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 fluid ounce. 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 $3,000.

(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-

ton, would not seem wonderful, because you will find a larger instrument in your city.

Enough, however, of machinery, and almost enough of the Fair. Let us enter only, before we leave, this large room built and lined with the different kinds of wood which grew in California. The wood riches of all the earth are seemingly gathered here, so many are the kinds and so well polished the specimens. Strahle & Hughes, who exhibit, call it the "Laurel Palace," and a palace it certainly is—worthy the Fair and worthy the State. B.

San Francisco, Sept. 27, 1869.

On the Assimilation of Inorganic Substances in the Animal Economy.

MESSRS. EDITORS:—The idea that inorganic substances are not assimilated in the animal organism, advanced by a correspondent, pages 166 and 230, current volume, is a favorite theory of the so-called vegetable or Indian doctors, to which class his authority, Dr. Bellows, appears to belong. The theory in question is founded on the obscure notion that some mysterious change takes place when an inorganic compound is absorbed in a vegetable, that it is vitalized, and that only vitalized compounds can be appropriated by living animals. Unfortunately this theory is not borne out by the facts; the very contrary is true. It might, with some slight chance of success have been defended many years ago, when the sciences of synthetic organic chemistry and biology were yet unborn; but since we have learned to compose many so-called organic compounds, for instance, alcohol, gum, sugar, etc., and even urea and several other animal substances, out of their constituent elements—without the aid of living organisms—and that these thus artificially manufactured substances are perfectly identical, to all intents and purposes, to those derived from the usual organic channels, and act on the animal system in the same manner, the doctrine of the so-called "vitalism" is exploded.

We know now, also, that there is no difference whatever between phosphates, sulphates chlorides, etc., if made by art or derived from vegetable sources, so that, for instance, the phosphate of lime or soda, naturally found in the bran of flour is not in the least different from any other compound of that name, from whatever source it be derived, provided it be pure.

In regard to the main point, the absorption and assimilation of inorganic matter, in the animal body; this is a so well established fact as to make the contrary assertion almost unworthy of contradiction. Water is certainly an inorganic compound, and this is so largely assimilated that the great portion of the bodies of all animals consists of water; the salts contained in the divers mineral waters, are so thoroughly assimilated as to cause changes in the constitution of the individuals using them, even the external applications in the shape of sulphur and other baths, have similar effects; and lead, mercury, arsenic, etc., either externally or internally, are so thoroughly assimilated as to cause painters' colic, the mirror-makers' paralysis, and the finding of arsenic in the very bones of the subject. In such cases the antidotes must also be assimilated in order to find the poisons and perfect a cure.

It may be asserted that these cases must not be called assimilation, and are only an absorption, because such substances do not belong in the living organism; by the following facts, however, I will prove that if substances belonging to the organism are absorbed in the same manner, they finally perform all the functions of assimilated ingredients.

The cause of chlorosis is that the digestive apparatus is unable to absorb the small amount of iron present in many kinds of food. Now experience has taught, in general, that if certain necessary substances are not absorbed, all that we have to do is to present these very substances in large quantities, and that finally the system will be compelled to absorb them. So in chlorosis, iron is administered with the food, either as a metallic powder, an oxide, or as a chalybeate mineral water; if inactive, the dose is simply increased, and finally in some cases the disease is only overcome, by giving extraordinary large doses, which compel the system more forcibly to absorption. If once absorbed the difficulty is overcome, assimilation follows at once. Recent investigations have shown that a small quantity of manganese is always present in the blood with the iron, and as the iron administered is always chemically pure, it was suggested that some cases of failure in the iron treatment might be due to the absence of the necessary manganese. The idea was at once acted upon, and now, in case of non-success of the iron treatment, all physicians who are posted up in regard to the progress of their art, add a small quantity of manganese or a suitable manganese compound to the iron, and always with perfect success. The iron and manganese pills, or quinine and manganese pills, have, in fact, become a standard prescription.

