GREAT CANDLE MANUFACTORY—DESCRIPTION OF THE OPERATIONS.

A correspondent of the London *Chemist and Druggist* describes the Sherwood Works, at Battersea, England, belonging to the celebrated Price Patent Candle Company. We have condensed the most instructive and interesting portion of this description for the benefit of our readers :—

The manufacture of candles upon an enlarged scale embraces a range of high scientific information. The art has been completely revolutionized within the past thirty years, and for this the world is chiefly indebted to the French chemist, Chevreul, who has now charge of the Royal Dye Works, at the Gobelin manufactory of tapestry carpets, in Paris. Chevreul patiently investigated the nature of fatty bodies, with the view of determining their relative value for illuminating purposes. He found that every natural fat contained substances which ought not to be present in candles, because such substances reduced their illuminating power. Thus tallow is composed of at least two distinct solid bodies, namely, stearic and margaric acids; also a liquid oil—oleic acid and glycerine—a sirupy body, which serves as a base to the three acids. Each of these acids, when burned in the wick of a candle or lamp, gives a more brilliant flame than the tallow from which they are derived, but the glycerine gives a flame which is exceedingly feeble. To obtain a good candle material the latter body must be removed from the fat; and as the presence of oleic acid renders the material soft and greasy, this substance must also be got rid of. Chevreul, in the year 1823, described a process by which the hard acids might be separated. From that time candle making has advanced with rapid strides, and what was once a rude and noisome trade has become a first class chemical manufacture. To appreciate the difference between the two phases of the art, we need only compare the common parlor candle of twenty years ago with that which now takes its place. The snuffy, guttering, feeble-flamed mold, formed of simple tallow, represents the mechanical stage of candle making, and is rapidly becoming a relic of the dark ages. Instead of it we find in general use, a hard, clean, polished cylinder, composed of beautiful chemical products, which burn away brightly by a slender and snuffless wick. Wax and sperm are still used as formerly, but to a limited extent. A new material, paraffine, has nearly superseded them.

At Price's Candle Works palm oil, cocoa-nut oil and Rangoon petroleum are used extensively for candles. The palm oil is solid, and comes in casks from Africa. These are emptied in a most expeditious and simple manner. The casks are rolled to a large shed, the floor of which is traversed from end to end with an opening about a foot wide, which is in communication with an underground tank. Over this opening the bunghole of each successive cask is brought, and a jet of steam is made to play upon the solid mass. The heat of the jet speedily melts the oil, which flows out of the bunghole into the tank, whence it is pumped by steam power to a large pipe, which conveys it to the distilling rooms.

The works cover eleven acres of ground; the distilling rooms are large one-storied buildings, with roofs of corrugated galvanized iron; no furnaces are used; no offensive smell is noticed, and all things look neat and clean, and very different from the filthy fetid candle works that formerly existed. Throughout the factory, steam, either at the common temperature or superheated, is employed as the source of heat in all operations connected with the separation and purification of candle material. The steam is conveyed to the different rooms by suitable pipes, and the smoke, dust and danger of the furnaces are thus kept at a respectful distance.

When the stearic candle manufacture was in its infancy the fat acids were separated from the glycerine by the process called lime saponification. The tallow was first boiled up with thin cream of lime, which seized upon the fat acids and caused them to forsake the glycerine; the soap of lime thus formed was then treated with sulphuric acid, which, by uniting with the lime, set free the fat acids. This was an expensive process, as to each cwt. of tallow 14 to 16 lbs. of lime, and 28 to 32 lbs. of sulphuric acid were employed; moreover, in the candle material, stearic acid, when obtained, was only in the proportion of two parts to five of the tallow employed, and the other product, oleic acid, had little commercial value.

