1390. This project occupies at the present moment the attention of the North German Parliament, and, being one that may safely be ranked among the gigantic engineering enterprises of the present age, we have endeavored to collect such accurate knowledge with regard thereto as existing sources admit.

WHY THE PROJECT WAS STARTED.

Two reasons call peremptorily for the accomplishment of a navigable route between the North Sea and the Baltic, to wit: gain in time and safety. The distance between the English canal to the open Baltic Sea around the promontory of Skagen is about 880 miles. It would be shortened for two fifths of its whole length if a straight route from one shore of Holstein to the other could be chosen. Steamers would thus be enabled to make the voyage from London to St. Petersburgh in five days, instead of seven, while sailing vessels would gain from one week to one month, according to circumstances.

The second reason for the building of a ship canal is still more important. According to even very incomplete statistical data, the annual number of losses of vessels in that portion of the sea is greater than that of any other equally large portion of the globe. This is the more to be deplored as the route around Cape Skagen is the only one from the North Sea to the coasts of Sweden and Finland, as well as to the very heart of Russia. Indeed, it has been ascertained that the yearly loss experienced on the old sea way amounts to three millions rix dollars, or about two million dollars in gold. This sum is certainly a large one, but it must be remembered that the cargoes of many vessels are exceedingly valuable. For instance, the cargoes of the American bark *Joseph Clark* and the English steamer *Arctic* amounted to half a million dollars in gold; the former vessel was shipwrecked in 1857, and the latter in 1860. These accidents mainly occur on the western coast, especially on the sand banks of Skagen, which, for this reason has been denominated "the graveyard of ships." Indeed, small and large wrecks are seen there in every condition and at every time of the year.

It may be remarked that there are now two channels across the isthmus of Holstein; they are, however, altogether inadequate to the existing demands of navigation. The one is the so-called Strekenitz canal, begun in 1390 and completed in 1398. It is one of the oldest in Europe, and connects the river Elbe with the Trave, uniting with the former just above Lauenburg, and with the latter above Lubeck. The second artificial water communication is known under the name of the Schleswich-Holstein, or Eyder Canal, and may be found on any good map.

THE PROPOSED LINE.

This has been submitted to the world in the form of an anonymously published pamphlet, entitled, "The Cutting of of the Isthmus of Holstein between the Baltic and the North Sea." Lubeck is proposed as the eastern terminus of this route, while it is thought that the most feasible point for the western terminus would be Gluckstadt upon the Elbe. This line, as shown by accurate and reliable surveys, would require no locks. It is proposed to follow the river Trave from Lubeck to a point where it approaches the Hemmelsdorf Lake. This lake belongs to the most remarkable water reservoirs of the Baltic countries; originally an inlet, as most of the other lakes of the Baltic, it is now separated from the sea by a narrow strip of maritime deposits. Hills of about one hundred feet in hight protect it against all winds in such a manner that Napoleon I. designated it for a winter harbor for his Baltic fleet, when, by the catastrophe of 1813, the whole project fell into oblivion. Moreover, this natural harbor is situated in the midst of one of the most populous, prosperous, and best cultivated districts; it is surrounded by a circle of charming villages, and only awaits the completion of the projected canal to become an excellent seaport. The length of the section from this lake to Gluckstadt is forty-eight miles; adding thereto the distances through the lake and from Lubeck to the Baltic, we have a total length of fifty-three miles, or over half the length of the Suez Canal. The cost of the execution of this work, including the construction of harbors at Gluckstadt and Lubeck, has been estimated at $23,720,930, in gold.

Should a work of this kind be executed, a yearly passage of from twenty to thirty thousand vessels through the canal might safely be predicted. Such a strait would open to the ocean the immense territory in Russia; and, besides this, the Prussian coast, which is over half the length of that of France would be made directly accessible to the open sea.

Taken all in all, the cutting of the isthmus of Holstein may safely be contrasted with that of Suez. In shortening an old way of traffic it will contribute of transforming the slow march of civilization in the northern European countries into one worthy of this century of steam.

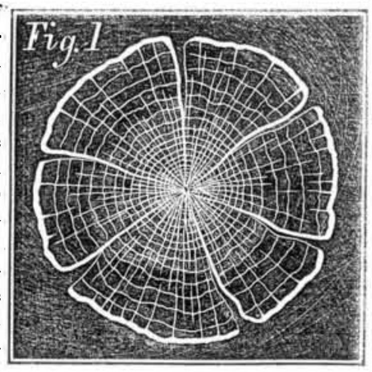
THE CONTRACTION OR SHRINKING OF TIMBER.

In a lecture delivered by John Anderson, C. E., at the "Society of Arts" in London, some information was given on the contraction of timber which we deem of sufficient interest to reproduce from *The Builder*, together with the diagrams illustrative of the subject.

