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SOAP MANUFACTURE.

Soap is by no means a modern invention; it is so old that no one can tell when or where it originated. Specimens of it were found in the ruins of Pompeii, together with the apparatus for its manufacture. It is not our purpose to give a detailed history of this industry nor to describe generally the processes by which the great variety of soaps now found in the market are made, but to give the reader an idea of the apparatus and processes employed in the largest soap manufactory in this country, if not in the world.

Crossing the North River on one of the ferries one cannot fail to notice in the lower portion of New York city a building much higher and wider than any of the others, upon which is displayed in huge letters the name of B. T. Babbitt. The stranger might be at a loss to know whether the great manufacturer had chosen this as a conspicuous place to post his advertisement after the modern fashion, or whether it really designates the spot from which emanate the products so familiarly known all over the world; but the latter is correct. B. T. Babbitt's soap works occupy an area equal to twenty-three city lots, 25x100 feet each. This immense surface is covered with substantial brick buildings, ranging from three stories to five and eight stories in height. The aggregate floor space devoted to manufacturing is 300,000 square feet. These buildings are located on Washington and West streets; the numbers on Washington street comprising Nos. 64 to 84 inclusive, and on West street Nos. 41 to 51 inclusive.

The business offices of the concern occupy a large floor, and in connection with the establishment there is a large restaurant, where employes of the works can procure meals at reduced prices and without loss of time.

The power used in these works is furnished by twenty-five engines placed wherever power is needed, and supplied with steam from four boilers of Mr. Babbitt's own invention, ranging from 500 horse power to 60 horse power. By this arrangement long lines of shafting are avoided and the power is applied directly.

For carrying out his plans for the construction of boilers and machinery, Mr. Babbitt has extensive machine shops at Whitesboro, N. Y. Everything connected with the establishment is upon such a grand scale that it is impossible to realize the extent of the works without personal inspection.

The amount of raw material consumed in these works is astonishing. The annual consumption of some of the leading materials includes upward of 70,000 barrels of the purest white tallow, received principally from Texas; 40,000 barrels of resin from the Carolinas; immense quantities of potash are imported from England, and vegetable oils and other ingredients are consumed in proportion. All of the materials are selected with the greatest of care, and nothing but the first quality is ever bought. Notwithstanding the immense quantity of materials used in this establishment, one cannot discover the slightest disagreeable odor in making a tour of the entire works, and the most scrupulous cleanliness is everywhere observable.

In the manufacture of soap Mr. Babbitt employs six enormous caldrons made of boiler iron; the largest, which is shown in one of the views on our first page, is 25 feet in diameter and 57 feet in depth, holding 1,800,000 pounds at a single boiling. The aggregate capacity of these huge receptacles exceeds 3,500,000 pounds. The average cost of the raw materials for filling each kettle for a single boiling is $36,000, while the value of the contents of the largest caldron reaches the enormous sum of $125,000. Everything here is subject to regular system. Nothing is wasted, nothing neglected. The gigantic operations proceed with perfect regularity. Wherever possible machinery has been introduced to save labor.

The foundation of nearly all varieties of soap is pure white tallow, which is received in barrels or casks. It is transferred to the soap kettles by placing a large number of the barrels in line upon a platform with the bung downward, and introducing steam pipes, the steam from which quickly melts the tallow, when it flows into large reservoirs, and thence to the kettles. The lye, composed of potash and lime, is prepared in large iron tanks, and conducted through pipes to the kettles. After the tallow and lye are thoroughly mingled, steam is admitted to the kettles, and the boiling begins. At a certain stage in the process common salt is added, which, dissolving in the lye, increases its density, and permits the soap to float on the surface of the liquid. It requires several days to complete this process. When it is finished, the liquid soap is drawn off, and forced by means of powerful steam pumps into large iron reservoirs, from which it is drawn through pipes into the soap frames to cool and harden. The kettles are filled in regular rotation, so that while one is boiling, the process has nearly approached completion in another, while a third is being emptied.

The average daily production of the works is about 1,500 boxes of soap, each containing 75 pounds.

The soap frames above alluded to are shallow iron boxes, made separable to facilitate the removal of the soap. Each frame holds about 1,500 pounds. After the soap has hardened sufficiently it is cut into bars by means of wires, and is afterward pressed into oblong cakes, with rounded corners, without loss of weight, and at the same time receives its imprint of "Babbitt's Best Soap," a brand which is universally recognized as a guarantee of excellence.

