nitrate of mercury test as affording sufficiently clear reactions to enable him to find this oil when mixed with olive oil.

He used Pontet's test as follows: 6 parts of mercury are dissolved in 7½ parts, by weight, of nitric acid, 1·36 without the application of heat, and form the test solution. The tubes for making these experiments are merely strong test tubes of 7 inches in length, and holding about a fluidounce. They are roughly graduated by pouring in 30 minims of water and scratching a line upon the glass; another line is made at the point reached when a total of 6 drachms of water have been poured in. The lower line is marked "test," the upper one "oil." Pour in first the test to its mark, and fill up with the suspected oil to the other line; shake well and set aside, shaking again about an hour afterwards. In from three to twelve hours, according to the temperature, etc., a genuine olive oil will have solidified entirely, the product after the latter interval being quite hard when touched by a glass rod. Cotton-seed oil, when similarly treated, will not solidify, but remains fluid. A mixture of 25 parts of cotton-seed oil with 75 parts of olive oil gives an intermediate condition. The contents of the tube become solid, but if a little be taken out with a glass rod, it is found to be soft, pasty, and without any friable character. On the other hand, when pure olive oil is so treated, the product is hard, friable, and not pasty. Comparative trials should always be made, and caution exercised in accepting the apparent conclusions. Where only 12½ per cent of cotton-seed oil is present, the reactions are not so distinct as with 25 per cent., but Mr. Reynolds considers them usually sufficient to decide the case.—*Druggists' Circular.*

THE MANUFACTURE OF SULPHURIC ACID.

From the Report of J. Lawrence Smith, United States Commissioner to Paris Exposition.

Black Ash—Mond's Process for Obtaining Sulphur.—I propose giving a tolerably full account of Mond's process, as described by himself, in using the waste from the black-ash generally employed in England, and which allows of more rapid operation than the more compact waste of most continental works.

In place of the set of four vats generally in use for lixiviating black-ash, he employs a set of ten or twelve. All of these are connected by pipes in the usual way, so that the soda liquor runs from the bottom of one vat to the top of the next one, and by special pipes and taps which allow the sulphur liquor to run out of the bottom of each vat to the top of any other vat in the set. Besides this, they are provided with extra taps and shoots to convey the sulphur liquor to wells or settlers. The lower parts of all the vats are connected with a fan (capable of producing a pressure of about seven inches of water), by pipes furnished with dampers, which regulate the quantity of air passing through.

A noiseless fan of Schiele's construction twenty inches in diameter, price $50, propels a sufficient quantity of air for the treatment of the waste resulting from 100 tuns of salt cake per week. Four of the vats are always filled with black-ash in the course of lixiviation; the other six or eight with waste to be treated according to the invention. As soon as the black-ash is completely spent, and the weak liquor is well drained off, the connection with the fan is opened. The waste soon begins to heat, the temperature gradually rising above 200° Fah., and gives off quantities of steam, becoming greenish, and afterward yellow on top, gets more and more dry, and would take fire if the air was passed through long enough. The time for discontinuing the passing of air, so as to have the best results, must be ascertained in each establishment by experiments, and varies according as much or little hyposulphite in the hydrosulphide and bisulphide of calcium are formed, which are afterward oxidized into hyposulphite. A part of the hyposulphite is again decomposed into sulphur and sulphite, which is very insoluble, and cannot be extracted by lixiviation. Carrying the oxidation too far would therefore entail a serious loss. On an average the time of exposure will be limited to between twelve and twenty-four hours. The waste is now lixiviated systematically with cold water, the weaker liquors passing from one vat to the next one in course of lixiviation, so as to obtain only strong liquors, which operation can be easily performed in six to eight hours. When this lixiviation is finished, air is again passed through the waste in exactly the same way as before; the waste is again lixiviated, and the same treatment is repeated a third time. The vat is then ready to be cast, and is again filled with black-ash. When the operations have been well conducted, sulphur equal to about 12 per cent of the weight of the salt cakes used in making black-ask is obtained in solution from the waste. The waste contains only traces of sulphide of calcium, and is principally composed of carbonate of lime, sulphite, and sulphate of lime, which, far from being noxious, make the waste, on the contrary, a valuable manure. In separating the sulphur from the liquors thus obtained, by adding muriatic acid, I met with much more difficulty than I had anticipated from such a reaction.

