

Dick Greene

Story
OF THE
Owens-Illinois Glass Company
FOR USE
IN
Junior High Schools

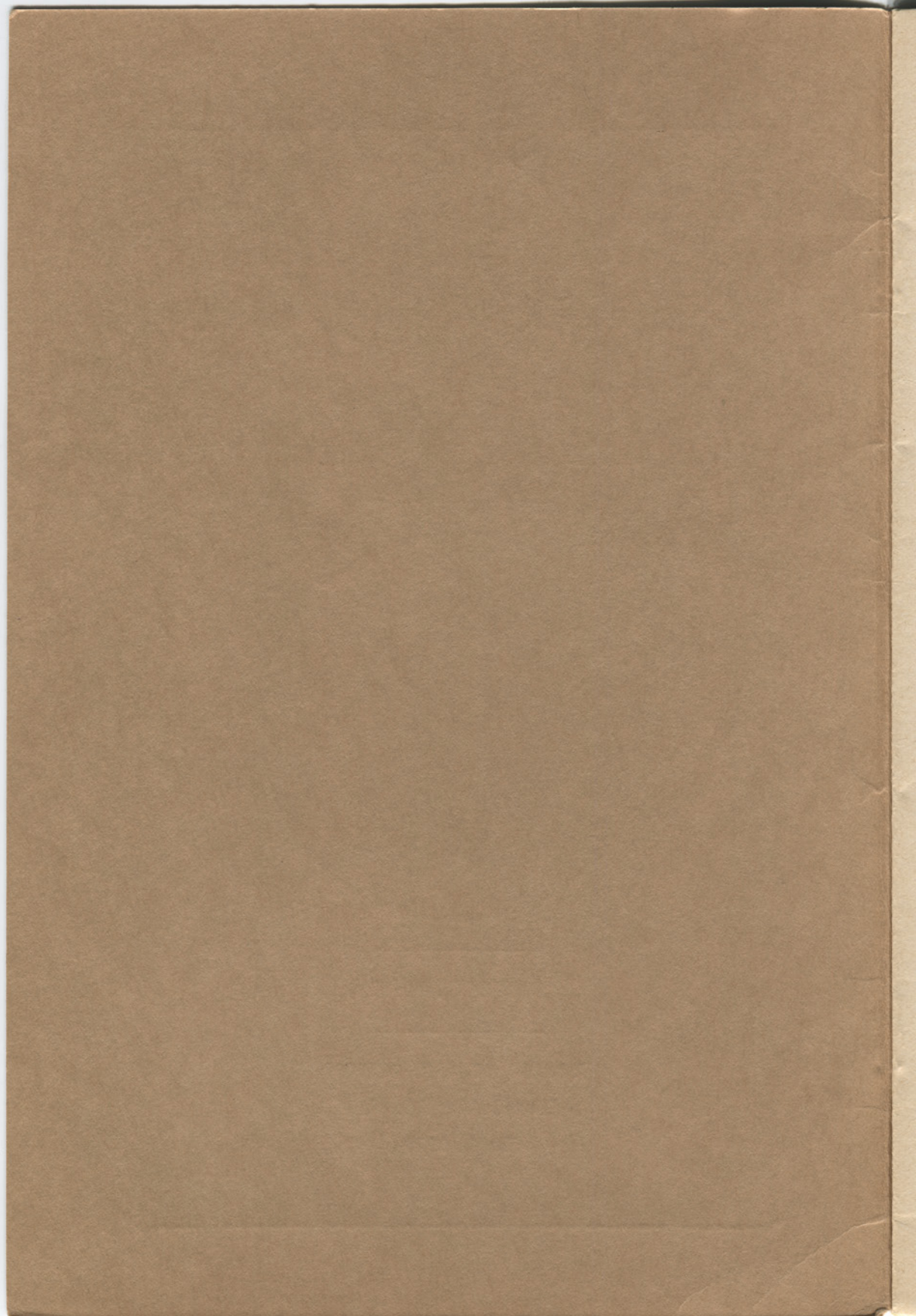


MONOGRAPH G

BOARD OF EDUCATION

Muncie City Schools

Sept., 1939



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— P R E F A C E —

A major function of the modern school is to interpret to the child life of his home community. It, therefore, becomes the business of the school to collect, to organize and to present the necessary facts to develop in the child a clear understanding and appreciation of the life of his native city. The problems of modern life are so many and so great that children cannot learn all that should be known of their immediate environment from direct experiencing.

The teacher who attempts to interpret the community to his classes soon discovers the distressing dearth of materials and descriptions from which a child can easily obtain an accurate picture of the life and activities surrounding him. He finds that, as in the days of Egyptian slavery, he must "gather his own straw" if he is to lay the groundwork for community understanding.