The description given above is applicable to the manufacture of nearly all varieties of hard soap, except the choicest kinds of toilet soap, in which pure vegetable oils take the place of tallow, or are used in combination with it. Olive, palm, and cocoanut oil are the most generally used for fine soaps. A considerable portion of Mr. Babbitt's establishment is devoted to the manufacture of toilet soaps, and in this, as in the manufacture of ordinary bar soaps, nothing but the best materials are used.

The frauds which have been perpetrated under the cover of perfumes by unprincipled manufacturers have created a distrust of the highly scented soaps, and made a demand for a wholesome soap free from such objections. Mr. Babbitt, with his characteristic enterprise, met this increasing popular demand, by introducing an elegant article of toilet soap which is entirely free from artificial odor of any kind. It is made from the finest of vegetable oils, by new and original processes. "Baby Soap," as this new article is called, is peculiarly suited to the delicate skins of infants, children, and ladies. It preserves, softens, and smoothens the skin, and is an elegant toilet luxury, not only well adapted to the use of ladies and children, but equally well adapted to gentlemen's toilet. Although it has but recently been put upon the market, it bids fair to become one of the most popular of Mr. Babbitt's manufactures.

The other articles made in this establishment are so widely known and so well appreciated that it is unnecessary to add anything to the universal verdict as to their merits. Potash balls, so well known in the market, originated in this establishment. One of the upper views in the engraving shows the workmen in the operation of pouring the fused potash into the iron moulds which give it its spherical form. Each ball, after casting, is given a protective coating of melted resin.

Saleratus, an important article of trade and commerce, is made in large quantities here. One of the lower views in the engraving represents the department in which this article is weighed and packed.

It is difficult, with a limited number of engravings, and brief article, to convey a just idea of the magnitude of Mr. Babbitt's establishment. The great success of this concern is due so the fact that Mr. Babbitt combines inventive and mechanical skill with business talent of the highest order. He has been enabled to originate new and valuable processes, and to devise labor-saving machinery, by means of which he has secured great advantages over his competitors.

Vehicles of Intelligence.

Newspapers, like nations, have a historical existence. They "go to and fro" in the world and exert a powerful influence. Tribes and individuals far removed from hearing what is transpiring among men are always ignorant and degraded. That person who uses means to obtain a record of passing events always improves and advances in knowledge; the man who is dead to such influences is dead to his own best interests. Well did the old Greeks know the value of obtaining new information. When voyagers and travelers came to their ports and cities they were taken to their public marts and requested to recite an account of what they had seen and heard abroad. The influence of this custom, before the art of printing was discovered, was like that of our modern newspaper; it tended to excite the people, and lead them to achieve reputation in all that was held worthy of being distinguished.

As attainments in the useful arts make men distinguished and nations great, we take occasion to solicit the favor of our constant readers in extending the circulation of a paper devoted to disseminating such information among the people as is useful and elevating. We urge our friends to give us their assistance in presenting the claims of the SCIENTIFIC AMERICAN to their acquaintances. We have no doubt but there are a great many mechanics, manufacturers, and others who would become subscribers were our paper brought to their notice, and its character and advantages pointed out by those who know it well.

SOME RECENT INVENTIONS.

Mr. Ernest W. Noyes, of Bay City, Mich., has patented an adjustable toe weight for horseshoes, which consists of a weight with a longitudinal dovetailed groove, which engages an inclined bar rising from the edge of the shoe. In the groove is a spring pawl adapted to engage holes in the bar, whereby it can be fixed at different points to adapt it to the throw of the animal's feet.

Upon elevated and other steam railways the platforms are usually fitted with gates, which are opened to permit passengers to pass out and closed when the train is in motion, and the signal to the engineer for starting the train is given by means of a bell rope when all the gates are closed. There is always a liability of the signal being given before all the passengers are off, and of the occurrence of serious accidents by starting the train too soon. Mr. J. Charles E. Ohlenschläger, of New York city, has patented an improved electric signaling apparatus, which prevents the signal from being given until all the gates are closed.

An improvement in button holes for boots and shoes has been patented by Mr. Benjamin L. Newhall, of Lynn, Mass. The invention consists in a process of re-enforcing button holes by inserting a blank coated with "compo" in the flap and setting it thereto by pressure, in the peculiar construction of the blank, and in the mode of combining the blank with the flap.