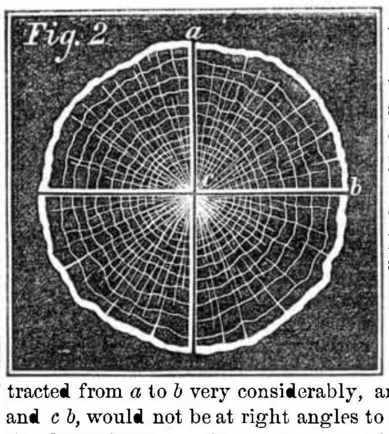
The lecturer, after some introductory remarks proceeded as follows:

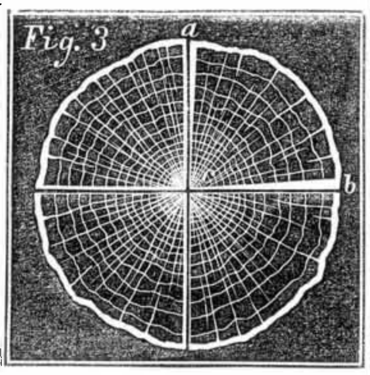
The wretched state of the floors, doors, and shutters in many of the London houses too plainly gives ample and complete evidence of persistent disobedience to the natural law of shrinkage, and the only hopeful consolation is that we do not go unpunished, as the penalty inflicted in time may lead to improvement.

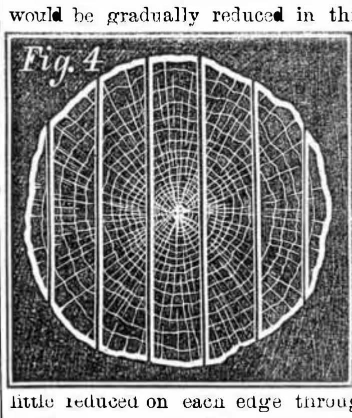
An examination of the end section of any exogenous tree, such as the beech or oak will show the general arrangement of its structure. It consists of a mass of longitudinal fibrous tubes, arranged in irregular circles that are bound together by means of radial strings or shoots, which have been variously named; they are the "silver grains" of the carpenter, or the "medullary rays" of the botanist, and are in reality, the same as end wood, and have to be considered as such, just as much as the longitudinal woody fiber, in order to understand its action. From this it will be seen that the lateral contraction or collapsing of the longitudinal, porous, or tubular part of the structure, cannot take place without first crushing the medullary rays, hence the effect of the shrinking finds relief by splitting in another direction, namely in radial lines from the center, parallel with the medullary rays, thereby enabling the tree to maintain its full diameter, as shown in Fig. 1.

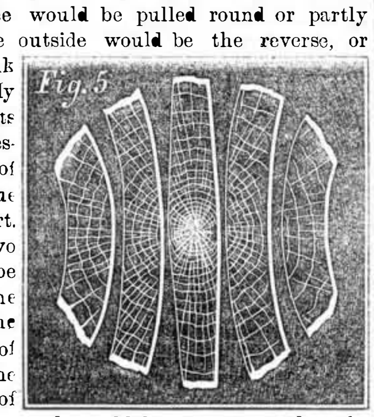


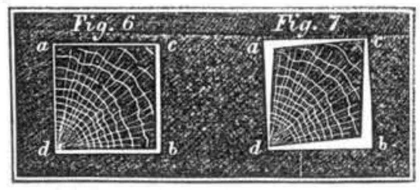
If the entire mass of tubular fiber composing the tree were to contract bodily, then the medullary rays would of necessity have to be crushed in the radial direction to enable it to take place, and the timber would thus be as much injured in proportion as would be the case in crushing the wood in the longitudinal direction. If such an oak or beech tree is cut into four quarters, by passing the saw twice through the center at right angles, before the contracting and splitting have commenced, the lines *a c*, and *c b*, in Fig. 2 would be of the same length, and at right angles to each other, or, in the technical language of the workshop, they would be square; but, after being stored in a dry place, say for a year, it would then be seen that a great change had taken place both in the form and in some of the dimensions; the lines *c a*, *c b*, would be the same length as before, but it would have contracted from *a* to *b* very considerably, and the two lines *c a*, and *c b*, would not be at right angles to each other by the portion here shown in white in Fig. 3. The medullary rays are thus brought closer by the collapsing of the vertical fiber. But, supposing that six parallel saw cuts are passed through the tree so as to form it into seven planks, as shown in Fig. 4, let us see what would be the behavior of the several planks. Take the center plank first. After due seasoning and contracting, it would then be found that the middle of the board would still retain the original thickness, from the resistance of the medullary rays, while it would be gradually reduced in thickness toward the edges for want of support, and the entire breadth of the plank would be the same as it was at first, for the foregoing reasons, and as shown in Fig. 5. Then, taking the planks at each side of the center, by the same law their change and behavior would be quite different; they would still retain their original thickness at the center, but would be a little reduced on each edge throughout, but the side next to the heart of the tree would be pulled round or partly cylindrical, while the outside would be the reverse, or hollow, and the plank would be considerably narrower throughout its entire length, more especially on the face of the hollow side, all due to the want of support. Selecting the next two planks, they would be found to have lost none of their thickness at the center, and very little of their thickness at the edges, but very much of their breadth as planks, and would be curved round on the heart side and made hollow on the outside. Supposing some of these planks to be cut up into squares when in the green state, the shape that these squares would assume, after a period of seasoning, would entirely depend on the part of the tree to which they belonged; the greatest alteration would be parallel with the medullary rays. Thus if the square was near the outside, the effect would be as shown in Fig. 6,