The process of sulphuric acid purification, introduced into the manufacture about twenty years ago, was an immense improvement upon the lime process. It is still employed in these works, though to a comparatively small extent. The quantity of sulphuric acid now employed to decompose 1 cwt of fat, in some cases is reduced to 4 lbs., and even 3 lbs. Six tuns of the raw material, usually palm oil, are exposed to the combined action of concentrated sulphuric acid, and a temperature of 350° Fah. The result of this action is very striking. The glycerine is decomposed, and the fat is changed into a mixture of fat acids of a very dark color, with a very high melting point. This is washed to free it from charred matter and adhering sulphuric acid, and is then transferred to a still. When it is exposed to the action of steam the palm oil passes over from the still in a limpid stream, and the product is collected in clean cans, from which it is transferred to tubs. The acid action and the distilling operations separate a dark, bituminous-looking residuum from the pure fatty acids. The sulphuric acid process involves the loss of glycerine and a waste of material, owing to the decomposition of part of the fat acids. These defects induced the chemists of this manufactory to seek for a still more perfect process, and in 1854 such was discovered. This consists in passing superheated steam directly into the neutral fat, by which means it is resolved into glycerine and fat acids; the glycerine distilling over in company, but no longer combined with them. Glycerine, which was formerly looked upon as a nuisance, as something to be got rid of at a great expense, is now valued, and sells at a higher rate than stearic acid. The presence of this body in the tallow candle gives rise to the offensive odor of the snuff when the flame is extinguished.

To obtain the pure stearic acid which forms the beautiful white adamantine candles, the distilled oil is cooled in tubs. When it congeals it is placed in bags of cocoa-nut fiber, and subjected to hydraulic pressure in a room at common atmospheric temperature. In another building is a long line of heated chambers, in which the process of heating is completed. To these the piles of solid acid which have undergone cold pressure are carried, and by a second squeezing, together with the action of heat, every trace of oleic acid is removed from the material. The hard cakes of starric acid are now removed to large wooden vats, in which they are liquefied by steam heat, and the candle material is ready to be run into the molds. Cocoa-nut oils and all solid fats receive the same treatment for making pure stearic acid candles. Common candles are made from the product of distillation before it is subjected to pressure.

Paraffine is obtained for making candles from Rangoon (East India) petroleum, which is similar to that of the oil wells of America. This source of paraffine is much cheaper than the heavy oil obtained by distilling cannel coal. The Rangoon petroleum is a natural product of Burmah. It flows out from the ground like the Pennsylvania oil. It is treated to distillation in the Price Candle Works, and separated into different products, according to the temperature at which it is distilled. The most volatile liquid that passes over from the still at 160° Fah. is called Sherwood oil, and is really the benzine, so called, obtained in distilling American well oil. It is used for cleaning kid gloves, and for removing grease from silk and other fabrics. Oil for burning in lamps comes over, when distilled, at a higher temperature, then heavy oil for lubrication, at a temperature of about 550° Fah., and lastly paraffine, at 620° Fah. When cooled and solidified—by its temperature being reduced with ice—it forms the most beautiful known material for candles except white wax. In distilling this substance from petroleum, superheated steam is employed in order to elevate the retort to the proper temperature. Paraffine is subjected to pressure in the same manner as the solid fatty acid, obtained from palm oil and tallow. It is a beautiful white substance, and has a silvery luster. It is melted with steam heat, and run into molds in the usual way. In many cases great trouble has been experienced in removing stearic acid and paraffine candles, after they had become solidified, from their molds. In this manufactory a most convenient and ingenious method of removing them is employed. It is simply the force of compressed air. There are several large iron tanks, in which compressed air is forced by a steam engine; and these tanks connect with the machine in which the candles are molded. The candle molds are arranged in benches. Along the top of each bench there is a little railway, on which runs the "filler"—a car containing hot candle material. The wicks having been adjusted truly in the molds, the filler advances and drops in each mold the requisite amount of material. After a sufficient time has been allowed for solidifying and cooling, the boys who attend the machines proceed to remove the candles from the molds. It is in this operation that the compressed air is made use of. Each mold is connected with the reservoir, and on merely opening a tap, pop goes the candle, which is dexterously caught by the boy.

The candle molds and air pump constitute an immense air gun, containing a stock of several thousands of barrels, each loaded with a candle. The turning of a cock by boys in attendance lets off these guns, and ejects the candles with a slight hissing noise. This fusilade is going on all over the room, throughout the entire day, and in the course of ten hours no less than 188,160 candle projectiles, weighing upward of 14 tuns, have been shot forth.

Innumerable contrivances for drawing candles have been attempted, but none equal this, as the compressed air does not injure the fine polish of the molds on which the beauty of the candles greatly depends. The tops of the candles are downward when molded.