Early in the school year 1936-37 a plan was made to develop a series of pamphlets or monographs on various phases of local life through which the community can be accurately interpreted to the children in the schools. Committees were appointed to begin at once the preparation of these pamphlets

The magic and mystery of glass is shrouded in the myths of the past. Glass was known before the emergence of recorded history. Precious ornaments and valued trinkets made from glass are often found in the tombs of ancient peoples. As an industry it is closely associated with the manufacturing of earthen wares. Growth of the glass industry parallels closely the industrial application of fire and the development, direction and control of the higher temperatures. During the past quarter century newer methods of manufacturing and new uses for glass have stimulated phenomenal growth within the industry. The relation between the improvement of lighting and the development of glass has been intimate. Glass has made possible the victory of light over darkness.

This monograph, the seventh in the series on local life, tells the story of the Owens-Illinois Glass Company, one of the major industries of Muncie. Members of the committee, Benjamin Stout, chairman; Harry Kemmer and Errol Myers are to be highly complimented for their careful work. They were given valuable assistance by officers and employees of the Owens-Illinois Company. Mr. T. B. Calvert, Director of Budgets and Research contributed generously of his time and talent in editing the copy and preparing the final draft.

This monograph will be used in the Junior High Schools.

H. B. ALLMAN,
Superintendent of Schools.

DISCOVERY AND HISTORY



No one knows for sure just who it was that first discovered how to make glass. Certainly it was a long time ago, probably a great many years before the birth of Christ. It may have came about in the following way: Perhaps a group of savages once sat on the seashore (See Picture 1). They kindled a fire of driftwood to keep them warm. The sand at this place had perchance been mixed in the right proportion with a fusing ash and the fire melted grains of the mixture, making a hard, brittle, transparent¹ substance which the savages liked because it was shining and clear.

Whether it was discovered in this way or not, surely the first glass makers had little idea of the importance of their discovery. The first traces of glass have been found in Egyptian tombs, dating from about 4,000 B. C. Glass beads were buried with the mummies of old Egyptian kings, which tells us that it must have been a very precious and valued material, even in those days, since it apparently was used only by the rulers and rich men.



Picture 1. Discovery of Glass.

After so long a time, early man found whenever a certain kind of sand was heated enough it always melted into a thick glue-like mass which could be molded into many different shapes, and which became hard, brittle and transparent when it cooled.

¹ transparent—something through which one can see.

He learned to spread it into thin sheets to make panes for his windows. Finally, he learned that by inserting the end of a pipe of some kind into the molten glass and blowing through it, the glass on the other end of the pipe, instead of letting the air through, simply expanded like a balloon shape. When this bubble cooled and hardened, it became the first bottle ever made of glass. This discovery opened an entirely new field to glass workers who soon learned how to control the size and shape of the bottles. Can you explain how this was done?

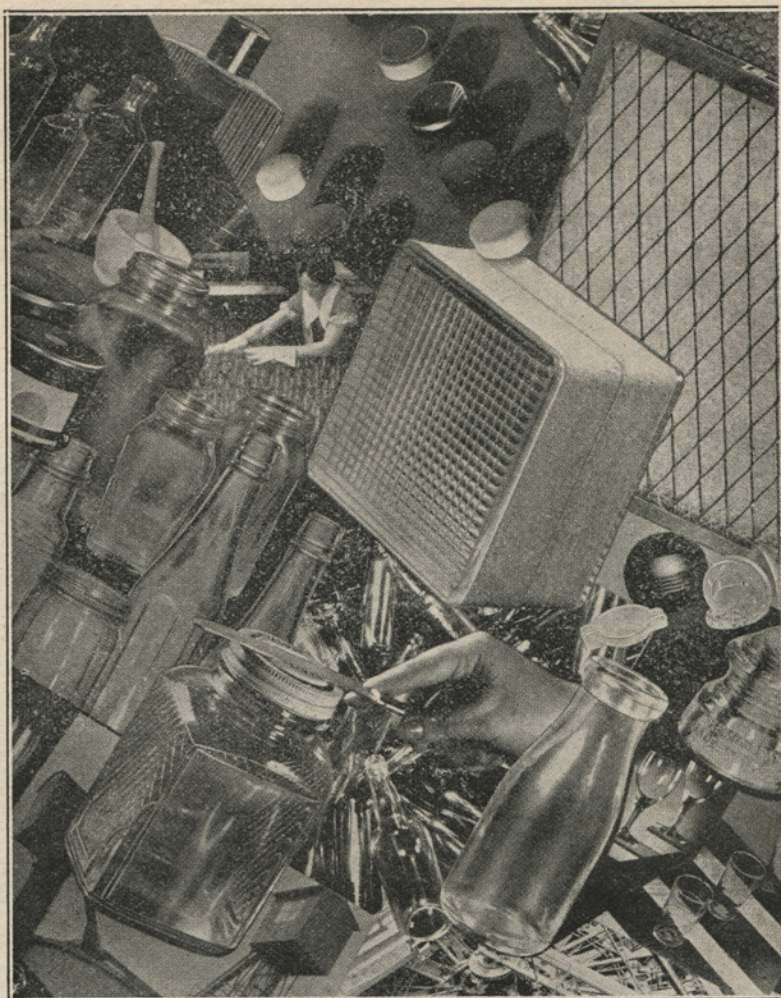
Glass has become one of the most necessary materials used by modern man but, with all the uses which he has found for it, we wonder if we have much more than begun to realize its great possibilities. When we stop to think about it, glass has a far more important place in our daily lives even now, than most people know. If it was not for glass, you would probably have a great deal of difficulty in reading this page from where you now sit, for, if you are reading by the light of the sun, it very probably comes through a window pane made of glass. If you are using electric lights, the light falls on this paper only after passing through at least one layer of glass, and very likely two. If you have defective vision and need help to see to read, your eyes are probably behind glass, and almost everything you see is seen through a thin layer of this substance which was first discovered such a long time ago, but which is still amazing us with its usefulness and adaptability².

