MAKING A MILK BOTTLE

UNFAMILIAR Story of the Production of a Familiar Article in Which There Is Much That Is Instructive, Spectacular and Often Dramatic

NEW YORK, Saturday.

"A LITTLE sand, a little limestone, a little alkali, 3,600 degrees of heat and an awful lot of human interest," mixed thoroughly, properly and according to Hoyle, and the result is a glass bottle (a milk bottle, for instance), the ordinary milk bottle that you find on your back stoop in the morning, or on the dumbwaiter if you are a town dweller.

To see a bottle made is to witness one of the most interesting sights in all manufacture. This holds, no matter whether the bottle be machine made or man made. The machine operates in a wonderful way, but the man—well, in bottle making the labor of the human worker is spectacular always, dramatic very often.

The old question regarding the ultimate destination of all the pins might be applied to the bottles, except that the answer in the latter case is much easier. The pins are lost, the bottles are broken. That is why 2,880,000,000 bottles were made in the United States last year. Of course, these figures mean very little to the man who does his reckoning in thousands or even millions, but they convey a very good idea of the vastness of the bottle making industry of the country. Also, between 1900 and 1905 there was an increase of fifty-five per cent and the expansion since has been very great.

The man who gave the recipe quoted for the production of a milk bottle is superintendent of the Long Island City plant of the Bottlers and Manufacturers' Association and the Bottlers and Manufacturers' Supply Company, of New York. He knows all there is to know up to date about the making of bottles, and can tell you of the steps marked by the industry from the days of the Colonials, who began making their own bottles down on the sands of Southern New Jersey, near the place so appropriately called Glassboro.

An Artist at Work.

Up to 1890 the actual framing of a bottle depended principally on the craft of the hand, but along in 1895, at a little factory in Beaver Falls called "The Yellow Cow," a machine was set up for the production of small, wide mouth ware like the familiar little vaseline bottle. Then came an appliance that turned out the wide mouth fruit jar, and then came an improvement which permitted the manufacture of bottles with narrow necks. To-day there are hundreds of machines making all sorts of bottles, but the machine is not the man, and to see the latter in action is to witness one of the most fascinating operations in which a deft hand, a quick, sure eye and an active steady brain can be employed.

The man who makes bottles is an artist. He is well paid—$12 a day is a fair wage for him—and he is all the while making a display of dexterity and cool nerve that not only amazes but thrills the onlooker.

There are bottlemakers who are so deft, so keen of eye, so accurate in judgment that you can place before them a bottle of any size or shape you desire, and before your very eyes these men will reproduce your model exact as to size, color, form and even weight.

So when the superintendent of the Long Island City plant spoke of the awful lot of human interest attaching to the making of a bottle he knew, because, after all, it is the personal element that lends the fascination that surrounds the making of even such a commonplace article as your everyday milk bottle.

Well, let's see just how they make bottles in this Long Island City place. You enter a group of huge, high roofed sheds extending from a pier on the East River back to Vernon avenue and near Webster street. One shed is full of coal and the materials of which glass is made. In another is a furnace, gas retorts and their apparatus; a third holds the output of the factory ready to go to the bottle market.

But all these sheds are merely subordinate to the big central one where the bottles are made. Men, clear eyed and pleasant voiced, move from one shed to another, each on his own task intent and all working with the cohesion that is necessary where the product depends on the quick thought, the crafty hand and the keen eye.

The principal apparatus in the main shed consists of two low chambers made of fire brick—not the kind in your stove, but a brick specially prepared to resist intense heat. Built close together, these chambers are connected at the bottom by a small pipe. Ten feet high, the chambers are eight by ten feet within and circular. One is called the melting tank, the other the gathering tank. These two tanks are the points of interest, for on them depends the success or failure of the bottle we are about to see made.

The Ingredients.

"A little sand, a little limestone, a little alkali." In a cellar a man shovels sand into a wheelbarrow and weighs it. He tips it on the floor in a heap. Another man adds the limestone, another the alkali, all properly proportioned to the quantity of sand. Almost any kind of sand will do, but the cleaner it is the better. Very good sand is found in the Berkshires and some in Pennsylvania, but that which the man is wheeling to the heap on the floor came from Belgium. It was brought over as ballast and transferred by lighter to the East River pier.

