a short distance westward of the large Corliss engines, an immense vertical blowing engine. With the exception of a very few of the minor details, it is now complete; and from its great hight and massive proportions, it may readily be seen from almost any part of the floor of the great building. The steam cylinder is 50 inches in diameter by 7 feet stroke, and the air cylinder is 90 inches in diameter, with the same stroke. It is of the style generally known as the "steeple," with the air cylinder placed vertically upon the steeple frame. The axes of the cylinders are in one line, and the piston rods are severally connected to a yoke, which encompasses the crosshead, the rod of the air cylinder passing upward, and that of the steam cylinder downward. The whole hight of this machine is 37 feet 6 inches above the floor, and its total weight over 100 tuns. It is a condensing engine, but will be run (without pressure in the air cylinder) during the exhibition as a high pressure or non-condensing engine, at about 16 revolutions per minute, discharging into the upper regions of the building nearly 10,000 cubic feet of air per minute, which ought to render the immediate vicinity of this engine a favorite locality during the heated term, which we are sure of in the months of July and August. Upon either end of the shaft, which is below the bottom cylinder head, is a massive fly wheel of 20 tuns weight, which is, in some respects, quite notable. The hubs or centers of the wheels are somewhat larger than in the ordinary constructions of this kind, sufficiently so as to permit of the crank pin being inserted into them as in the ordinary disk crank. These hubs or centers have holes bored radially in their edges for the reception of the arms of the wheel; and each arm, cast with its own section of the rim, has a corresponding cylindrical projection upon it, which is turned in the lathe to fit the radial holes in the hub. The sections of the rim where they join each other are secured with the usual internal link and driven keys, riveted over on the outside to prevent withdrawal; and the turned ends of the arms are secured in the hub with similar riveted keys through slots, cast in them and the hub for that purpose. This is something of a novelty in the construction of large sectional fly wheels, and has at least the merits of cheapness, precision, and security.

A rather curious feature in this engine is that the connecting rods—as necessarily must be the case with the crank pins inserted in the wheel centers—pass outside of the fly wheels; the crossheads being of sufficient length to permit of the fly wheels revolving between them and the steam cylinder; and the shaft being below the cylinder, the connecting rods are long enough to keep the crosshead clear of the rims of the wheels at the top. The weight of the two pistons, piston rods, and crosshead is balanced by coring out some of the arms and a part of the rims of the wheels, which externally are symmetrical in form. The valve gear very much resembles the old Stevens cut-off with its side pipes, poppet valves, and overhung lifting rods: except that the long toes of that form of valve gear are replaced by friction rollers working in the lower ends of the lifting rods and actuated by peculiar cams upon a rotating shaft which receives its motion by the intervention of spur gearing from the engine shaft. This arrangement is called the Wanock cut-off, and, as an expansion gear, can only be adjusted by hand. This machine seems to be a well conceived design for blowing purposes under pressure, all the strain being received and transmitted in direct lines, except in the case of transverse strains upon the crosshead, which, if the work of the machine requires that the fly wheels should be as heavy as they are made, has the appearance of being entirely light to transmit the momentum of these rotating masses of iron.

The Japanese mechanics have finally entombed themselves in their new abiding place, for any one of them is now rarely to be seen outside of that structure. The clatter going on within, however, gives note that they have by means ceased their labors. They have expressed themselves as considerably astonished—which must, however, have been in the form of words or gestures, for their immobile visages seem incapable of any such expression—at the rapidity with which the "Melican man" erects his large and handsome buildings, and they rather feel themselves in the shade in this respect. At the beginning of their labors, a large and curious throng was always to be found observing and criticising the tools and methods of the "Japs," and no doubt gave the foreigners the impression that they were creating a grand excitement among, and imparting much valuable knowledge in the building line to, the American mechanics and architect. If such has ever been their state of mind on that subject, they have evidently become disabused of it; for not only have they expressed their surprise at the rapidity of our workmen, but they now look upon their own chosen instruments and tools as inferior to ours: as is instanced in the fact that Mr. Henry Disston, saw manufacturer of this city, has received an order from them for 900 hand saws to be sent to Japan. In the operation of such tools as planers and saws, their cutting is done by pulling the tools towards them; but they are evidently coming to the conclusion that a little American "push" is the best.

J. T. H.

Editorial Amenities.

Under the head of "New Industries Wanted," we lately published a paragraph relative to the needs of the people of the Mississippi Valley, which we quoted from and credited to the *Engineering News*, as it appeared in that paper without credit to any other journal, and, we supposed, was original with the *News*. We are now in receipt of a note from the editor of the Indianapolis *Journal of Commerce*, desiring us to inform our readers that the paragraph in question was original with him and first printed in his paper