Some of the other more common uses to which glass has been put are: Car windows, traffic lights, mirrors, kitchen utensils, dining ware, telescope and microscope lenses, and bottles. Find others in Picture 2. Many advantages can be named which we would not have if we did not have a substance like glass which will allow light to come through, but which will keep air, rain, and dust from entering.

As glass came to be used more and more, people realized its tremendous possibilities. In later years companies were formed by men interested, first, in making the glass products which people used (See Picture 2), and second, in making tests and experiments in laboratories in order to discover new ideas for using glass, and new methods of producing the things which people had already accepted.

Two of these early companies in the United States were the Owens Bottle Company and the Illinois Glass Company. The former

² adaptability—can be used in many different ways.



Picture 2. Some Modern Uses of Glass.

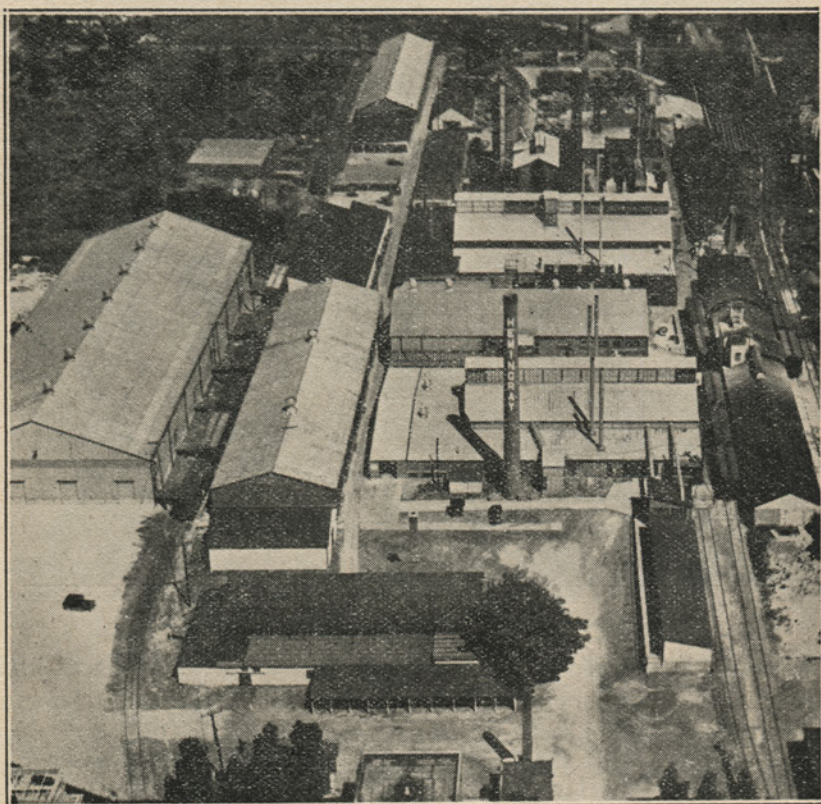
was mostly interested in the making of glass bottles. It was built around the invention, in 1903, of the first automatic blowing machine for making bottles. The latter, a much older company, was formed to supply the various forms of glass known at that time and to try to discover new services to which glass could be put. The two companies merged in 1929, and the new business concern was called the Owens-Illinois Glass Company.

THE OWENS-ILLINOIS COMPANY IN MUNCIE

We are most concerned, of course, with the branch of the company which is located in Muncie. To understand its history, we must go back and find out about still another glass company.

The Hemingray Glass Company was organized in Cincinnati,

Ohio, in the year 1848. It moved to a new location across the river at Covington, Kentucky, within a few years. In 1888, this company moved to Muncie. Two reasons determined the selection of Muncie for the site of the new factory: One was because of the Ohio River, which flooded the factory site in Cincinnati nearly every spring, and the other was the abundant supply of natural gas in this section at that time which could be used for fuel to furnish heat for producing the glass. It is said that at this time enough gas could be bought to run a glass smelting furnace for a year for about six hundred dollars. This supply has long since been exhausted.

