Frank O'Neill and the O'Neill Glass Machines

Bill Lockhart

A very unusual base scar, made by a heretofore unknown glass machine led to the my interest in Frank O'Neill and his numerous inventions. Over a span of 40 years, O'Neill invented and patented 31 machines, glass feeders, or other glass-related devices. His press-and-blow machines were used in Canada as early as the Turn of the 20th century to make jars and wide-mouth bottles, and his narrow-mouth machines became some of the most sought after soda bottle producers in the 1920s. By the time O'Neill sold his firm to the Owens-Illinois Glass Co. in 1933, his name was recognized throughout the glass industry.

Early Life

Frank O'Neill was born ca. 1864 at St. Clairsville, Ohio. He apprenticed at a machine shop in Martin's Ferry, Ohio, for nine years, then moved to Findlay in 1886 to work in "a machine shop which made molds for the manufacture of glass articles." He moved to a shop at Fostoria and began inventing "automatic machinery for making glass products" (*Toledo Blade* 12/1/1954). The newspaper may have meant the mold shop owned by Christian Arduser at Cicero, Indiana, where O'Neill worked during his initial inventive period (Paquette 2002:395).

Meigh (1960:15), however, noted that "at the age of fifteen in the year 1877 he was apprenticed to learn mould making at the Buckeye Glass Works, Ohio. When out of his time he worked as a journeyman mould-maker in some half-dozen glassworks." We have been unable to verify either claim. Meigh also noted that O'Neill built a power-driven press in 1893, although we have found no patent that early.

O'Neill's First Patents

While living at Cicero, Frank O'Neill applied for his initial patent on October 5, 1897, but the patent was divided, and a new application was filed on March 22, 1898. He received Patent No. 605,648 for a "Machine for Manufacturing Glassware" on June 14, 1898. The invention was "an improved, rapidly-working machine for the manufacture of tumblers, jelly-

glasses, and other glass articles adapted to be formed by pressing." According to a court transcript (Reasoner 1913:578), O'Neill transferred a one-quarter interest in this invention to Christian Arduser, his employer at the mold shop on July 15, 1898.

Although the patent document is unclear on the subject, O'Neill applied for another patent (probably the other section of the division reported above) on January 21, 1898. He received Patent No. 616,251 also for a "Machine for Manufacturing Glassware" on December 20, 1898. The patent document noted that O'Neill assigned one-quarter of the rights to Christian Arduser. The patent had "particular reference to certain improvements in the construction and relative arrangement of the plungers, the actuating means, and the mold carrier." In other words, this, too was a pressing machine.

An Interesting Sleight of Hand

At this point, there is an interesting discrepancy between the 1913 court transcript and the patent records. According to the courts (Reasoner 1913:578), Arducer and O'Neill transferred their interests in the initial patents to Safe Glass Co. on December 22, 1898. Then, on March 15, 1899, the Safe Glass Co. "transferred one fourth interest to Arducer and a three fourths interest to . . . Marion O Neill," the wife of Frank O'Neill. At this point, I can only speculate that the Safe Glass Co. purchased an option on the machine in December then withdrew from the agreement in March.

In contradiction, O'Neill applied for a new patent for the identical machine described in his first patent on October 5, 1897 and received Patent No. 643,253 on February 13, 1900. The rights were transferred "by mesne assignments, to Christian Arduser . . . and Marion O'Neill."[1] This suggests that the assignment of the patent was intended to eventually reside with someone else. Ironically, that final assignee was probably the Safe Glass Co. However, the patent process took so long that Arducer and Marion O'Neill were once again the correct owners of the patent.

[1] According to Wikipedia, "In property law, a mesne assignment is an intermediate assignment in a series of assignments which occurs prior to the final assignment.