If any one still doubts assimilation of inorganic substances by the blood, let him try to take phosphate of iron daily. Many individuals will soon find that their blood becomes so rich under this treatment that it shows itself in pimples over the face and elsewhere. Many potash compounds have the same effect.

The above will suffice, I believe, to settle the point in question, and I will only add that the assimilation of inorganic compounds seems highly probable, if not proved, by the following facts: The rapid cure of sore gums by internal use of chlorate of potash; the prevention of morbid profuse perspiration by the internal use of mineral acids; the cure of epilepsy by sulphate of zinc; the blue coloring of the skin by internal use of nitrate of silver; the sedative effect of bromide of potassium; the resultant brittleness of the bones by the prolonged use of iodides; the nourishing effect of lime water, if added to milk or certain other kinds of food.

P. H. VANDER WEYDE, M. D.

Tyndall's Theory of Comets.

MESSRS. EDITORS:—In your notice of the ingenious theory of Dr. Tyndall (p. 219), in relation to comets, I find a corroboration of a belief of my own that "all space is filled with imponderable matter except the small part occupied by the planets—which are themselves pervaded by the same—and that this ungravitating matter is the medium for the action of the imponderable agents, electricity, magnetism, etc., which agents are the manifestation of different elements of that matter."

The nucleus of a comet is no doubt ponderable, as it observes the laws of gravitation, but is so rare and transparent that it obstructs only the calorific rays, while the actinic, passing through, precipitate the imponderable matter of space, rendering it visible, the same as they precipitate invisible vapor of water or other matter, this being again dissipated as soon as the shadow is removed.

If the nucleus were an opaque body the shadow would be a cone, unlike a comet's tail, but being transparent the rays passing through are more or less refracted and reflected, causing this pseudo-penumbra to assume various shapes, according to the nature of the interruption or the varying direction of the deflection.

May not the "luminous envelopes" which surround the nucleus, and which you say are not accounted for by his theory, be, on the other hand, a corroboration of it; if it is admitted that the sun's actinic rays may be reflected from the surface of the nucleus, or from surfaces within it, into the spaces immediately around it, with even greater power than have those which pass through with but little refraction? This theory, if correct, makes of the sun almost a creator, realizing the dreams of the magi.

As the "vortical" theory of Laplace and Herschel, if true, demonstrates that there was a *time* when creation commenced, and therefore a power which instituted at that time a new sun, so I do not despair of our yet finding out the way in which it was done. Because we know that gravitation was infused into some matter, it does not follow that all matter is subject to it.

CHARLES BOYNTON.

How to Kill the Fleas and the Dog.

MESSRS. EDITORS:—Your correspondent, G. W. B., on page 230 of the present volume, says that "a mixture of carbolic acid with water—one fourth acid, three fourths water—put on a dog will kill fleas at once." There is a somewhat important omission here—it will kill the dog also.

Your correspondent undoubtedly means one fourth of the *saturated aqueous solution* of carbolic acid, three fourths water. Carbolic acid is a crystalline substance (chemically an alcohol rather than an acid), which is soluble only to the extent of 5 per cent in water. A solution for the purpose of killing parasites on animals should contain little more than 1 per cent of carbolic acid to 99 per cent of water.

There is a very dangerous concentrated fluid carbolic acid in the market, consisting often of 90 per cent of the pure acid, dissolved in some of the hydrocarbons associated with it in the process of manufacture. I have purchased this of a druggist of the highest reputation in the city of New York under the name of "solution of carbolic acid," and have suffered accidentally in consequence from its cauterizing effects. I have been cognizant also of several serious accidents from confounding this concentrated fluid with the *saturated aqueous solution* of carbolic acid, which is perfectly safe and strong enough for all applications, except surgical, to the living subject.

It is important that some nomenclature should be agreed upon, and rigidly adhered to, to distinguish these preparations. Otherwise, in the extended use of carbolic acid, fatal accidents will be liable to occur.

WM. F. CHANNING, M. D.

Providence, R. I.

Demuth's Improvement in Glass Window Lights.