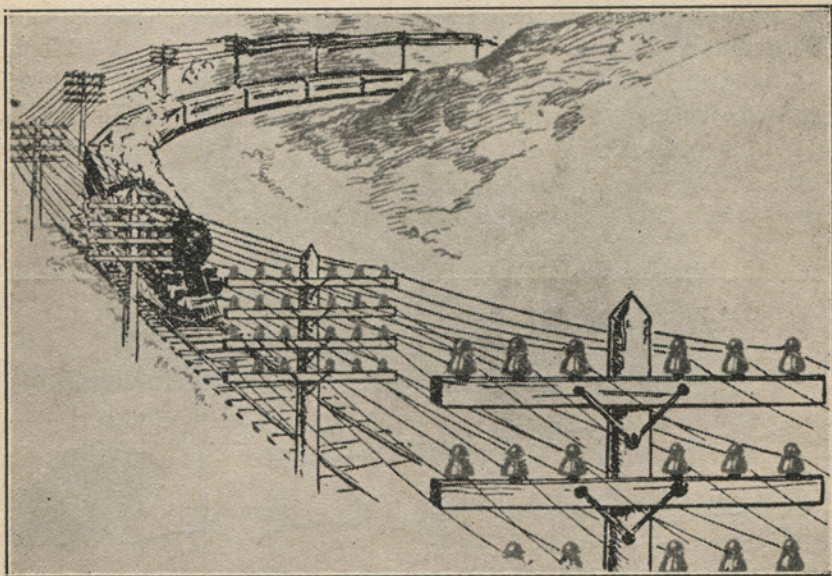


Picture 3. Aerial View of Owens-Illinois Plant
Looking Eastward.

The plant was located on Macedonia Avenue between Ninth and Tenth Streets. It has operated there for about 50 years, being known as one of the most steady industries in the city (See Picture 3). It manufactured a varied line of glass products, in-

cluding both blown³ and pressed glass products⁴. Among the earliest of its pressed products were glass insulators, designed and made to suit the needs of telegraph companies then just being organized. The manufacture of this article was steadily increased with the growth of the telegraph and telephone and, later, the electric light lines, until about the year 1900, when the size of the business of making insulators had increased to the point where the company decided to specialize in this product and stop making other glass articles. This company has always led the field in the making of this product. If the glass knobs to which electric, telephone, and telegraph wires are fastened, as they are stretched from pole to pole along country roads and railroads were examined, very probably it would be found that a great majority of them were made in Muncie by the Hemingray Company. In 1925, the manufacture of bottles was begun again at this plant and was unusually successful.

But what does this have to do with the Owens-Illinois Glass Company? Simply this: In 1933, during the depression, the Hemingray Company was purchased by the Owens-Illinois Company



**Picture 4. Insulators Carrying Wires
Through Rural Areas.**

³ blown-products—those made by collecting molten glass on the end of a blow pipe and formed by forcing air into it and making it take the shape of a mold by the air pressure from within.

⁴ pressed products—those made by pressing the molten glass into the desired shape with a plunger.

and operation and control of the plant was taken over. That is why the tall smoke stack still bears the name "Hemingray" though it is now owned by the Owens-Illinois Glass Company (See Picture 3).

Under the new management, it was decided to stop production of bottles and to specialize again on the making of glass insulators, since the spread of electricity through rural sections of the country was making a steady demand for this product (See Picture 4).

MATERIALS FOR MAKING GLASS

Molten glass itself comes from materials which are found in rather widely separated places in the United States. The basic material of all glass is quartz sand which, in the case of the Owens-Illinois Company, comes from an outcropping near Ottawa, Illinois. To melt this sand at a lower temperature, various "fluxing" materials are used in combination with it, including soda ash from Detroit and borax from California deserts. Materials called "stabilizers" are also used to help protect the products which are used out of doors from the attack of weather conditions (See Diagram 1). The materials in Diagram 1 do not represent proportional amounts. These materials are lime, containing magnesium, from Ohio and feldspar from Colorado. Borax, besides acting as a fluxing material also adds luster and comes under the heading of a stabilizer. Glass in the natural state is of a light green color. To make it entirely clear, a "Decolorizer" is added. If a color such as red, green or blue is wanted, that color must be added. These materials are mixed