By at least September 29, 1899, O'Neill was living at Wallaceburg, Ontario, Canada, when he applied for another patent for another "Machine for Manufacturing Glass Articles." On July 10, 1900, O'Neill received Patent No. 653,523. This machine was "for manufacturing glass articles as are partially formed by pressing and completed by blowing." The drawings showed jars with continuous-thread finishes.

The Canadian Connection

Soon after the receipt of the U.S. patent, O'Neill applied for a Canadian patent on July 31, 1900 and received Patent No. 73,425 on April 19, 1901. This was "an improvement in machines for manufacturing glassware to provide an improved mechanism for measuring and delivering molten glass to the moulds" (King 1987:96).

Although the exact relationship is currently unknown to me, O'Neill was involved in some way with the Ontario Glass Co. (located at Kingsville). The plant made wide-mouth jars and fruit jars – almost certainly on O'Neill's machine (King 1987:96). The *Glass Chatter* (2009:2) cited Dick Roller as saying that the newly designed Frank O'Neill machines had been installed in the Kingsville plant in the spring of 1901. By September 28, 1901, it was reported that D.A. Gordon, of Sydenham Glass Co., had dismantled the Kingsville plant and taken the tools and machinery to Wallaceburg, Ontario. I have discovered no machine-shop connection, so the machine may have been built at the glass factory. The plant ceased production on August 6, 1901 (King 1987:96).

O'Neill was living at Kingsville when he applied for another patent on April 15, 1901. On December 31 of that year, he received Patent No. 690,119 for a "Machine for Manufacturing Glass Ware," although the patent was really for a neck-ring mold. O'Neill explained the need for an improvement: "When a plunger is forced through a neck-mold, and while sections thereof may be so firmly held as to yield thereto and separate only very sightly, yet the least separation produces a fin or seam on the threaded neck, which is objectionable." The new invention clamped together the sections of the neck mold to "hold them against even the slightest separation during the pressing operation." Although not mentioned in the patent document, this machine could press 27 glass jar lids per minute (Paquette 2002:368).

Wallaceburg and David A. Gordon

Although I have not discovered the exact sequence of events, O'Neill was living at Wallaceburg in late 1899, and he had moved to Kingsville no later than 1901. How long he remained in Canada is a mystery, but he became financially (and apparently cordially) involved with David A. Gordon at some point. Gordon was a managing director of the Sydenham Glass Co., Wallaceburg, Ontario, when Sydenham purchased the Ontario Glass Co., so the connection may have occurred at that point (King 1987:97-98).

Gordon was certainly involved by January 13, 1902, when he acquired the one-fourth interest of Arducer in the early patents. Later that year (October 13), Marion O'Neill transferred one-half of her interest in the patent to Gordon, who now owned three-quarters of the patent or patents. Frank O'Neill applied for yet another patent on August 3, 1903, although he had moved to Detroit, Michigan, by that time. However, he did not receive Patent No. 767,310 for a "Glass-Pressing Mechanism" until August 9, 1904, just over a year later. O'Neill assigned half the patent rights to David Gordon.

Meanwhile, Gordon and the O'Neills had sold their rights for the first three patents to the Ball Bros. of Muncie, Indiana, for $12,000 on June 25, 1903. On the same day, the Ball Bros. gave back a license to the O'Neills and Gordon to all of the United States, reserving to themselves the State of Indiana (Reasoner 1913:578-579). Of course, O'Neill was not finished inventing. On October 21, 1904, he applied for a patent for a "Glass-Finishing Apparatus. He received Patent No. 805,876 over a year later, on November 28, 1905. This patent was directed at the "finishing of tumblers and other glass articles, and has particular reference to glass apparatus which may be used for fire-finishing alone or for fire-finishing and reshaping."