The oxidation of the waste is regulated so as to obtain a liquor, which contains as nearly as possible to every equivalent of hyposulphite two equivalents of sulphide. This liquor is decomposed by first adding to a certain small quantity of acid an excess of liquor, until there is a trace of sulphide in the mixture; then a quantity of acid sufficient to neutralize the whole of the calcium is poured in; a new quantity of liquor equivalent to this last quantity of acid is added, and then acid again and liquor again, and so on until the vessel is nearly filled. To the last liquor only one half of the required acid is added, and steam introduced until the liquid shows a temperature of about 140° Fah. Practically speaking, the liquor and acid are poured at the same time into the decomposing vessel in nearly equivalent proportions, the workmen taking care to keep a small excess of liquor up to the end of the operation. This part of the process is carried on in covered wooden tanks connected with a chimney in order to carry off any sulphureted hydrogen which may be evolved by mistake of the workmen. If properly carried out there should be, however, no appreciable quantity of that gas evolved.

The practical result of this mode of working is simply precipitation of nearly the whole of the sulphur in a pure state.

$$Ca\,O,S_2\,O_2 + Ca\,S_x + 3\,H\,Cl = 3\,Ca\,Cl + 3\,H\,O + (2+x)\,S.$$

The details of the reaction are, however, very complicated, almost all the different acids of sulphur being probably formed during the process.

In practice, about 90 per cent of the muriatic acid, calculated according to the above-described method, is required to thus effect the complete decomposition of a well-proportioned liquor. If it contains more hyposulphite than above indicated, less acid is, of course, to be used. About 90 per cent of the sulphur contained in the liquor is precipitated in an almost pure state, and settles exceedingly well within two hours. The supernatant clear solution of chloride of calcium is then drawn off, and another operation directly commenced in the same vessel as soon as a sufficient quantity of sulphur is collected in it, which will depend on the size of the vessel and on the strength of the liquor, ranging from 4 per cent to 7 per cent of sulphur; it is drawn out by means of a door at the lower part of the vessel into a wooden tank with a double floor, where the chloride of calcium is washed out by water, and the sulphur is then simply melted down in an iron pot. The product thus obtained contains only from one tenth of one per cent to one per cent of impurities, and is thus by far superior to any sort of brimstone in the market, though it has sometimes a rather darker color, caused by traces of sulphide of iron, or a little coal dust, which latter may have been suspended in the muriatic acid.

The total yield of sulphur obtained by the process amounts thus to 10 or 11 per cent of the weight of the salt cake used in making black-ash, or to about one half of the sulphur therein contained, and to about 60 per cent of the sulphur contained in the waste. It is still hoped, however, to considerably increase this quantity after some more years of experience.

The cost of production is inconsiderable. In the different continental and English works, where the process has now been working for years, the expense for wages, fuel, and maintenance amounts only to $5 per tun of sulphur, and the outlay for the apparatus will be more than covered by the net profits of the first year. An establishment making three tuns can save at least $2,000.

(To be continued.)

For the Scientific American.

THE RELATION OF MECHANISM TO ART.

[BY W. L. ORMSBY, JR.]

The facility for duplication produced by mechanical processes has aided signally in the perpetuation of artistic productions. In the single department of casting, the varieties of artistic forms that are multiplied become illimitable. The commonest articles of domestic use, with the aid of mechanism are embellished by the *perpetuation* of the work of artists. Even so ordinary an object as a parlor stove is now decorated with scrolls and flowers and other devices not unworthy the chisel of a sculptor. The application of the same principle of casting gives us beautiful ornaments in gas fixtures, chandeliers, picture frames, cornices, type, and a million other devices of the plastic art.

Likewise the wonderful improvements in printing have perpetuated the achievements of the draftsman and engraver, until the cheapest book is incomplete without its complement of artistic illustrations.

In articles of dress, too, the combination of mechanism and art is peculiarly striking; see the exquisite texture and patterns of brocades, of embroideries, of laces, and even of the cheaper goods. How beautifully is the universal taste for regular forms ministered to, while in even the cheapest calicoes are seen some productions of great artistic skill.

Take the single article of carpets, of all the varied products of the loom, and we find that in the combination of colors, the delineation of objects, the art of the painter is often fairly rivaled. The cheapness of duplication by mechanical means is also an essential requisite for its success in multiplying artistic forms. Take, for instance, paper hangings—the finest of which are almost undistinguishable from fresco painting—a day-laborer can paper the walls of his dwelling almost as cheaply as he can whitewash them.

The difficult and expensive art of engraving affords one of the most striking illustrations of the point in question. Few persons are aware of the immense expenditure of time and money and artistic ability that are necessary to produce an ordinary bank note or a common stamp. The elegance that marks them would be absolutely unattainable without the wonderful mechanism through which an expense of a hundred thousand dollars is made available on each two cent letter stamp.

Nor should we overlook in this connection the beautiful shapes that are furnished by such absolute mechanism as the turning lathe. The ornamentation of bank notes, of the backs of watches, of furniture, machinery, and tools, by the simple operations of the lathe are familiar examples.