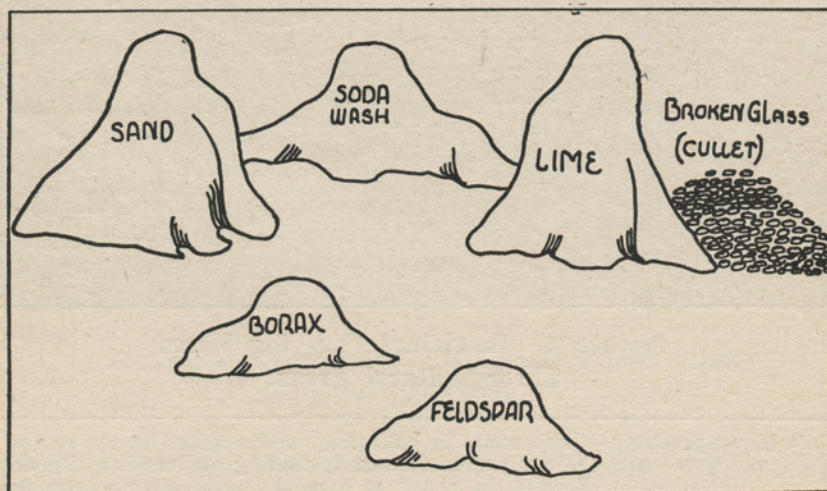
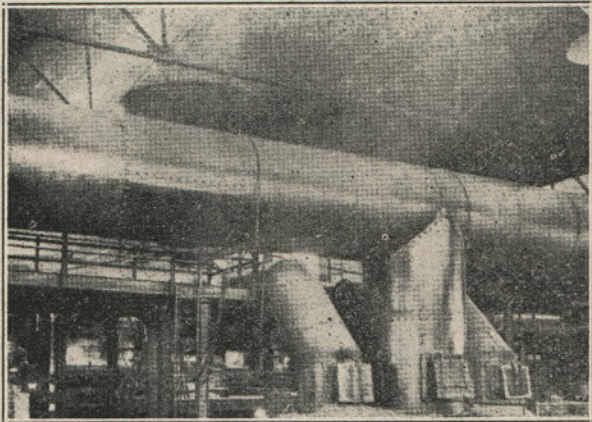


Diagram 1. Materials Used in Making Glass.

together in the right amounts, based on many experiments, and fed slowly into the furnaces by a machine.

Even with the fluxing materials, however, this mixture must be heated to an enormously hot temperature (About 2,700 degrees) to melt the sand so that molten glass is the result. This is done by applying heat from the natural gas flame to the dry mixture inside huge clay block furnaces for a long period of time.

The natural gas used now comes by a long line of pipes from oil fields in Texas and Oklahoma and it costs at the rate of about six thousand dollars per month to keep a furnace operating (See picture 5). One of the furnaces uses about six hundred thousand cubic feet of gas a day, and the tremendous heat produced by the burning of this much gas burns a furnace out in about twelve months. It must then be rebuilt of special fire clay blocks. After a new furnace is completed, heat is gradually applied for about twenty-one days so as to allow for gradual expansion and to prevent cracking of the furnace before any glass is drawn from it.



**Picture 5. Gas Lines Entering the
Owens-Illinois Factory**

None of the materials used in glass manufacture are especially expensive, the transportation of most of them being nearly as large a cost as the materials themselves. A large proportion of the expense, then, is in transportation of both the raw materials and the finished product, the fuel and machinery used in their manufacture, rebuilding the furnaces, and the labor involved.

MAKING GLASS INSULATORS

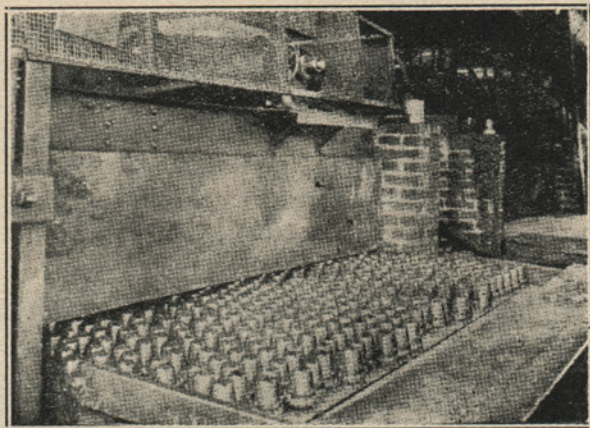
Over thirty different types of insulators are manufactured by the Owens-Illinois Company under the trade name of Hemin-

gray Glass Insulators. In general they are divided into two classes: Those used in communication, such as on telegraph and telephone lines, and those used for the transmission of electricity.

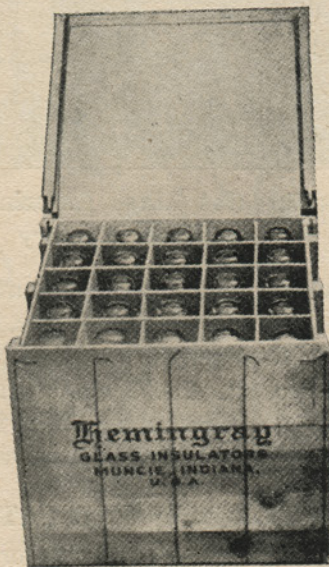
In making the insulators, the molten glass comes from the furnace at white hot heat and is run into molds located on a revolving machine. The mold not only



Picture 6.
Glass Insulator



**Picture 7. Insulators Coming from
Annealing Ovens.**



Picture 8. Boxed Ready for Shipment.

