which revolves rapidly, and contains a fly-fan, which rotates in an opposite direction; in about five minutes a complete mixture is effected, and the charge is received in a bag tied over the lower orifice of the drum.

The "composition" is next taken to "the incorporating mills," and is now a combustible compound, to obtain its explosive power by the ingredients being thoroughly incorporated. The mill consists of a pair of circular stones ("runners"), weighing about 3½ tons each, and slowly rolling over the powder which is placed on the stone bed of the mill, surrounded by a huge wooden basin. The powder is previously damped, as it could not be safely ground dry; about seven pints of water ("liquor") being added to the charge of 32 lbs. of powder, during 3½ hours, the time of grinding. To insure this with precision, and to obviate the chance of any irregularity in a clock, the water-wheel, which works two of these mills in one house, also marks its revolutions on a dial, so that the attendant can never be mistaken in the time the charge has been "on"—a most important point, where the over-grinding of the too-dry powder might cause it to explode. Sometimes, a portion of the wood-work of the roof, or mill, becoming detached—such as a cog of the wheel—and falling into the pan, acts as a skid on one of the runners, and by friction produces heat enough to cause a mass of powder to explode. As a protection, over each house containing a pair of mills is suspended a flat board, which, in case of an explosion, is first blown upward, and being connected by wires with a cistern of water over the fellow mill, upsets the same, and drowns the gunpowder. The attendants are as little as possible in these mills, and only work by daylight.

More hazardous processes, however, follow. The powder thus incorporated is in hard flat lumps, and has again to be reduced to dust in the "breaking-down house," by conveying it down an inclined plane, through rollers, which crush nearly 500 lbs. in the hour. The powder is then taken to the "press-house," and there, between gun metal plates, is pressed in thin cakes to one-third its bulk, by a power of 700 tons in a hydraulic press. The cakes are roughly broken up, and sent in baskets to the "granulating mill," where the powder is again broken down into grains, the size being regulated by sieves. The floor is covered with hides fastened down with copper nails, and the mill can be started or stopped by a rope passing through the wall, which is bomb-proof. The powder is then dried by heat, in the "stoving-room," which is flanked externally by "traversers" (mounds of earth 30 feet thick), to confine explosion, should it happen, as much as possible to one house. Lastly, the powder is sifted in the "dusting house," where the sieves revolve with great velocity; the dust escapes through the meshes, and the gunpowder is drawn off through a short tap, into barrels, for packing. The finest powder is "glazed" by black-lead being shaken up with it; but cannon-powder has not this finish.

UNFERMENTED BREAD.—Take fine flour, six pounds; bicarbonate of soda one and one-eighth of an ounce; pure muriatic acid, one ounce and a quarter; water, three pints; and salt, three-quarters of an ounce; mix the bicarbonate of soda and the salt intimately with the flour, and put the muriatic acid into the water, and then blend the whole in the usual way of making dough. As soon as it is thoroughly kneaded, bake it either in tins or not. Bread thus made has an agreeable natural taste; keeps much longer than fermented or common bread, and is said to be more digestible, and much less liable to turn sour or moldy. We may observe that the chemical action of the acid on the soda disengages gas, which, though it makes the bread "light," disappears in the oven, and that the result of this action is to produce nothing but common table-salt, which can be easily proved by mixing a similar proportion of the acid and the soda in an appropriate vessel, when the well-known taste of common table-salt will be recognized.—*Septimus Piesse.*

Newly-painted Ships Unhealthy.

The carpenter of the American ship *Union*, which sailed last year from London on a voyage to the East Indies, has recovered $100 from the captain in a trial by jury, lately held in London, for injury to his health from sleeping in a bunk which had been newly-painted with white lead. In the course of the voyage he suffered from constipation and an affection of the nervous system, which prevented his hands from being actively engaged in the carpentering business, and he was incapacitated for some time. There was no ventilation in the place, and the paint was represented as very offensive. While at Bombay, the plaintiff states that he asked the defendant to discharge him and pay him off, but defendant refused. On returning to London, the plaintiff consulted a medical man, who stated that he was suffering from the deleterious effects of white lead in paint being absorbed into the system.

INVESTIGATIONS recently made at the naval depots of Chatham, Portsmouth and Plymouth, and the military depot of Woolwich, England, show an amount of peculation, regularly pursued, that beats our republican affairs of the kind "all hollow." No less than $500,000 worth of various articles have annually disappeared, for which no account could be given, from these four places.