MESSRS. EDITORS:—I call your attention to an error in your notice of Demuth's Glass Window-lights, published in your edition of October 16. You state that the illuminating power of the light transmitted through the rods is not materially impaired, whereas it is not only not impaired but on the contrary materially increased, or at least concentrated to such a degree that the back part of an apartment will become nearly as light as the front containing the lights. The refracting power of the rods, which like so many lenses collect the radiating rays into a parallel beam, produces this effect, which can never be obtained by flat panes, and which, with rods of different tints, is exceedingly beautiful.

By publishing the above correction you will oblige

New York city. VICTOR E. MAUGER.

Fresh Water at the Seaside.

MESSRS. EDITORS:—Through the constantly shifting sands of Cape Cod, sixteen to twenty feet from high water and not more than three feet above it, is sunk an iron tube to a depth of fifteen feet, at which point is found fresh water of the sweetest quality and in inexhaustible quantity, which rises and falls in the tube regularly with the tide of its near neighbor the Atlantic ocean.

Yet though more than one hundred barrels have been pumped from it at one time, not the slightest trace of saline matter has been found to mar the freshness of its taste. Of such fine quality is it that vessels supply themselves for a sea voyage from this well.

I think the above facts may prove themselves a curiosity to others as well as myself, and that you will be able to give an explanation of the phenomenon through your columns.

North Brookfield, Mass. JOHN Q. ADAMS.

Glass Manufacture in the United States.

MESSRS. EDITORS:—Some singular statements get into newspapers sometimes. Here is one copied from the Boston *Commercial Bulletin* of Sept. 11, that for accuracy is not much to be depended upon. Under "Pittsburgh Items" it says, "In June last, Redick & Co. began the manufacture of extra annealed flint glass lamp chimneys—they are the only manufacturers who anneal their chimneys—which process renders them strong and clear."

It is most assuredly the first time that the wonderful revelation has been made that glass is rendered clear by annealing, and the *savans* who have made researches upon this subject have been sadly in the dark if we are to believe Messrs. Redick & Co. Yet Réaumur, Dartigues, Dumas, Bontemps, and others, all agree that glass slowly cooled (annealed) may be devitrified, that is to say, that in cooling glass slowly, the elements arrange themselves in such a manner as to form a certain refined crystalline silicate, which separates from the remaining mass and produces thereby a milky and rough grained glass.

If the object of publishing such a statement is to sell the wares, it is a poor kind of a puff; and instead of recommending the goods it advertises the ignorance of the manufacturers.

While on this subject of glass, let me say a word in regard to the comparative degree of efficiency between European and the American manufactories. It is universally conceded, that although we have vastly progressed in this country, especially in pressed glass ware, we are still sadly behind hand in many branches. It is true we are making a very fair article of plain window glass, but have we yet made any colored window glass? Can we compete with the French, the English, for fine cut glass? Can we imitate or excel the Bohemian in fancy colored glass? Can we rival with the French, English, and Belgian manufacturers in making plate glass? Do we generally produce as fine an article of glass as the French and Bohemians do? Have we ever applied etching to glass as it is now so extensively done in France, or have we yet made any trials in applying photography to ornamenting glass? With the exception of one or two cases, have we used the Siemens furnaces with as much success as they have in Europe? Can we imitate the artistic *chefs d'œuvre* of production that are to be seen in Europe in the chandelier and fountain line? Do we gild and paint glass like the French and Bohemians? Can we generally produce those marvelous articles blown by the French, so thin, so brilliant, and so regular in workmanship?