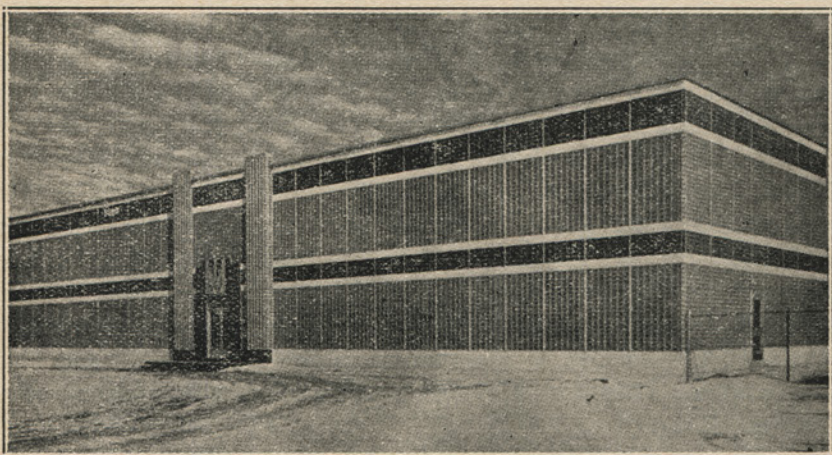
shapes the outside of the insulator, but also contains a threaded pin which shapes the hollow inside part of the insulator so that it will screw on to the pin on the telephone or power line pole.

When the glass is hardened enough to hold its shape, it is removed from the outside mold. The threaded core must then be removed by screwing it out carefully so as not to damage the threads.

The insulators are then put on a moving belt (See Picture 7) which slowly takes them through annealing ovens of progressively cooler temperature until, after several hours, they can be handled by workers who put them into cartons (See Picture 8) or store them for future shipment. Needless to say, a rigid inspection of each insulator takes place, after cooling is completed, to see that no cracks or other defects are present.

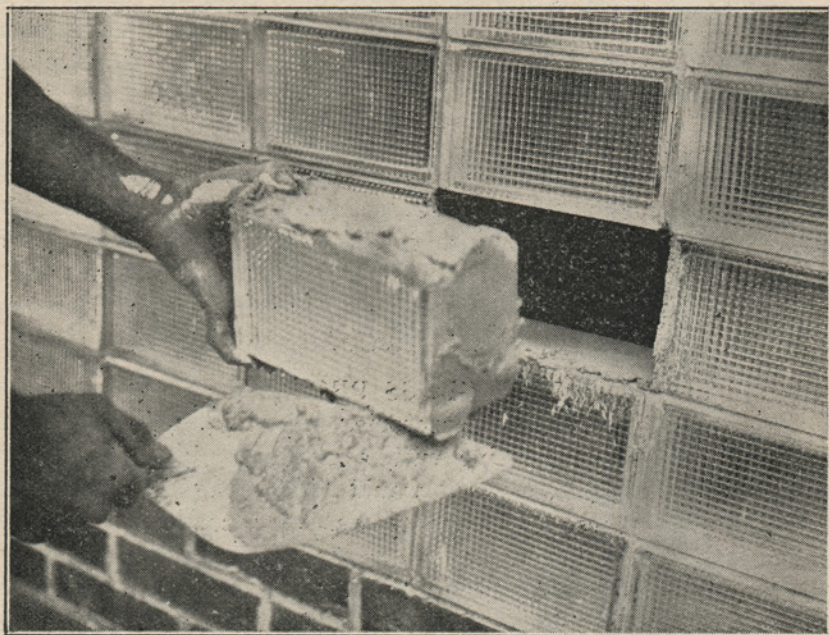
A NEW GLASS PRODUCT

For several years, the laboratories of the Owens-Illinois Company had been experimenting with a glass building brick, which would permit light to enter but would resist heat, cold, wind, and rain. In 1935, these experiments were far enough along that production for building purposes was started in the Muncie plant. This product was patented under the trade name of Insulux Glass Building Block, and the first was produced in April, 1935. The demand for this product has been so widespread that inside of three years it was shipped into every state in the union and into several foreign countries. The number sold increased very rapidly. The company has recently greatly improved and enlarged the part of the factory which is engaged in the making of this building



Picture 9. The First All-Insulux Building. The Owens-Illinois Research Laboratory, Toledo, Ohio.

material. It is now (1939) very much interested in the development of this product and feels that it has great possibilities as a building material (See Pictures 9 and 10).