CHURCH ORGANS.

We have received several requests from correspondents to give an account of the construction of church organs, and having recently passed through a large manufactory under the guidance of the intelligent proprietor, and having now under our eyes an elaborate illustrated description of the whole process, it would be easy to comply with these requests. We suspect, however, that our readers would not be generally interested in the technical details of the subject, but perhaps an idea of the essential principles of an organ, which we can give in a very few words, may be acceptable.

An organ consists of a series of pipes, which are, in fact, whistles, producing musical notes on the same principle as the whistles made by boys from the bark of chestnut saplings. These pipes have their lower ends inserted into the top of an airtight box, called the "wind chest,' into which the air is forced by a bellows, the pressure of the air being regulated by weighting the bellows. This pressure is made sufficient to support a column of water from two to four inches in hight, varying with the size of the church in which the organ is to be used. The openings from the wind chest into the pipes are closed by valves, which are connected by levers with the keys of the finger board, so that any pipe may be blown by pressing its corresponding key.

So simple is the principle of a church organ; but the science, experience and mystery of the art are embraced in the construction of the pipes for producing the several tones required. Some of the pipes are made of wood and the others of metal; zinc and an alloy called "pewter," being the metals usually employed. A few of the metal pipes are generally gilded and placed in the front side of the organ, forming the most conspicuous portion of the instrument. The wooden pipes are cheap and rough-looking things, being made of four strips of board glued together, so as to form a square tube. Each key opens several pipes of different tones, but tuned to the same note; and the pipes are arranged in series, called "stops," in such a manner that, by drawing a slide, all of the pipes of one series or stop may be opened together. The production of the several tones is a complicated study; for instance, a particular tone for one of the heavy bass notes is produced by one pipe of wood and another of zinc tuned in unison. Other tones are formed by making the pipes flaring, like a trumpet; others with vibrating reeds, similar to those of a clarionet: and others by stopping, or partly stopping, the ends of the pipe.

THE BEST WINE GRAPES.—Dr. Mosier, of Cincinnati, the vine grower and wine maker, thus writes to the *Horticulturist*: "Within the last twenty years I have had under cultivation and trial not less than thirty varieties of American grapes, for vineyard culture, and to furnish wine for the million. I think it will be a long time before we find a grape in all respects better adapted to the purpose than the Catawba. When properly cultivated and well ripened it makes a good dry wine, superior to the generality of Rhine wines, and a sparkling wine comparing favorably with the champagne of France. "For making a cheap red wine, to take the place of the clarets of Bordeaux, no grape that has been tried hereabouts is equal to the hardy and prolific Norton's Virginia Seedling. For choice fancy wines, of a superion grade, I would first place the Delaware, the Herbemont, the Venange, or Minor's Seedling, and the Diana, in the order named. Either of these grapes yield a wine for aroma and delicacy of flavor superior to Catawba, and in my humble judgment equal to any of the best wines Europe can produce; but as they have not as yet been tested for extensive vineyard culture, will remain some time in the hands of amateurs only."

Map of the Seat of War.

J. C. & Rae Smith, engravers and publishers, 71 Nassau street, this city, have published a beautiful colored topographical and military map of Virginia and Maryland, showing the mountains and prominent elevations, the rivers, and the railroads, country towns, &c. Also an enlarged map in detail of the country between Manassas Junction and Washington—the region between Fortress Monroe and Richmond.

SIR PETER FAIRBAIRNS' PATENT.

On another page will be found an illustration of an improvement in rollers for preparing hemp and flax, invented and patented by Sir Peter Fairbairn, of Scotland. The whole improvement consists simply in so cutting the leather with which the rollers are covered as to present the cut edges to the fiber instead of the sides of the leather in the method heretofore in use.

It would at first thought seem surprising that a man in Sir Peter Fairbairn's position, with all his important cares, should consider it worth while to be at all the trouble and expense of obtaining a patent in England, costing some $500, for the sake of securing so trifling a modification as this. But he is a man who has had large experience in patent rights, and has not only learned their value, but has learned how to handle them so as to make his money out of them. When he applied for a patent for this invention he probably knew what he was about.

Indeed, we believe that this is the very class of inventions which are the surest to pay for patenting. While the *great* fortunes are made from great inventions, like the sewing machine, the reaper, the electric telegraph, &c., those which are most certain to pay moderate sums of a few hundred or a few thousand dollars, are modifications in the details of mechanism, made by practical mechanics who see the objections to the machinery in use, and who happen to think of some way of overcoming them.