To the above and to many other questions I fear we must give a negative answer. The aim of most of our glass manufacturers has been to improve simply in pressed wares; a very worthy object it is true, yet it is well known that pressed glass can never attain the perfection of blown and cut wares. An inexperienced person will soon be able to distinguish one from the other, and there is a limit beyond which improvements in pressed wares can not go. Improvements in presses have been made to render them easy to work and to adapt them to different sizes of molds. Molds have been made with combinations to mold all sorts of shapes. Some have been quite successful, but for all that, all pressed glass bears its stamp and can not be compared to blown and cut glass. Is is not time then for some of our glass manufacturers to devote their time and intelligence to other purposes? With the exception of one or two Eastern manufacturers, we have but little or no colored glass made in this country. Where is the fault? It cannot be the cost for we have plenty of materials and at reasonable prices. I fear it is not this but the want of the skillful labor they have in Europe. It is a crying shame that we should send to Europe for all the plate glass we use, and we use a large quantity of it, while we have everything in profusion in this country to make glass. Attempts have been made in this country to make plate glass but so far have been unsuccessful. Another attempt is now being made at New Albany, Indiana, according to a communication printed lately in the SCIENTIFIC AMERICAN. Let us hope that this, like the others, will not be a failure, but I think I can say, almost positively, that the non-success of these enterprises is not due to disadvantages in materials, but is attributable to an over-confidence and self-reliability in the knowledge of those who undertook it without having skilled and experienced hands to help them. Mr. Lockwoode, in the communication above referred to, says, that "there is no such word as fail in the dictionary" of the gentleman at New Albany. Let us hope that he may not be called to print it.

Washington, D. C. C. COLNE.

Testing Boilers.

MESSRS. EDITORS:—Sometime since a correspondent suggested a boiler test, to be tried at the present Fair of the American Institute. It consisted in connecting the boilers to be tested to a 40-horse power engine, arranged to drive an immersed screw propeller; the boiler which would produce the greatest number of revolutions of the propeller with a given amount of coal, to be adjudged the "champion boiler."

There would, doubtless, be some fallacies involved in a test of this kind. The power required to put a propeller in motion is dependent, to a great extent, upon the velocity with which it revolves, varying nearly as the square of the velocity. For example, it would require one hundred times the power, per revolution, to communicate one hundred revolutions per minute to the propeller, that it would take to communicate ten. Consequently, if the proposed test were put in practice, the "champion boiler" would be the one which fired slowest and ran the propeller at the lowest velocity. F. G. FOWLER.

Bridgeport, Conn.

Improvement in Farm Gates.

Nothing is more unsightly around a farmer's house than a dilapidated farm gate. Many improvements have been patented, but the one illustrated herewith is among the latest. As these modern gates have been adopted by farmers a vast improvement in the appearance of country homes is apparent. The gate shown in the annexed engraving is claimed to possess advantages not to be found in any other in use.

Fig. 1 shows this gate partially opened; and Fig. 2 shows it entirely opened, and held from closing by a latch. In Fig. 1, if the gate should be slid to the left it would meet the post, A, and the latch, B, engaging with the post would fasten it shut. When partially opened, the gate rests on a block, C, at the middle of the bottom, with a notch at the top to admit the bottom rail of the gate, the first motion in opening being a sliding to the right.

It has a wooden hinge bar, D, composed of two pieces of timber playing on each side of the gate, with a gudgeon or hinge pin, E, at the top and a similar one at the bottom. This hinge bar stands at the angle shown in Fig. 1, when the gate is closed, and remains in that position until the middle vertical bar of the gate meets it as the gate is slid open.

A roller, F, between the two parts of the hinge post, D, allows the gate to be slid back to the position show in Fig. 1 without disturbing the position of D. A cord running from the post, G, to the top of D, limits the inclination of the latter.

In opening the gate after it has reached the position shown in Fig. 1, it engages with the hinge post, D, the bottom of which is held by, and plays in a step H. The hinge post is then thrown back to a vertical position, lifting and carrying the gate with it until the gudgeon, E, enters a slotted bearing, I, nailed on to the tops of the posts G and I. These posts are not set one directly in front of the other, but one a little to one side of the other to allow the gate to swing between them.