A New Direction and a Break

Still at Detroit, O'Neill turned his hand in a new direction – small-mouth bottles. He applied for a patent for a "Bottle-Finishing Machine" on July 13, 1905, and received Patent No. 805,877 on November 28, 1905. Most of the parts of the apparatus were the same as O'Neill's tumbler-finishing device, but it was specifically adapted for narrow-mouth bottles. An important objective of the invention was "to provide bottle-neck-finishing devices of improved

construction and to provide for moving a series of such devices into operative position successively, thus presenting a fresh device for each finishing operation." Because this finishing was to occur on bottles blown by mouth into two-piece molds, it included an "improved snap or holder for sustaining bottles while being finished."

Although I have not discovered any trace of Frank O'Neill for almost three years, the Ball Bros. approached him in the spring of 1908, wanting to purchase the license that the Balls had conveyed to Gordon and the O'Neills on June 25, 1903. Neither the O'Neills nor Gordon had conducted much (if any) business with the license during the intervening years, and the O'Neills had moved to Zanesville, Ohio, by this time. On March 31, 1908, Frank O'Neill wrote to Gordon at Wallaceburg, asking how much he would take for his share of the license. Gordon replied on April 6 that he would be "pleased to get $2,500" for his interest (Reasoner 1913:579-580).

In his March 31 letter, O'Neill also revealed what had kept him occupied for the last few years. He told Gordon, "I expect to have my new beer bottle machine in working order within the next ten 10 days. Have been able to reduce the cost of building it from $2,500 to $400 and make a much better machine." Gordon accepted the offer for his share of the license, and O'Neill wrote the Ball Bros. on May 1, saying, "I hereby grant you an option for sixty 60 days on license granted by Ball Bros to David A. Gordon, Frank O'Neill, and Marion O'Neill. Purchase price of said license to be $10,000." The Ball Bros. accepted (Reasoner 1913:579-581).

Soda Bottle Machines and the O'Neill Semiautomatic

O'Neill's jubilation over his small-mouth bottle machine was a bit premature. It was not until May 7, 1909, that he submitted his application for a patent for a "Method of and Apparatus for Manufacturing Glass Bottles." After a delay of just over two years, he received Patent No. 994,421 on June 6, 1911. The small-mouth bottle machine was ready. O'Neill assigned the rights for the machine to the O'Neill Bottle Machine Co. of Terre Haute, Indiana.

To place the 1911 O'Neill semiautomatic bottle machine in an overall perspective requires a look at bottle-machine production history. Although some forms of container machines were designed earlier, the first successful semiautomatic machines to make jars and

wide-mouth bottles began production in 1891. By the beginning of the 20th century, such machines were fairly common (Bernas 2012).

The Owens Automatic Bottle Machine, however, was ahead of its time. While other inventors were improving semiautomatic wide-mouth machines, Michael J. Owens patented the first fully automatic machine in 1903 – one that could make either wide-mouth or narrow-mouth containers. Although there was some use of the "Johnny Bull" (Ashley) British machine earlier, the Owens was the first really practical small-mouth bottle device.[2] Various glass houses began designing small-mouth semiautomatic machines by 1905, but the first soda bottles to compete with the one produced on the Owens machines did not enter the business until the 1908-1910 period (Lockhart 2006; Miller & Sullivan 1981; Skrabec 2007).

As Toulouse (1971:445-446) noted, "Beverage bottles were . . . handmade until about 1912. Thus, O'Neill's 1909 invention (patented in 1911 and described below) was one of the earliest semiautomatic machines to produce small-mouth bottles, creating an unusual basemark that left a mystery for later researchers. O'Neill had plenty of competition.[3] By 1912, at least four other semiautomatic machines were making small-mouth bottles, such as the Ashley machine at the Glenshaw Glass Co. (1908), the Olean machine at the Brockway Machine Bottle Co. (ca. 1910), the Graham machine at the Graham Glass Co. (1910 and earlier), and the Red Devil at the Root Glass Co. (by 1912) (Lockhart 2006; Paquette 2002:368-369).