Eight hundred operatives, consisting of men and boys, are employed in this establishment. The wicks for the candles, and the cocoa-nut fiber bags are woven on the premises. There is a school for the boys, and a large space of ground alloted for them as a gymnasium. There is also a large swimming bath, and an excellent library.

Etching on Glass or Stone.

An important improvement in engraving by means of hydrofluoric acid has been made by MM. Jardin and Blancoud. Instead of acting upon the glass with the acid in a gaseous state, they employ it while liquid. They have sought to turn to account the remarkable properties of this acid in engraving hard siliceous stones, and have succeeded in producing, with the greatest facility, some very important artistic results. If a stone, upon which it is wished to to engrave a design, be coated with a varnish of wax dissolved in turpentine, after the drawing is made with a fine point, the hydrofluoric acid is poured on. Immediately a white vapor rises, which increases rapidly, and the proportion of which indicates the action of the acid. After a while, the duration of which experience alone can determine, the effect produced may be examined. If the engraving is satisfactory, the varnish may be removed; if the contrary, the action of the acid must be repeated as often and as long as may be necessary. In many instances it may be necessary to complete the action of the acid by the graving tool, in order to secure an artistic result. For ordinary engraving it is indispensable, as in the execution of a line engraving, or an engraving upon lithographic stone, not to prolong the action of the acid more than absolutely necessary, else the siliceous stone will become corroded all over, and so destroy the design. At other times, on the contrary, we can take advantage of this corrosive action to produce certain useful effects, permiting us to realize valuable results in an artistic point of view.

Every natural or artificial substance containing silica, and consequently attackable by hydrofluoric acid, is susceptible of being treated according to the process of MM. Jardin and Blancoud. When the action of the acid is concluded, the lines may be filled with colored materials, metals, &c., and a kind of damascening obtained which presents a new resource in the ornamental arts. Various kinds of porcelain, transparent or opaline glass, may be treated by this process with very novel and tasteful results.

RETURN POSTAGE.—Correspondents who write to us for information, expecting an answer by mail, should always inclose a postage stamp to prepay our reply. Our correspondence is very large, and it costs us from $5 to $7 per day to pay postage. If our correspondents would bear their own postage expenses it would relieve us of a large tax.

Improved Evaporator.

The extensive introduction of the culture of Chinese sugar cane, has created a large demand for apparatus for making sugar and molasses from the juice, and has stimulated inventors to make improvements in this apparatus. The accompanying engraving illustrates an arrangement of furnace and pans devised for the purpose of conducting the evaporating process, by which the watery portion of the juice is expelled from the saccharine portion, with great economy of labor and in a manner to produce a superior article of molasses.

The inventors state that experience has shown that when the sirup has been boiled down to a specific gravity corresponding with about 20° or 30° of Baume's scale, if it is then allowed to cool at rest, the gummy portion of the juice will be precipitated, and will fall to the bottom; but if the boiling is continued, the gum will become so mingled with the molasses that it cannot be separated, imparting to the molasses a disagreeable acid flavor. This apparatus is accordingly designed to enable a pan of juice to be easily taken from the fire when the proper degree of evaporation is reached, and to allow it to rest till the gum is deposited, when the sirup is drawn off into another pan where the evaporation is completed.

The fire is made in the furnace, A, and the smoke passes through the horizontal flue, B, and out of the chimney, C. The juice is first poured into the pan, D, where it is heated to the boiling point. The gate, e, is then opened and the juice is drawn into the pan, F, through a suitable spout. This pan rests over the flue where the heat is less intense than it is directly over the furnace, and where, consequently, the sirup is in less danger of being burned. Here the boiling is continued until the juice is about half evaporated, when the pan is raised from its seat and carried to one side of the flue, while another precisely similar pan, G, is brought into its place and filled with a fresh supply of juice from the pan, D, in order that the work may go on without interruption.

To facilitate this changing of the position of the two pans, F and G, they are suspended from a carriage, H, which runs on rollers upon a cross beam supported over the flue by upright posts at its ends. As the pan must be raised from its seat before it is carried to one side, the pans are hung upon a vibrating lever, J. A brace, K, holds the lever, J, either in a horizontal or in an inclined position, as may be desired.