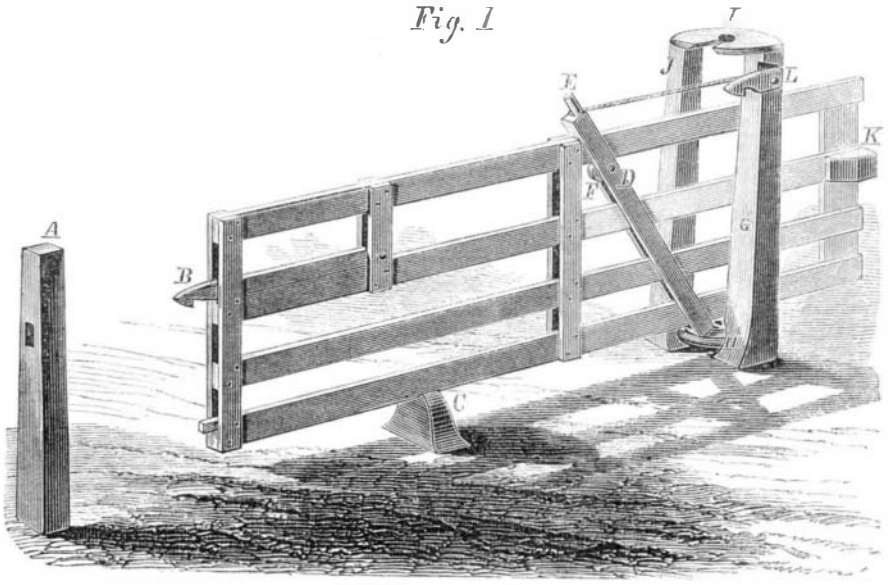
As soon as the hinge post, D, reaches the vertical position the gate is balanced on its center of gravity, and may be rotated upon D until it reaches the position shown in Fig. 2, in which it is held by the latch L.

Fig. 2 shows by the dotted lines the first position of the gate and also exhibits the positions of the different parts when the gate is fully opened.

The hinge post, D, may be made of a proper length to elevate the gate above snow in winter, and the gate may be unhung as readily as gates with the common hinges. Nothing but wood and common nails are employed in its construction.

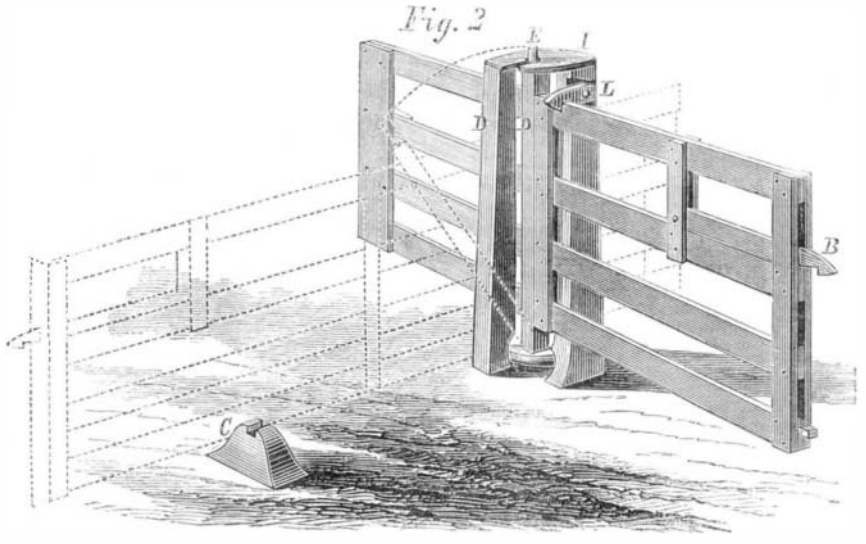
Patented April 27, 1869, through the office of the Scientific American, by J.T.Moxley, whom address for further information at Owasso, Mich. See advertisement on another page.

Fig. 1



MOXLEY'S FARM GATE.

Fig. 2



Suspension Bridges.

In the construction of suspension bridges, the ties, or ropes from the main cable, sustaining the roadway, are of twisted wire as well as the main cable. With the alleged advantages of twisted wire ropes, for this purpose, over straight iron rods, I am not aware that the less expansion and contraction of the wire ropes, by changes of temperature, have been recognized.