And now, in obedience to a great law, and following in the train of mechanical triumphs comes chromo lithography, perpetuating the skill of the painter as printing has perpetuated the skill of the engraver.

The whole subject is suggestive of the correlation of the arts. Just as individuals cannot improve without improving the nation, so one art or science cannot advance without carrying the sister arts and sciences in its train. The triumph of mechanism has been the perpetuation of art.

Correspondence.

The Editors are not responsible for the Opinions expressed by their Correspondents.

The California Fairs.

MESSRS. EDITORS:—While waiting to keep an engagement in this *Fair* building of the Mechanics' Institute of San Francisco, I am reminded that your readers might be pleased to see even a hasty sketch of the two California Fairs—the State Fair at Sacramento recently closed, and this one at San Francisco, recently opened.

Of the State Fair at Sacramento I cannot say too little; while of this one I can scarce say enough, in the little space at your disposal for such a purpose. To say that the State Fair, so much and so loudly heralded, was a disgrace to California, and would have been unworthy as an exhibition of the industry and productions of any fourth-rate county within her borders, is to speak a simple truth.

The one thing which seems to have engrossed the faculties of the managers, was the half-mile race course. The entire machinery department consisted of a boiler, engine, and shafting—all the requisites for machines in motion, without a single machine of any kind to be thus exhibited; a part of the space set apart for this purpose was used for the display of a slim collection of agricultural implements.

Pleasanter far is the duty of calling attention to this Fair of the Mechanics' Institute, held in a building some 250 by 150 feet, provided with double galleries on each side of the nave (which is not far from 75 feet wide and 50 feet high) constructed for the purpose, and well filled in every part with articles of use and novelty.

The central feature of the main exhibition room is an oval shaped fountain, around which, and freshened by the ceaseless play of the waters, the most tempting fruits are displayed—fruits of all seasons and of almost every clime. Beans and blackberries, apples and apricots, grapes and lemons, melons and oranges, pears and pomegranates, peaches and pumpkins, plums and potatoes, peppers and quinces, strawberries and squashes. Turnips and vegetables, of every kind, are exhibited in great profusion, while pilfering fingers are restrained by the intervention of coarse wire nettings. Flowers and plants, too, of number and variety uncounted, are assigned places in the immediate vicinity; and behind them again are stands, where new cider is made, which, with California Vichy water, slakes thirst for the thirsty.

The general effect of the decorations of the room is excellent. Indeed the exhibition of taste in the arrangement of draperies and in the classification of articles is well worthy the attention of our American Institute managers. Without attempting to particularize, I will content myself with a partial enumeration of articles which attract my attention as especially novel or useful. Not the least of these is the Patent Agency—where a variety of quaint models appear, and behind them two specimens of printing presses, one a power and the other a hand press. On the latter is being printed a facsimile of Ben Franklin's first newspaper, copies of which are in very good demand at a dime each.

A suspension bridge connects the galleries near the fountain, and enlightens the otherwise ignorant as to the modes of making and using wire cables for such purposes. The bridge is the joy of all juvenile and many senile visitors.

Did you never think of the advantages of windows without weights? Here is Sullelt's ball window catch which holds either upper or lower sash at the precise point desired—a more simple and effective appliance for the purpose than I have heretofore seen.

Dreamed you never of an endless band saw for scroll as well as heavy work? Many a time have I, and my dream here has substantial shape in the contrivance of Otis Jackson. The wheels upon which the saw moves are about five feet diameter, made of iron, tired with leather; and the ends of the saw are skillfully brazed together, forming, substantially, an endless belt. Have you broken your back at your father's wood pile? Then you *would* look with pleasure on Noel's application of crank power to a common buck-saw, worked in connection with a common buck for the wood.

And if the pump were as absolute a necessity in New York as it is in California, your eyes would sparkle at sight of Atwood & Bodwell's self-regulating wind-mill for operating it, and also at that of the Gerrish submerged force pump as a substitute for the usual style of the article.

Had you plowing to do, and California soils in place of the stony hardnesses of New England, you would debate less upon the instrument itself than upon the ease of the seat. The several gang plows in use here do their work well, and all of them provide a comfortable seat for the driver, while the work goes on. Nearly a dozen different specimens of gang plows, the work of as many different makers, are here on exhibition. They consist of two plows managed in connection with a two-wheeled vehicle on which the driver rides.

If the construction of water and sewer pipes required your consideration, you would doubtless respect the asphaltolin pipes, and wonder why the same material might not be applied to tunnels of large caliber.

A blower on Root's plan, built at the Globe Works, Stock-