Two other men tackle the heap on the floor. Each has a shovel and they work opposite each other in criss-cross fashion and very carefully mix the mass, making the blend uniform throughout. These men must not shirk their task. Very soon the material they are at work on will be the groundwork of the bottle, and unless the shovelling is done with skill and care the subsequent operations will fail.

Machines have been used for the work those two men are doing, but here is where the personal equation is above mechanism. The law that drives the one part of the mass to the outer edge and keeps the other in the centre works against the proper blending of the ingredients. Shovels wielded by men must be employed.

So these two men carefully mix their various parts of sand, alkali and limestone. Also there are soda, potash, lime, alumina and oxide of lead.

Soon the men with the shovels have done their work and the "batch," as it is now called, is carried from the mixing place by an endless belt to a point near the melting tank in the main shed. Here it is deposited automatically in the open and is ready for the Plutonic breath of the 3,600 degrees of heat.

Next in the process comes a man who is called a "shearer." He, also with a shovel, places enough of the "batch" in the tank to keep the contents at a uniform depth of about forty-two inches. And over this mass steadily pours from above the terrific heat that registers 3,600 degrees Fahrenheit. Some idea of 3,600 degrees Fahrenheit may be had by recalling a summer day when the mercury reaches the 100 mark.

"This heat blast," says the superintendent, "comes from an apparatus known as the Siemens regenerative furnace. It is the invention of the great engineer of that name and has been improved and adapted by Andrew Ferrari and other American experts. We keep the furnace in an adjoining shed, as you will notice, and we convey the heat to the melting tank by a conduit.

The Terrific Heat.

"Intense heat is necessary to fuse the materials in the 'batch,' and the Siemens furnace creates this heat by a combustion of superheated gas and superheated air. It is just the same as if you were to feed your stove with heated air.

"You might have noticed," adds the superintendent, "that the man we call the 'shearer,' while feeding the 'batch' into the melting tank, threw in with it a few bits of broken bottles collected for remelting. This is called a 'cullet,' there being a theory that it will cause a better grade of glass to be produced. This is one of the odd things about glass bottle making, for we do not really know whether it is a help or merely a legend—a sop to superstition, as it were. At any rate the broken bottles go with each 'batch' as a sort of ceremony. If they help well and good. At any rate they can do no harm."

Meantime the men at the big tanks are watching the fusing process with practised eye and managing it with deft hand, and as the melted mass, fused by the savage blast from above, pours to the bottom of the melting tank it flows on through the passage already mentioned to the adjoining gathering tank. This molten mass is now liquid glass, and, being heavier than the ingredients of which it is made, easily finds its way to the second tank, where its arrival is carefully watched and noted by men and boys, who work in squads of six, each squad being known as a "shop." These "shops" succeed one another ceaselessly day and night almost the whole year round. They surround this marvellous caldron and from its contents make their bottles.

The mass we have followed to the gathering tank is now viscous and sticky and ready for the experts, who fulfil the promise that there is "an awful lot of human interest" in the bottle recipe.

The "Blower"

Feeding the "Batch" Into the Melting Tank, Where the Terrific Heat Registers 3,600 Degrees Fahrenheit

There are holes in the caldron wall through which the molten glass can be seen. Around the tank and two feet off the ground is a narrow platform. On this stand the men who are now to do their part in the making of the bottle. The holes through which you can see the red mass are called "rings." Each is about a foot and a half in diameter. Two men are at each "ring"—one the "gatherer," the other the "blower."

And thus is reached the fine point in the making of our bottle. Keep your eye on the gatherer first. He is an artist—a master. In his hand he carries what the superintendent tells us is a blowpipe. It is a metal rod five feet long, about three-quarters of an inch in diameter and hollow. The artist jabs this rod through one of the holes in the tank, sticks its end into the molten glass, deftly twists it until he has a certain absolute quantity of the red viscous mass attached to the end. He quickly pulls the rod out with its clinging burden and stews lively until he reaches a small tub of soapy water, close at hand. In this tub partly immersed is fastened half of a small hollow steel sphere. The man gives to his melted glass a quick turn or two in the hollow sphere. The glass takes on a shape like a ball on the end of the pipe. This man, you recall, was called the "gatherer."