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[2] The Ashley machine, initially patented in 1886, was the first machine capable of making small-mouth bottles. However, there were problems with the system, and it was not in much used in the U.S. until well after 1900 (English 1923). Phillip Arbogast had also patented a machine to make small-mouth bottles in the U.S. in 1881, but it was never practical (Lockhart et al. 2013).

[3] Only the American Bottle Co. had a license from the Owens Machine Bottle Co. to produce soda and beer bottles. Almost all of the bottles made on the Owens machine, however, were sold to Mexican bottlers and breweries until 1916 (Lockhart et al. 2010). Thus, Owens-made bottles were not in competition with the very early machines. In fact, the success of the early O'Neill, Graham, and other machines almost certainly spurred the American Bottle Co. to begin selling bottles made on the Owens machine in 1916.

How Blow-and-Blow Bottle Machines Work

Almost all bottle machines used (and still use) a two-stage manufacturing sequence – regardless of whether the machine is semiautomatic or fully automatic. The initial stage is called the parison or blank stage, and the process begins when the operator (or the machine if it is fully automatic) drops a gob of glass into the parison mold. A puff of air then blows the parison against the sides of the parison mold to form the rough shape of the bottle that is mostly hollow.

The first stage also creates the finish, the very top of the bottle. The top part, including all the area that forms the means for closing the bottle, is called the finish because it was the last part created when a bottle was made by hand. In all machine-made bottles, however, the finish is formed during the first stage.

The parison mold then opens, and the parison is transferred into the final or blow mold. Although a valve or ejection rod is used in the removal of milk bottles and many jar types, a typical soda bottle machine merely continues to hold onto the finish to move the parison to the blow mold. Once seated in the blow mold, a puff or air blows the parison into the final bottle shape. The blow mold then opens, and the operator (or machine) can remove the completed bottle.

A typical bottle machine creates a scar made by the baseplate of the parison mold. This scar is round in shape, but the line is thin and shallow.[4] All of the machine scars are created by the parison stage and move off center during the blow-mold cycle. The parison sags unevenly when it is first placed in the blow mold, so the puff of air reshapes the final bottle, leaving the scar slightly off center.

The Researcher's Mystery

Lockhart (2010, Chapter 7b, Figure 7-23) reported a bottle with atypical basal scars that was used by the Woodlawn Bottling Co. at El Paso, Texas. Lockhart estimated that Woodlawn

[4] Scars made by the Owens machine were typically slightly deeper and "feathered" – i.e., the scars had rough edges, especially on one side.

Figure 1 – Base of Woodlawn bottle

used the bottle during the 1912-1915 period, although he was unable to identify the machine used in the process. Although the Woodlawn bottle exhibited typical machine characteristics otherwise, the base was anything but normal. Off center but still near the middle of the base was a circular scar that was reminiscent of the ejection scars created on milk bottle and fruit jar bases by the valve or ejection rod that pushed the parison out of the parison mold. However, there was a second, wider circular scar, also off center, that appeared to have been created by the same method as the smaller one (Figure 1). Unlike typical machine scars, these are both deep grooves – deep and wide enough to insert a thumbnail and trace it around the scar. The rest of the bottle is typical of early 20th century machine-made containers (Figure 2).