Modern Calico Printing.

It is comparatively but a short time since the production of designs upon calico was effected by means of hand blocks, made of sycamore or pear tree wood, two or three inches thick, nine or ten inches long, and nine broad. The face of the block was either carved into relief in the desired pattern, like ordinary wood cuts, or the figure was formed by the insertion edgewise into the wood of narrow slips of flattened copper wire, and the patterns were finished with small brushes, called "pencilings."

In engraving, the first kind of roller used was made by bending a sheet of copper into a cylinder, soldering the joint with silver, and then engraving upon the continuous surface thus obtained. An improvement on this consisted in producing the pattern on copper cylinders obtained by casting, boring, drawing and hammering. In this case, the pattern is first engraved in entaglio upon a roller of softened steel, of the necessary dimensions. This roller is then hardened and introduced into a press of peculiar construction, where, by rotary pressure, it transfers its designs to a similar roller in a soft state, and the die being intaglio, the latter, called the "mill," is in relief. This is hardened in its turn, and, by proper machinery, is made to convey its pattern to the copper roller.

This improvement alone reduced the cost of engraving on copper many hundred per cent, and, what is of far greater importance, made practical an infinite number of intricate engravings, which could never have been produced by hand labor applied directly to the roller. A further improvement was made by tracing with a diamond on the copper roller, covered with varnish, the most complicated patterns by means of eccentrics, and then etching. The combination of mill engraving with the tracing and etching processes naturally followed, adding immensely to the resources of the engraver and printer in the production of novel designs. Another point of progress is the tracing of patterns on the surface of rollers, effected by machines made on the principle of the pentagraph.

STEEL CANNON BURST.—A large steel gun lately made at the Mersey Steel Works, Liverpool, England, burst at the seventh round while being tried at Shoeburyness. It had thrown 128 pound shot six miles, but the material of which it was made is stated to have been so defective, that it surprises almost every person that it did not burst at the first round instead of the seventh.

Two English chemists, named Joseph Lardley and R. Clayton, were lately killed at Richmond, Va., by the explosion of a quantity of fulminating powder which they were preparing in their laboratory for making percussion caps.

Manufacturing Ice.

Ice is not only one of the greatest luxuries for many purposes in hot climates, but it has become one of the most useful and necessary preservatives of fresh meats and vegetables during warm weather. Innumerable have been the efforts made to manufacture ice artificially and economically, so as to obtain it in unlimited quantities in those countries where the demand for it is great; but hitherto all such efforts have been very fruitless. The principle which has formed the base of all ice making operations is the well-known refrigerating quality of volatile fluids, by the expansion of which water placed in their vicinity is robbed of its heat, and reduced to a temperature below the freezing point.

The accompanying engravings represent mechanism for applying this principle, for which a patent has lately been taken out in England by James Harrison, of Geelong, Victoria, and a machine has been operated in London with considerable promises of success. The invention consists partly in the employment of a vessel similar to a boiler, with its tubes placed very close together, as shown by the elevated section of the entire apparatus, Fig. 1. Ether is placed in the spaces between the tubes, and a strong solution of common salt is made to flow in a current through the tubes. This solution is not congealable at the degree of cold required for making ice. It is conducted through boxes or molds, Fig. 2, containing water, and being of a lower temperature than 32°, it freezes the water and converts it into ice. A steam engine is required to produce the exhausting evaporative operation, and one of ten horse-power has been employed in London.