The Blower at Work.

Now comes the other man we noticed—the "blower." It is his turn. He reaches for the hollow rod with its ball of glass on the end, lays the glass globe against a slab of marble or metal—they have both kinds—called a "marvering stone"—gives to it a few certain and absolutely correct revolutions and, behold! the glass globe takes on a cylindrical form, something like a great pearl, and also there grows a pear shaped end that ultimately will be the neck of a milk bottle.

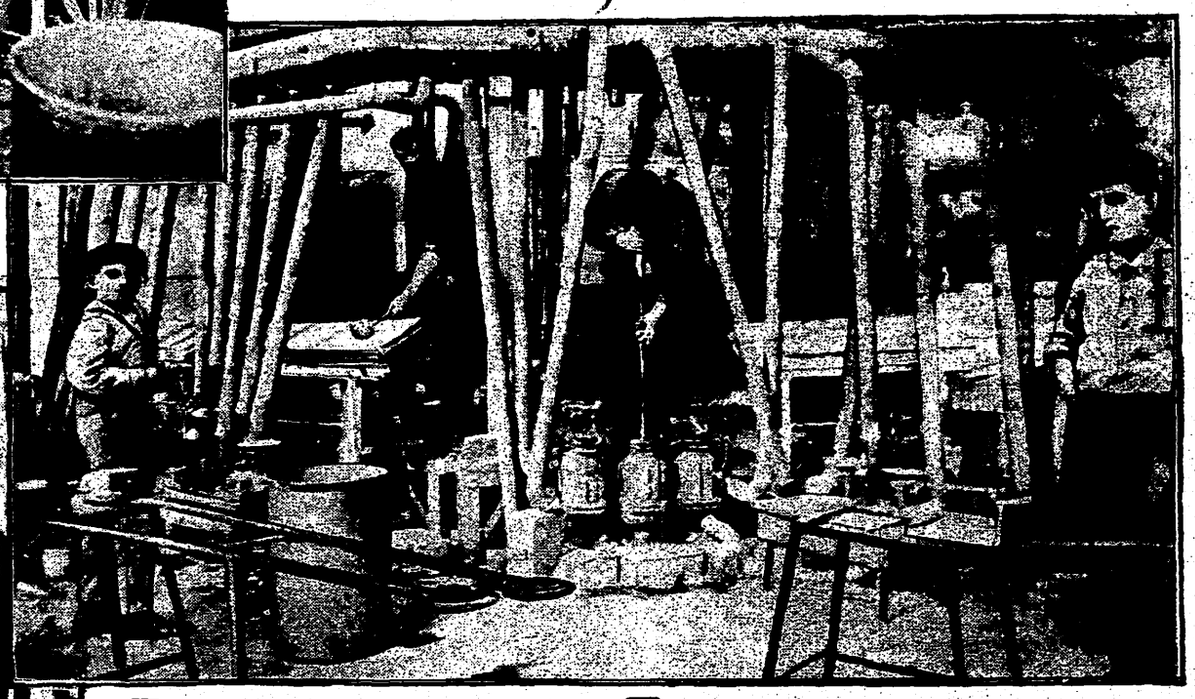
Then the blower proves his right to $12 a day as wage. He lifts his mass of glass from his marvering stone and puffs just a little air through the other end of the pipe. This air gathers in the centre of the mass of glass. It becomes a bubble, to be expanded in an instant to the full size of the bottle about to be made.

"If an amateur were to take a rod and try to do what that man has done," says the superintendent, "there would be serious trouble, because the amateur could not possibly cause the molten glass to adhere to the blowpipe. He might twist and twist, but the mass would drop off, and the chances are there would be a nasty little explosion. Because our man knows how to do the trick is why he earns his very big wages, and with his partner is capable of making 240 dozen quart bottles a day. Rarely do these two have an accident in their gathering, their marvering or blowing. All they show besides their dexterity and skill is an earnest desire to do their work well. They take a pride in it and their ability for rapid, precise skill."