An improved oil cabinet, patented by Mr. James M. Thayer, of Randolph, Mass., is designed for the use of retail dealers in oils and other liquids, corporations, factories, etc., which allows the oil or other liquid to be drawn in any desired quantity and without drip or waste, and prevents any escape of odors into the room.

An improvement in loom shuttles has been patented by Messrs. Adna B. Roberts and Le Roy Lyons, of Manchester, N. H. The object of this invention is to furnish shuttle spindles so constructed as to hold the bobbin upon them when lowered into the shuttle, and allow the bobbin to be readily put on and taken off when raised out of the shuttle.

Messrs. Gideon B. Massey and Edward E. Spencer, of New York city, have patented an improved revolving shoe heel, which is so constructed that they will allow the curve of a French heel to be continued across the edge of the revolving part, and that will give no indication to a casual observer that there is a revolving part.

Minneapolis (Minn.) as a Milling Center.

The substitution of "St. Paul" for "this city," in a statement of milling operations at the Falls of St. Anthony, given on the authority of the *Pioneer Press*, of St. Paul (SCIENTIFIC AMERICAN, October 25), was the means of doing unintentional injustice to the rival city of Minneapolis. As a business center the latter has outstripped her older but less favorably situated sister; and now the mills of Minneapolis have, it is claimed, something like five times the capacity of those of St. Paul. When mills now building are finished her capacity will reach 15,000 barrels of flour a day. Another of her great industries is the manufacture of lumber, amounting to 200,000,000 feet a year.

Correspondence.

Ice Boat Propulsion.

To the Editor of the Scientific American:

Referring to the subject of the propulsion of ice boats by sails, recently revived, it seems to be accepted as a fact that such boats may travel faster than the wind, without any serious effort being made to solve the problem. It ought not to be mysterious to scientific men, and is only so because sufficient thought is not given to the matter.

The error in this question consists in considering the velocity of the wind at all, except as the means for producing the pressure by which the boat is propelled. Given the weight to be moved, power required to overcome inertia and friction, and speed desired, the extent of sail, surface, and the wind pressure required to propel the boat may be very nearly calculated. The principle is the same with all boats using sails, whether in water or on ice, the difference being that the power to propel a vessel in water is great, while but little power is required with ice boats. With vessels in water the result is a great weight moved slowly, or in other words, the pressure of the air, the power converted to the motion of the vessel, is represented by a comparatively low rate of speed. If it were practicable to spread sufficient canvas, a vessel could be propelled in water faster than the wind.

With an ice boat the conditions are changed: the weight is small compared to spread of canvas, and the friction slight, so that the power obtained, transformed to speed, gives a resultant velocity in some cases greater than the wind.

The wind pressure on a plane surface exposed to its direct action is much greater than usually supposed. From tables we find the pressure on such surface to be 2 lb. for each square foot, with wind moving 20 miles an hour, and with the velocity increased to 60 miles an hour the pressure increases to 18 lb., so that with an exposed surface of 1,000 square feet there will be a constant pressure of 18,000 pounds. This applied to force an ice boat forward must give great speed, and the boat rushes forward until the equivalent of the power is obtained in speed. The pressure due to the wind velocity being obtained, that velocity may be eliminated from the problem. As an example, suppose it requires a wind velocity of 20 miles, or a pressure of 2 lb. per foot, to propel the boat at the rate of 20 miles an hour. Now, suppose the wind velocity be trebled, the pressure then runs up to 18 lb., nine times that required before; we then have an actual force which must be expended to increase the speed of the boat until an equilibrum is established. The query that naturally arises here, is this: Will not the pressure cease the moment the boat exceeds the wind in speed? If air was a non-elastic fluid, that would be the result; but air is elastic; its pressure on the sails is due not only to its momentum but to its elasticity by compression against the exposed surface, and this elasticity is a constant acting force, which, exerted under the favorable conditions provided by an ice boat, gives the result of a great speed. Were this not so, there would be a limit to the size of vessels which could be propelled in water by wind pressure, and a large spread of canvas would have but slight advantage over a smaller exposure. This can be illustrated by a boat floating with the current of a stream: its speed could not be increased by wings projecting at each side; it would move forward with greater force, but at the same speed.

The same principle is seen in a turbine water wheel, the weight in that case taking the place of the elasticity of the air as a constant force. There is the same difference in character of operation between a current water wheel and a turbine as there is between an ice boat moving with a gentle breeze and one sailing under pressure of a high wind.

W.