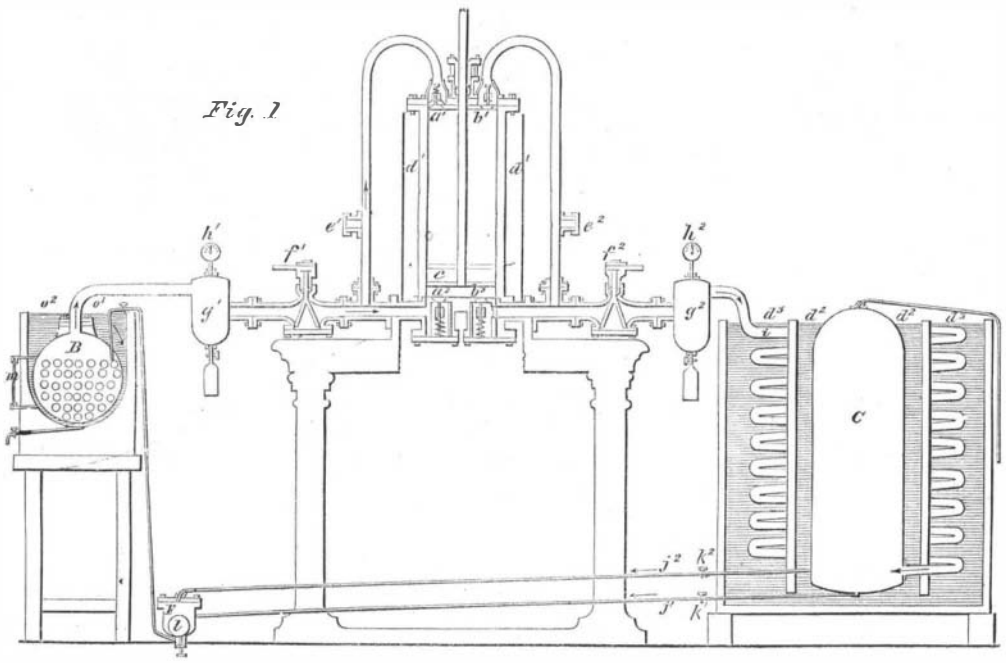

Fig. 1

A vertical pump is placed on the pedestal, and the engine is employed to operate its piston and withdraw the ether from the tubular vessel, B. The vaporized ether is placed into condensers, C, when a stream of cold water on the outside, aided by the pressure inside, reduces it again to a liquid state, to be used over and over again. In this is believed to consist the great economy of the operation, the steam power being the only expense. From the condenser, C, the ether flows back through the passages, F, to B.

The ether, as it evaporates in B, and flows up through the pumps into the condenser, C, carries off a great quantity of heat from a strong solution of common salt in the tubes. The funnel, n, is for pouring in the ether. The vaporized ether is drawn off by the pump passing it through the valves, a^1 a^2, and out of it by the valves, b^1 b^2, into the condenser. The piston, c, is made to work close to the top and bottom of the cylinders; g^1 8^2, are small copper vessels for receiving the oil used in lubricating the piston. Pressure gages, h^1 h^2, are placed on those vessels. The condensing water passes around the vessel, C, into the spaces, d^2 d^3, containing the worm, i, and then up through the overflow pipes. The ether flows back through pipe, j^1, then into the chamber, F. A return pipe, j^2, is for permitting any air that may find access to flow back into C. The cocks, k^1 k^2, are for opening and closing the pipes. India-rubber washers are used at all the joints to make them air-tight, so as to prevent all leakage of ether vapor. By removing the cap, e^1, and shutting cock, f^1, any leak will easily be detected. The surfaces of the tubular vessel, B, is 270 square feet; that of the condensers, C (two or three are used), amount to 260 square feet.

In Fig. 2 the end of the tubular vessel, B, is shown in section, and the strong solution of salt water contained in the tubes (and which is cooled below 32° by the evaporative ether surrounding it) flows, as shown by the arrow, up through the partition, h, between a series of inclined mold boxes, 1 2 3 4 5 6, &c., successively, which contain pure water, The very cold saline solution absorbs the heat from the water, and reduces the water below the freezing point, thus forming ice in the wedge-shapen molds. The molds are of tinned copper. The salt solution is returned by a pump, as shown by the arrow, and does duty over again.

The temperature of the cooling surfaces in this machine has been reduced as low as 23°. In fifteen minutes ice is formed one-quarter of an inch thick; in one hour an inch thick. The principles of refrigeration by evaporation and the condensation of recovery of this ether, in this apparatus, are easily comprehended. It requires full experiments to determine the economy of thus manufacturing ice, but the practicability of it is beyond all dispute. Such a machine as this is not only capable of making ice in hot weather, but it may be applied to cool air to a very low temperature for hospitals. It is also adapted for rendering water very cold without actually freezing it, and it may be carried to the top of a building and made to flow down through a pipe to form a most grateful and cooling cascade in warm apartments.

ARTIFICIAL FORMATION OF ICE.