The air bulb is formed. The blower moves on. He inserts the glass in a metal mould, set a few inches below the platform which runs round the tank. This mould is in two parts, one immovable, the other hinged and controlled by a foot lever. The glass is still sticking to the end of the hollow rod and the little bubble in the centre is intact. The glass is shut in the mould by the foot of the blower on the lever. The man then blows in his pipe's end until the glass has expanded to the side of the mould. A portion of the glass projects above. The blower jerks his pipe away with a queer little twisting motion and passes it back to the gatherer for a repetition of that artist's part in the making of the bottles.

So far, so good. The neck is next. In the mould the glass cools very rapidly and it is not left there very long, only for a few seconds. Along comes another artisan, a "snapping boy." He has a little clutch in his hand and he pries open the mould. Out he takes the potential bottle, sets it on a scale to test its weight, and, noting this, carries it, fastened in an iron case with a very long handle, to another expert, who is seated quite comfortably in front of a small but very hot furnace. This man, too, has his queer name. He is a "gaffer," and his business is with necks. His furnace has many openings, called "glory holes," and into one of these he shoves the bottle and its iron case as they are handed to him by the "snapping boy." In a jiffy what is to be the neck of our bottle is reheated into a plastic state. Jerking it from the furnace, the "gaffer" jams the end of the bottle into a patent stopper so adjusted as to absolutely make the size of the neck. This stopper has arms of iron and revolves. And in a few motions your milk bottle is complete.

The "Gaffer" Who Shapes the Neck of the Bottle



View Showing "Marvering Stones" and Moulds Arranged Around the Gathering Tank

Brick Ovens, Seventy to Ninety Feet Long, Where the Finished Bottles Are Cooled Gradually

The Finishing Touches.

Ready for the market? Not quite. Another man, highly paid and skilled in the knowledge of what goes to make glass extremely brittle, or otherwise, has his inning. He takes the bottle, still very hot, and puts it in a brick chamber or oven called a "lear," and here it is cooled gradually. The chamber over which he presides is from seventy to ninety feet long, and his part of the process of bottle making is called annealing. First comes 1,000 degrees of heat for our practically finished product, and then it is pushed along down through this chamber and into a passage way. With each move the temperature reached is lower, and for twelve hours the bottle is thus moved along through the gradually cooling passage until at the end it is ready for delivery.

"Did you notice the boy who weighed the bottles?" asked the superintendent. "Well, it may add to the interest you are taking in the making of bottles to know that the weight must not vary more than an ounce in seventeen. It rarely ever does. So you can see another angle of the skill of the gatherer in taking his material from the molten mass.

"For the making of bottles," the superintendent added, "it is not necessary as a rule to have the highest grade of glass. For instance, if we wished to get a bottle glass of a sea green tint we would use a different blend of sand and alkali and limestone from that used in our milk bottles, but if we wished a flint glass bottle we would use just about the same substances, but would choose them more carefully and then use antimony to bleach the mixture. Bottle glass runs through many shades, from pure white to deep black. If amber is wanted we add a few ounces of black lead to a hundred pounds of sand. If we want blue we throw in some peroxide of cobalt.

"Long ago the substances we mix with the sand were prepared by grinding in our own factories, but nowadays we get them from men who make a specialty of preparing them for the glass workers."

And as the man who knows how to make bottles concluded he returned to his task of overseeing the men mixing the "batch," the gatherers loading their pipes, the blowers deftly starting their bubbles, the boys hurrying hither and thither and the various and interlocking devices that work together carefully and smoothly for the production of an article which is so common and so well known that it scarcely seems worthy of even a passing thought—the milk bottle of commerce.

ANTS' NESTS UNDER GLASS.

A NOVELTY in London is the "Lubbock formicarium," a portable ants' nest filled with the living insects. The nest is enclosed in a frame ten inches square, shaped like a picture frame. When it is desired to observe the ants engaged in their occupations the opaque cover of the frame is removed and a glass one is substituted. Besides ants other small insects naturally associated with them are enclosed in the nest. Each nest is supplied with a queen ant, or without, as may be desired, and complete directions are given for managing the nest, which, it is said, may be kept in good condition for several years. These formicariums not only afford pleasure to children, but offer opportunities for scientific study.