A hempen rope will contract in length when wetted, owing to the minute particles of water acting as wedges, increasing the width and the convexity of its spiral curves. The fibres of the same hemp laid straight, will not be shortened by wetting, but when in small fragments, as when made into paper, will be expanded in a similar manner by wetting.

An iron rod and wire rope of equal lengths would expand equally by heat, waiving the above referred-to property, but the wires of the rope being in contact, and expanding laterally, would, by an equivalent wedge-like action, increase the convexity of the curves and tend to shorten the rope. By a reverse operation cold contracts and flattens the spiral curves, and tends to lengthen the wire rope, as with the hempen rope, when dried and stretched.—*T. W. Bakewell.*

Steam Boiler Incrustations.

According to the *Chemical News*, M. E. Wiederhold states that the hardest incrustations of this kind are formed when the quantity of carbonate of lime amounts to from 20 to 25 per cent of the entire mass. He has found, by an experience extending over several years, that some kinds of clay, among these the substance known as *kieselschiefer* (a peculiarly fatty clay), when suspended in the water, contained in steam boilers, prevent the particles of carbonate and sulphate of lime dissolved in the water, even if the latter is very hard, to cling together, and become fixed to the sides of the boilers, forming there a hard incrustation. A series of experiments, made on purpose, and continued for a sufficient length of time to yield a reliable result, has fully proved that the addition to the feed-water of the steam boilers of fatty clays, especially the kind known as fuller's earth, entirely prevents boiler incrustations, even where, of necessity, very hard water has to be used as feed water. A loose, soft mud is deposited as soon as the motion of the water, due to the boiling, ceases on cooling. This mud readily runs off on opening the sludge valve of the boiler.

Increase of Weight During Combustion.

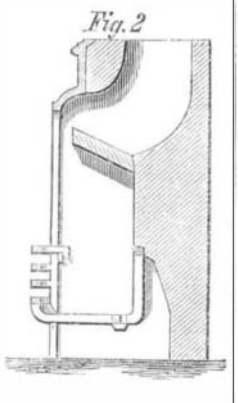
The *Chemical News* gives a description of an interesting experiment. A small horseshoe magnet is hung up at the beam of a balance sufficiently sensitive to turn with centigrammes; the poles of the magnet are immersed for a moment in the *limatura ferri* of the chemists' shops, and a beard of small particles of iron is caused to adhere to the poles; by means of proper weights placed on the scale-pan at the other end of the beam the equilibrium is restored. This having been done, the finely-divided iron is kindled, by approaching to it the flame of a Bunsen gas burner, and continues to burn. While burning, it will be seen that the arm of the balance on which the magnet is suspended considerably deviates from the horizontal position, thus indicating an increase of weight on the side where the experiment is going on. This experiment succeeds best with a magnet of moderate dimensions; the horseshoe magnet applied in this instance weighed, without its armature, 210 grammes, and can bear a load of 12·5 grammes of iron; when this is altogether converted in magnetic oxide, by combustion, the increase in weight will be about 4·7 grammes.

IMPROVEMENT IN OPEN FIRE GRATES.

Great as have been the improvements in all kinds of domestic heating apparatus, we all know that a very large proportion of the available heat still eludes us and passes through chimneys to the open air. And there is no doubt also that much of the combustible matter is distilled rather than burned, and passes off as gas, not only failing to give its share of heat but taking with it a portion of the heat furnished by that which is consumed.

Fig. 1

Fig. 2



Our engravings exhibit a form of grate called by the inventor a Perfect Combustion Grate, calculated to obviate these losses, by securing more perfect combustion, and using to greater advantage the heat produced.