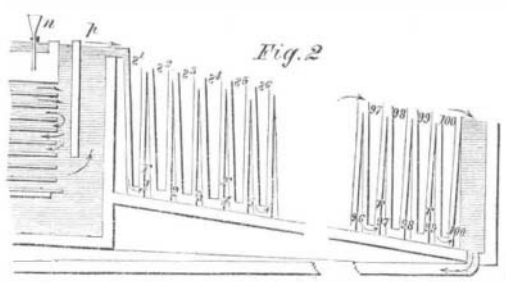
Fig. 2

RECENT AMERICAN INVENTIONS.

Polishing Stone.—Ezra H. Lewis, of Wilbur, N. Y., is the patentee of an improved machine for the above object. His invention consists in using, in connection with a horizontal rotating polishing bed, a vibrating or reciprocating bar, which is placed on the bed, and arranged to operate in connection therewith so as to give a vibratory movement to the stone while the same is being acted upon by the rotating polisher, and thereby cause the stone to be polished more rapidly and perfectly than hitherto, and also enable stones of a given size to be properly acted upon and polished by a smaller polisher than usual.

Constructing Iron Vessels.—The object of this invention is to obtain a mode of constructing iron vessels of navigation that will be much simpler, more economical, more durable, and which will enable vessels to be constructed with less weight of metal than usual. The invention, by B. F. Babbitt, of New York city, consists in the use of metal plates or bars, united or otherwise connected in a reticular manner, the plates or bars being bent or curved so as to form the framework of the hull, and the interstices of the framework filled with sulphur, the latter being poured into the interstices in a fused state, so as to completely fill the interstices and form a solid mass, rendering the hull of the vessel stiff and firm, and also protecting the metal from oxydation, as the sulphur covers the metal, and the former is not affected by either air or water.

Gas Retort.—This invention consists in the construction of a retort for making illuminating gas from resin, oil or other substance which can be introduced in a liquid state, with two upright chambers side by side, one of which, having the feed pipe attached, contains a series of partitions inclined longitudinally in opposite directions alternately, and provided with openings to allow the liquid substance to run from one to the other, from the top to the bottom of the series, so that all may be converted into gas or vapor before passing by an opening near the bottom, to the other chamber, to which is connected the outlet pipe, and in which the decomposition of the vapors is completed. The credit of this invention is due to A. K. Tupper, of Pontiac, Mich.

Veneer Saw.—The object of this invention is to saw veneers and their stuff from wood and ivory with a saw that will perform the work with a much narrower kerf than hitherto, and thereby effect a saving in stock.—To effect this result, L. B. Southworth, of Deep River, Conn., has patented an invention in which the usual "set" which is given saw teeth is avoided, and the latter are expanded or made of chisel form, and have their upper edges provided with a double basil.

Trachea Tube.—The object of this invention is to administer expectorant medicines directly to the trachea or to the nasal organs, so that in catarrhal affections, where the membrane of the throat is inflamed, the proper expectorant or anti-phlogistic remedies may be administered in proper quantities to the parts so affected, without bringing those remedies in contact with the mouth or tongue, as hitherto. The invention consists in a curved tube having a flat flaring double-throated portion formed on one end, the throats of which communicate with the hole through the tube, and a curved mouth piece screwed on the opposite end of the tube, so that this piece can be turned in a proper direction for directing the flaring portion either to the nasal organs or to the trachea. B. Segnitz, of New York city, is the patentee of the above invention.

HAVELOCKS A FAILURE.—Complaints are beginning to be made that havelocks are a failure. The dazzling white renders them conspicuous as marks for the enemy. They flap about the ears and face, interfere with the aim of the wearer, and prevent him from hearing the orders of the commanding officer. A substitute is mentioned which consists of a cork lining to be put into the top of the hat or cap, which keeps the head cool, on the principle that ice is kept in an ice-house by surrounding it with non-conducting substances.—*Exchange.*

There is no necessity for making havelocks with great ear-flaps. The back of the neck, extending down the spine should be covered, but that is all. Thin cork would make a good lining for a havelock, and it may be applied so as to render it a life-preserver when soldiers are crossing rivers.

SOLDIERS' FEET IN MARCHING.—A correspondent sends the following receipt for making an excellent composition for anointing the feet of soldiers during long marches. Take equal parts of gum camphor, olive oil and pure beeswax, and mix them together, warm until they are united and become a salve. At night wash the feet well, dry them, then apply this salve, and put on clean stockings and sleep with them on. Next day the feet will be in excellent train for marching. Our correspondent proved the great value of this receipt in a journey across the plains to California in 1852.