

T H E S I S .

Subject, A Bottle-Factory.

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Man has found use for bottles from the earliest times to the present day. In his primitive state he made them from the skins of animals; in later times he used clay or metal in their manufacture; and finally, by chance, as tradition would have it, glass came to his hands.

No other kind of glass manufacture was developed as early in history as the production of bottles and drinking vessels. Ages before the superiority of glass window-panes over holes in the wall was discovered, Thotmes III. of Egypt was having his name molded on glass bottles, specimens of which are in the British museum at present. Bottle factories were the pioneer glass houses, not only in ancient and foreign lands but in our own United States, as well; and they are still noted for their wide distribution and constant employment.

If the history of the glass bottle is so intermingled with the history of the human race and

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its use, at present is so extensive, it might be well to take a glance at its early surroundings in the factory.

Perhaps the first thing we notice, as we approach a glass house, at least one that has been built for some time, is the large brick chimney stack in the center of the main building. - In more modern factories, however, there may be no stack. Adjoining either side of the main building we see a number of smaller buildings or low sheds, as we might call them.

As we enter the main building we find every one, present, active. Some hold their blow-pipes in the apertures of the furnaces and gather the hot liquid metal on the ends of the pipes. These gatherers then hand the pipes to the blowers, who, after cooling the collected glass slightly and after rolling it on the smooth perfectly clean iron face of a stool called the marver, place it in the molds; then, by blowing

Page (3) will contain photographs of
a bottle-house, interior and exterior,
as soon as they are finished.

through the hollow pipe, the plastic glass is tightly pressed against the sides of the molds. Little boys then open the molds and the newly formed bottles are carried away by other boys to be finished and tempered. This process is going on continuously. To be sure, it is a simple one; yet we cannot but be impressed by the system and carefulness shown.

Our attention is next called to the furnaces, perhaps. In the center of the building is the large working furnace over which the great chimney-stack towers. Extending about four feet from the floor, all around the stack are several arch-shaped openings. Within the stack at each opening is placed a large cylindrical pot made of fire-clay. In these pots the components of glass are melted into the plastic fluid which the gatherers take on their blow-pipes. At the center of the stack floor is an

opening from the furnace beneath. A large cave, extending through the subterranean area of the glass house, passes under the base of the furnace; connected with the open air at each end, it supplies oxygen for the fire in the furnace; it serves too, as a place for feeding the fire with fuel; if coal is used; and for removing the fallen cinders. The furnace is made of fire bricks cemented together with fire clay. The flame and intense heat pass from the furnace through the opening above, then, instead of going immediately up the tall chimney, they strike against a slightly rounded roof-like structure called the crown and are made to pass against and over the pots before they can reach the stack above.

The day of the pot working furnace, however, is waning. The genius of man in the person of Dr. Siemens of England has invented something better. So, now, in most factories, if

there is any pot furnace at all, you can approach it without any danger from heat or flame. Placing your head in a working hole you can look up through the tall chimney to the blue sky far overhead, and muse on the crumbling towers of deserted castles; or, if you will so humble yourself, you may crawl in under the cold crown, where, looking down through the guarded aperture in the floor, you can gaze upon the darkness of the once brilliant furnace, and dream of Pluto's dreary realm. Yes, the old pot furnace is abandoned; while to one side can be seen one or more of the new tank furnaces doing its work for it.

The tank furnace is generally rectangular in shape: two or three times longer than wide and, as a rule, four or five feet in height. Within the furnace is a large rectangular tank made of fire brick. This tank takes

the place of the pots in the old furnace and is a great economical improvement upon them. The pots cost from forty to sixty dollars a piece and seldom lasted but a few weeks for they soon cracked and became useless. There is a great save of fuel and heat in the tank furnace too. Gas, either natural or manufactured, is used, as a rule. The flame is admitted at one end of the furnace and has to pass over the top of the batch in the tank (glass is heated by conduction) before it can reach the chimney flue at the other end. On account of the great temperature necessary in the furnace (the average is about 2000° F.) air chambers are arranged around and underneath the tank so that the outer surface may be kept at the requisite temperature to prevent any egress of the molten metal. In the sides of the furnace are the working holes.

Leaving this place of interest and looking

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above and around us, we see a system of iron pipes - from five to ten inches in diameter - leading apparently to all parts of the building. Through these, air is admitted from the outside and is made to pass down through these pipes almost to the floor. At the mouths of these pipes, workmen are regulating the temperature of the molds, tools, glass, etc., with which they are working. To know why the air comes through these pipes you must go to the engine house adjacent to the main building: there you will find a large fan, turned by machinery, drawing the air into a collector, thence, driving it into a large pipe, which leads to the main building. While there you may notice that steam is used for drawing up cargo and for turning a large grind stone, on which the tops of flasks are smoothed; you may notice, too, the adjacent blacksmith shop where tools are repaired.

Returning to the main building you may become interested with us in the finishing and annealing processes and furnaces. The finishing furnaces are small square shaped structures in the sides of which are little round apertures which the workmen call "glory holes". After the top has been cut from a bottle a band of molten glass is generally wound around the neck at the mouth; the bottle is then placed in a snap, and the mouth is held in one of these "glory holes" until it attains the proper degree of pliability; the finisher then seats himself on his bench on the arms of which he rolls the bottle, while he shapes the mouth with his finishing tools.

We next follow the bottle to the tempering furnace called a *leer*. This is a long horizontal oven with fire underneath. On the oven floor is a long chain of pans. As the bottles are brought from the finishing furnaces, they

are placed in the first pan to the front. At the far end of the leer, by means of a lever and chain a man pulls the long row of pans until one is outside. This one he empties of its bottles, and, fastening it to a track above, pushes it through a narrow hall along one side of the leer, around to the front, where it is again fastened to the long chain of pans; it is then ready to be refilled and taken again on its journey through the furnace. - It is only the smaller bottles, however, that are placed in the leer. Along one side of the building there are a number of ovens in which the large bottles are piled and annealed by a fire, not underneath, but in one corner of the oven.

To one side of the narrow hall by the leer, at the other side of the leer, and beyond it too, there are some rooms or sheds in which we are interested. In one are kept the many molds of all kinds and sizes. In one the boxes

for shipping are made. In another the corks
and caps are put on the milk-cans and
beer-bottles. In one, the mixing room, we
must stop a moment. Here we find piles
of white sand, lime, nitre, and soda; in
different places different materials are used,
however; but whatever is used, must contain
silica, soda or potash, and alumina. On
the floor of the mixing room is a wide wood-
en trough in which the batch of ingredients
is mixed. Beside it are two or more batch-
wagons ready to carry the mixture in the
evening to the fusing or tank furnaces, where,
together with the fragments of broken glass
gathered through the day, it is thrown into
the tanks which the night watchman guards
and keeps at the right temperature till morn-
ing; at which time the batch is melted and
ready for working.

Leaving the mixing room, we pass on

through the packing sheds where the bottles are being brought in from the sea and the ovens, and are being prepared for shipping. In adjoining rooms we find carloads of boxed ware, all marked and ready for the next train.

The superintendent of the works then kindly invites us into his office nearby, where we are shown samples of all bottles made in the factory. As we are about to leave, a train pulls up, and, amidst the rush and the noise of loading, we see the bottles started out on their life's journey. "What is their mission?" you ask? Well, that is a chapter of another story, which we cannot now relate. We have not discovered the bottle's destiny but we have found out the nature of its early home - the bottle factory: and that is the point which we wished to gain. So now, as we depart, we can express our sincere gratitude for the knowledge obtained; the courtesies received; the lessons learned.

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