Picture 10. Replacing a Glass Brick.

HOW INSULUX BUILDING BLOCKS ARE MADE

Insulux Blocks are made by the "pressing method" as opposed to the "blowing method" of glassware manufacture. By this method they can be made more uniform and with less defects.

A small mass of hot molten glass of the right amount for one-half of a block is dropped by a "feeding" machine directly from the melting furnace (Diagram II-2) into the waiting mold (Diagram II-3). A metal plunger, the outer surfaces of which are the size of the inside of the block-half, is forced into the molten mass and allowed to remain there an instant. The cooling effect of the metal mold and plunger is enough to cause the block-half to harden sufficiently to keep its shape when the plunger is removed. At this point, having been further cooled by blasts of air, it has become hard enough, although still at a temperature of over 1,000 degrees Fahrenheit, to be removed from the mold and transported by a conveyor (Diagram II-4) to a tank filled with molten metal (Diagram II-5).

It is here that one of the most outstanding and important processes takes place. The metal is a peculiar alloy^s which will fuse

^s alloy—a compound made up of two or more different metals.

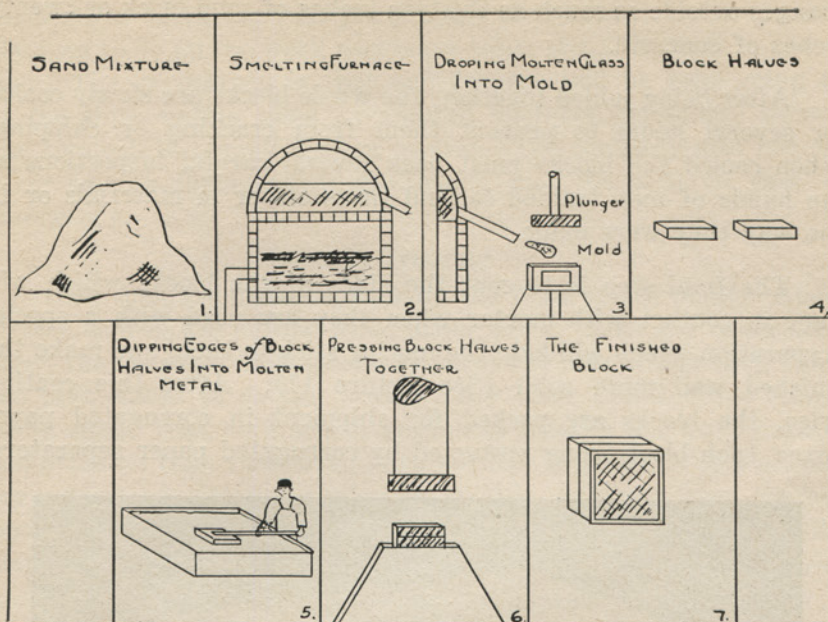


Diagram II. Process of Making Insulux Blocks.

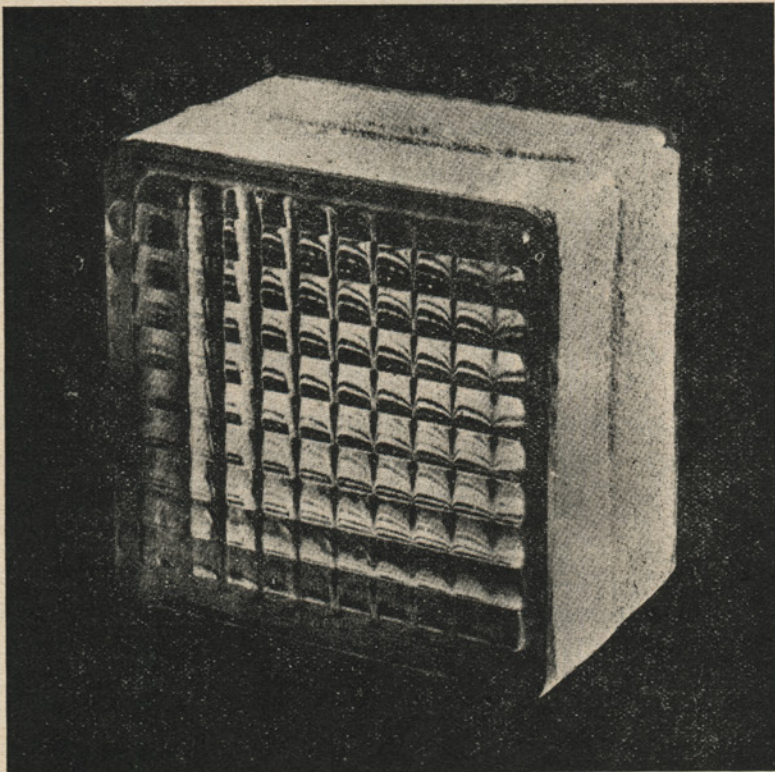
with glass, without cracking, in an airtight seal. The block halves are placed for a few seconds with their open edges in the hot metal to a depth of about one-fourth inch. This metal is quite a bit hotter than the glass, and a chemical union takes place between the glass block edges and the melted metal.