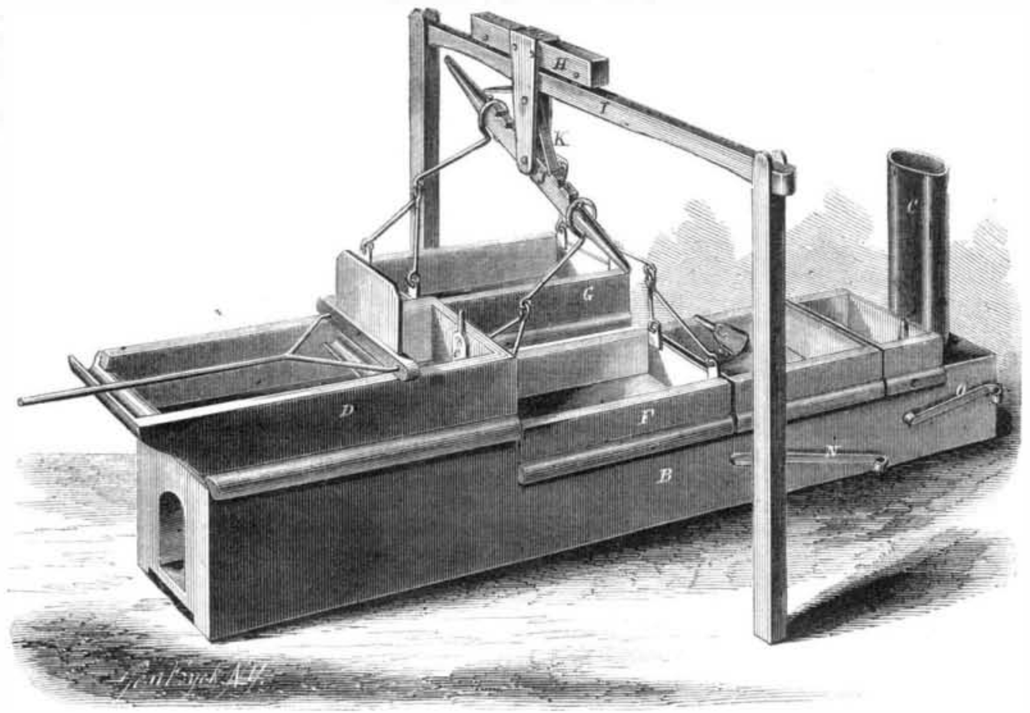
After either of the pans, F or G, is emptied, it must be very carefully cleaned before receiving a fresh supply of juice, and the pan, M, is provided for heating water for this purpose.

The upper part of the flue is left open to be closed by the pans, F and G, so that the smoke may come directly in contact with the bottoms of these pans; but provision is made for turning the smoke down away from immediate contact with the pans in case the heat should be too great. This is effected by introducing two sheets of metal of the same width as the interior of the flue and of the same length respectively as the pans, F and G. The sheet under the pan, F, is fastened at one end to a rock shaft, the end of which is brought through the side of the flue and has the lever, N, secured rigidly to its extremity. By carrying the loose end of this lever up or down, the metal plate is tipped so as to conduct the smoke either upon its upper or under side, thus directing the heat against the bottom of the pan or shielding the pan from its action as may be desired. The metal sheet under the pan, G, is connected in like manner with the lever, O.

The scraper in the pan, D, is provided from drawing out the scum which rises in this pan, the trough at the end of the pan greatly facilitating the operation.

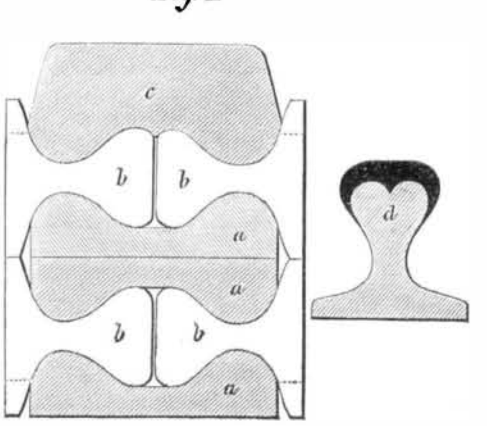
The patent for this invention was granted, through the Scientific American Patent Agency, March 11, 1862, and further information in relation to it may be obtained by addressing the inventors, M. and S. G. Tufts, at Maineville, Ohio.

TUFTS'S EVAPORATOR.