To secure these ends the grate is constructed as shown in front elevation, Fig. 1, and in section, Fig. 2. It will be observed that the mason work at the back of the grate is recessed to allow the air to flow freely up around and to enter the interstices of the grate as well at the back as the front. By similar means the air also enters the ends of the grate to supply all parts of the incandescent coal equally with the oxygen necessary to combustion. The air also becomes heated in this chamber previous to entering the fuel, and is thus in the best condition to favor combustion.

The ashes, when the grate is stirred, fall back into the recess instead of pouring forth into the apartment, and thus one of the objections to the use of grates, which has greatly retarded the employment of this most wholesome and pleasant of all the means employed for burning coal in dwellings is removed. The inventor claims that the use of this grate will cure smoky chimneys on account of the more perfect draft secured.

The back is made separate, and can be used with ordinary baskets, in grate fronts of any pattern and with all grates by re-setting. It is simple in construction, and not liable to get out of order. The inventor also states that air-heating compartments are successfully used in connection with it.

State and county rights may be obtained on application to the inventor, who will also furnish full-sized patterns gratis to purchasers.

Patented through the Scientific American Patent Agency, August 25, 1868, by G. H. McElevy, Newcastle, Pa., who may be addressed for further information.

Lurmann's Blast Furnace.

Engineering states that a considerable number of German ironmasters have, during the last two years, applied to their furnaces the system of Mr. Lürmann, the manager of the Georg-Marien Mining and Iron Company, of Osnabrück, Prussia, the improvement consisting in closing the front of the hearth, thereby dispensing with the dam stone, tymp, etc. A scoria outlet is set in the closed breast at a distance of about 6 in. below the tweers, and through this outlet the slag runs off regularly and constantly. The tapping hole is placed where the heat is greatest.

This arrangement has been successfully worked for six months or more at the Old Park Iron Works, Shropshire, and more than one of our leading ironmasters have expressed their intention of adopting it. Its advantages are thus enumerated:

1. The slag discharges itself through the scoria outlet at about the same level, therefore there are no vacillations of the slag in the hearth, and the corroding of the wall is diminished.

2. As there is no fore-hearth, there are of course no repairs, and no breaking up of the scoria crust in the same. This is equal, as shown above, to a saving of at least twenty days per year. Suppose a large furnace produces forty tuns per day, the same will yield at least eight hundred tuns per year more, if built on Mr. Lürmann's principle than if it were of the ordinary construction.

3. As there are no interruptions, the furnace does not cool. It works more regular, as the heat in the furnace is always the same.

4. The doing away with the dam and the fore-hearth allows the removal of the tapping-hole from the former into the wall of the hearth. The opening of the tapping-hole is then easy, as it is close to the greatest heat.

5. The completely-closed hearth allows a considerable increase of the pressure of the blast, because a throwing out of materials has become impossible.

6. The increase of the pressure is always of great importance, but especially where pit coal, anthracite, etc., are used; and where the layers are compact. The number of charges can be greater, effecting a corresponding increase of produce.

7. The augmentation in the number of tweers, and the equal distribution of them, made feasible by the doing away with the forepart of the hearth, allow a better and equal distribution of the blast in the hearth; the furnace therefore works better, and a greater quantity of ore is smelted, provided there is sufficient blast.

8. The number of hands may be lessened, as the operations are few and easy; the same need not be of great skill and experience. No fire clay and other refractory materials for the repairs, and less tools, are wanted. It may be mentioned that formerly the smelters of Georg-Marien-Hütte, when working, were almost stripped; now they are always in full working dress.

To Clean Oilcloth.—An oilcloth should never be scrubbed with a brush, but, after being first swept, should be cleaned by washing with a soft flannel and lukewarm or cold water. On no account use soap or water that is hot, as either would have a bad effect on the paint. When the oilcloth is dry, rub it well with a small portion of a mixture of bees' wax, softened with a minute quantity of turpentine, using for this purpose a soft furniture polishing brush. Oilcloth cared for in this way will last twice the time than with ordinary treatment.—*Septimus Piesse.*

We have received a number of communications on the subject of street crossings, none of which seem to us to contain any practicable suggestions, they are therefore declined with thanks.