At the proper time, the blocks are taken from the bath in pairs, quickly placed together, edge to edge, the films of molten metal on the two halves unite, and as they are pressed together by another plunger (Diagram II-6), the metal cools and hardens to form an airtight seal. The result is a hollow glass brick with the air inside having only about one-third of the air pressure of the atmosphere when the block cools (Diagram II-7). This is because the air is expanded with the terrific heat when it is imprisoned and after it cools, an approximate $\frac{2}{3}$ vacuum is the result. This is important because it is a well known fact that a vacuum does not permit changes of temperature nearly as rapidly as does the atmosphere. Therefore, Insulux Glass Blocks are more valuable for building, because they make a building warmer in winter, and cooler in summer. They do not allow the outside weather to affect the inside temperature as much as some other building materials. The company states that tests have shown that glass blocks four inches thick made in this way protect a building from temperature

changes outside as much as thirteen inches of solid brick or twenty inches of concrete.

After being joined together, the whole blocks are slowly cooled for several hours to prevent them from cracking or chipping. When cooled the blocks must pass several careful inspections at the hands of men trained to find flaws either in materials or in the way they were made.

The final step is to coat the sides of the blocks which will come in contact with mortar when they are used with a special preparation which will help the mortar stick to them and make the finished wall more solid (See picture 11). After this coating dries, the blocks are packed for shipment in corrugated paper boxes, each block being protected by corrugated paper separators.



Picture 11. One Style of Insulux Glass Block.

EMPLOYEES

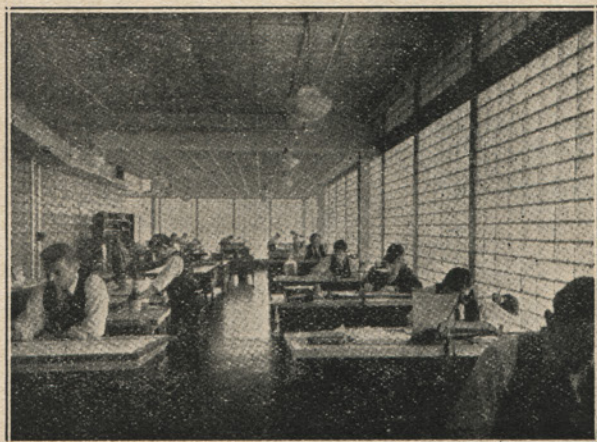
1. Number

The Muncie plant of the Owens-Illinois Glass Company employs from 400 to 750 persons, depending upon the number of

furnaces in operation. At the present time (1939) it takes about 400 men to do all the work necessary when one furnace is in operation. The expectancy is that one furnace will be kept going all of the time, unless some unexpected business depression occurs, and two will be operated when needed. The company also has another smaller furnace available which may be used in case of emergency.

2. Training

Only men are hired to work on the floor of the plant. About fifteen women are needed to do office work. Like any other company, the Owens-Illinois Company hires the men whom they think are best suited to do the work. They have found, other things being equal, that high school graduates usually are more capable and efficient than those who have not had the benefit of a secondary education. Many employees of this company have worked for years in the factory. Many of their fathers worked in the plant before them, when glass manufacturing was largely skilled hand work.



Picture 12. Built of Insulux Blocks.

3. Safety and Recreation

The Owens-Illinois Glass Company has a well organized program of safety and recreation under a trained personnel director and a trained nurse. Some of the other advantages given to employees are: Shower room equipment and locker room space, commissary or store inside the plant where tobacco, candy, food, and soft drinks may be bought; and an interplant recreational and athletic program which includes bowling basketball, and baseball in season. The latter is encouraged and sponsored by the company, and is under the direction of a physical education director. The company

has provided recreational rooms for employees, where the entire second floor of a new building is given over to providing a place for billiards, parties, a library, and a first aid room.

4. Wages and Hours

The Company has always had the reputation of paying its employees as high wages in all brackets of the industry as any glass manufacturing plant. Wages are variable with general business and the type of work done. Hours run from 36 to 40 per week, depending upon the job.

Visitors

The company has not encouraged field trips by large groups of school children in the lower grades. They welcome college people and older children who are genuinely interested in the work **and in the processes by which their products are made.**

It is the hope of the Company, as well as the committee which helped prepare it, that this monograph will prepare visitors for a more worthwhile trip through the plant, and that it will explain some things which will help make the story of glass manufacturing seem as interesting as it really is.

Note to Teachers

Any class studying this unit may get samples of the different products manufactured by the Owens-Illinois Company by contacting plant authorities.