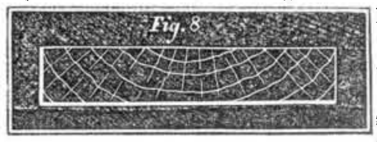




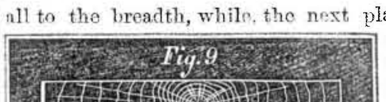




namely, to contract in the direction from *a* to *b*, and after a year or two it would be thus, as seen in Fig. 7, the distance between *c* and *a* being nearly the same as they were before, but the other two are brought by the amount of their contraction closer together. By understanding this natural law, it is comparatively easy to know the future behavior of a board or plank by carefully examining the end of the wood, in order to ascertain the part of the log from which it has been cut, as the angle of the ring growths and the medullary rays will show thus, as in Fig. 8.



If a plank has this appearance, it will evidently show to have been cut from the outside, and for many years it will gradually shrink all to the breadth, while the next plank, shown in Fig. 9, clearly points close to the center or heart of the tree, where it will not shrink to the breadth but to a varying thickness, with the full dimensions in the middle, but tapering to the edges, and the planks on the right and left will give a mean, but with the center sides curved round, and the outside still more hollow.



The foregoing remarks apply more especially to the stronger exogenous woods, such as beech, oak, and the stronger home firs. The softer woods, such as yellow pine, are governed by the same law, but in virtue of their softness another law comes into force, which to some degree affects their behavior, as the contracting power of the tubular wood has sufficient strength to crush the softer medullary rays to some extent, and hence the primary law is so far modified. But even with the softer woods, such as are commonly used in the construction of houses, if the law is carefully obeyed, the greater part of the shrinking, which we are all too familiar with, would be obviated, as the following anecdote will serve to show: It was resolved to build four houses, all of the best class, but one of the four to be pre-eminently good, as the future residence of the proprietor. The timber was purchased for the entire lot, and the best portions were selected for house No. 1, but by one who did not know the law, and to make certain of success this portion of the wood had an extra twelve months' seasoning after it was cut up. The remainder of the wood was then handed over to a contractor for the other three houses, who han an intelligent young foreman, who knew the structure of wood as well as how to obey the law, and who, therefore, had the wood for the three houses cut up in accordance therewith. The fourth house was built the following year by another man; but long before ten years had passed to the great surprise and annoyance of the proprietor, it was found that his extra good house, No. 1, had gone in the usual manner, while the other three houses were without a shrinkage from top to bottom. As Solomon says, "Wisdom is profitable to direct."

A similar want of correct knowledge of the natural figure and properties of the structure of wood, such as the oak, is constantly shown by the imperfect painting to resemble that wood, as exhibited on the doors and shutters of many of the houses of this metropolis. If we cannot afford to have genuine wainscot doors, as in France, but yet desire to have an imitation, it would surely be worth the trouble to have a block cut from the quarter of an oak tree, and to have each of its six sides planed and polished, in order to make plain their several features. The house painter would then see what nature really is, and thus save us from the ridicule of other nations, when we mix up "silver grains" and all the other natural features upon one side of a board or panel.

On Cotton-seed Oil, and its Detection when mixed with other Oils.

Mr. Reynolds believes that nearly the whole of cotton-seed oil is used in the sophistication of oils of older repute. The probability that the supply will now continue and increase is especially indicated by a consideration of the source of the oil. The weight of seed yielded by each cotton plant is about three times as great as the cotton obtained from it, and up to the present time nearly the whole of this seed has been wasted, or returned to the soil as a fertilizer. The present price of the refined oil is less than three shillings per gallon, and, considering the large porportion of seed that has yet to be utilized, it is probable that it will long continue to be the cheapest fixed oil in the market. Hence the desirability of our giving some attention to a substance which is pretty sure to present itself to us in our daily avocations in some shape or other.

After describing the methods of preparing and purifying cotton-seed oil, Mr. Reynolds adds some remarks upon the detection of this oil when mixed with olive oil. A well-known chemist, whom he regarded as the highest authority upon the subject of the adulteration of oils, told him that he did not know of a test for this purpose.

The experiments which he made induced him to regard the 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-ash 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-