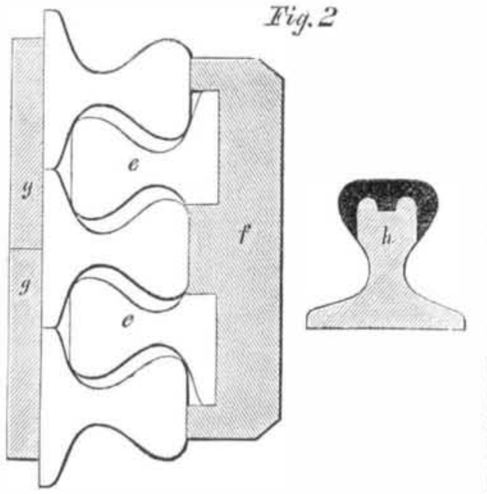
PERRY AND ONIONS'S MODE OF FAGOTING RAILS.

Fig. 1



One large item of expense in operating our railroads is the renewal of the rails, the ends of which are battered by the concussion of the wheels. The usual mode of renewing rails is by sawing them into short pieces, which are piled up in bundles or fagots,

Fig. 2



heated to a welding temperature, and re-rolled. The accompanying engravings represent an improved method of piling the old rails to produce in the new rail a more solid face than has been obtained heretofore.

Fig. 1, illustrates the plan for forming a pile of 4 rails. Three bars of iron are rolled in the form shown at *a a a*, and are piled with the rails, *b b b b*, in the manner represented. Then a bar of iron or steel of the form indicated by the shaded section, *c*, is placed upon the top of the pile, when the fagot is ready for the furnace and rollers. The first passage through the rollers crushes the flanges into one another to the dotted lines. Then the old rails are all worked into the interior of the mass to make the stalk of the new rail, while the top and bottom bars come into positin to form the head and flange—the parts which it is most important to have sound and free from fibrous structure.—The cross section or end of the new rail is represented at *d;* the darkly-shaded head showing the part formed by the bar, *c*.

Fig. 2 illustrates the mode of forming a pile of 5 rails; two of which, *e e*, are made up of the short pieces left from the saws and shears, with about an inch sheared from one of the flanges to make the pieces fit into the pile. This pile is passed 9 times through the rollers, the first 4 times on edge in the position represented. The head is formed by the piece, *f*, and the flanges by the pieces, *g g*. The pieces, *g g*, may be of equal or unequal widths, or they may be combined in one piece 10 inches wide. The end of the rail formed by this pile is represented at *h*; the darkly-shaded part showing the portion formed by the bar, *f*.

This mode of piling rails was designed by William Perry and William Onions, both of St. Louis, Mo. Steps have been taken to secure the invention through the Scientific American Patent Agency, and further information in relation to the invention may be obtained by addressing William Perry, at St. Louis.

CLOTHES WRINGERS—SQUEEZERS.

The little machines which are now so extensively employed for pressing the water from washed clothes are composed of two small rollers, covered with vulcanized india rubber, and set one above the other in adjustable spring bearings. Being geared together by pinions, they carry the clothes through and between them, when they are revolved, and thus press out the water. This class of machines have been used in calico-print works and bleaching establishments for a century, at least, and are called "squeezer rollers." Being employed to press the water from long pieces of cotton the rollers are made of wood, covered, in some cases, with several thicknesses of cotton cloth. Of course, such rollers are not suitable for pressing body clothing, because they would crush the buttons and the hooks and eyes of shirts and frocks; hence the use of vulcanized rubber, which, being elastic and moderately soft, is a great improvement for the covering of such rollers.

Wringing machines are different in their construction from squeezers. They are made so as to embrace a wringing or twisting motion. They generally consist of a revolving hook attached to a crank handle at one end of a frame, and this hook is connected, by an open bag of coarse linen, to a stationary ring situated on a post. The washed clothes are placed in this bag, and the hook is revolved. This action twists the bag and wrings the clothes. For wringing cotton yarn no bag is necessary. The hanks of yarn are placed over a stationary hook at one end, and a revolving hook at the other end of the frame. Such machines are also employed in some bleach works, and have also been attached to some of our washing machines. They are not so convenient for domestic purposes as the squeezers with vulcanized-rubber rollers for small articles, but are perhaps better suited for blankets and such like large articles.