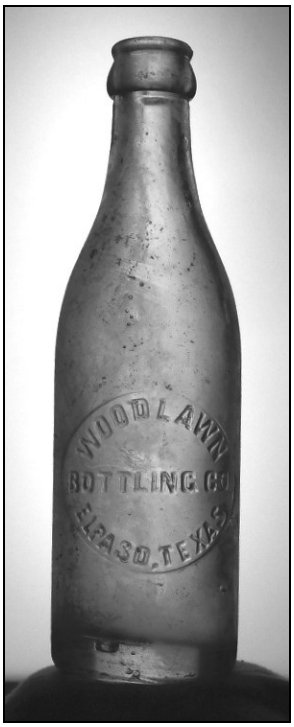


Figure 2 – Woodlawn bottle

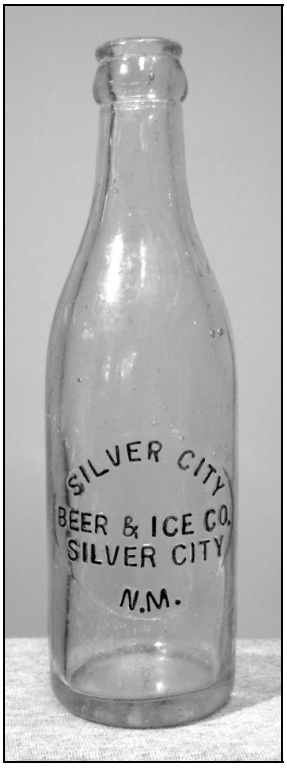


Figure 3 – Silver City bottle

Lockhart and Wood discovered a soda bottle used by the Silver City Beer & Ice Co. of Silver City, New Mexico (Figure 3). The base of the bottle was virtually identical to the Woodlawn bottle (Figure 4). Historically, the bottle again appeared to have been made during the 1910-1914 period. This time, however, the researchers found a matching machine.

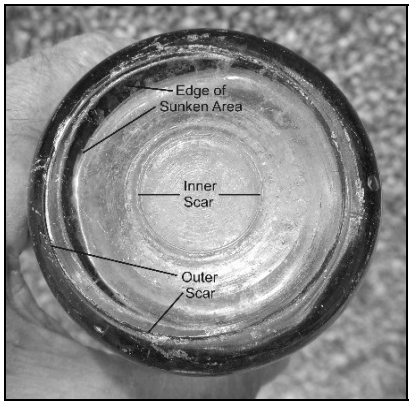


Figure 4 – Base of Silver City bottle

The Process of the O'Neill Machine

The O'Neill semiautomatic machine – made to the 1911 patent – used a fairly typical blow-and-blow arrangement – with one exception. Once the gob of glass was introduced to the parison mold, it was blown into its shape and transferred to the blow mold. The base of the parison hung ca. two-thirds of the way down the mold. O'Neill used a unique extra step to stretch the parison into the desired shape.

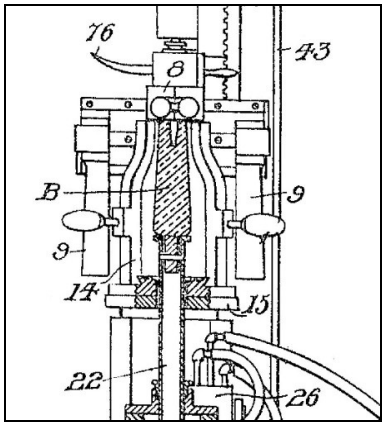


Figure 5 – Hanging parison – O'Neill 1911 patent

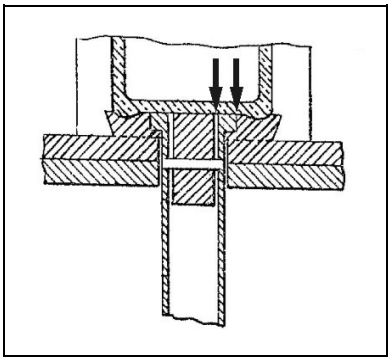


Figure 6 – The plug – O'Neill 1911 patent

Inserted into the base of the blow mold was a hollow tube with a plug in the upper end. The tube was raised up until the plug made contact with the base of the parison (Figure 5). Space around the plug allowed the plug to attach itself to the base of the parison when suction was applied to draw the tube back down into the baseplate of the blow mold, thereby stretching the parison. Since each place where two mold parts touch makes a seam, this plug created two concentric circles in the parison base (Figure 6).

Once the tube had reached the base of the blow mold, the suction was removed, freeing the parison (Figure 7). As noted above, in all two-part machine operations, the parison sags slightly as the blowing begins in the second stage. As the bottle expanded in the O'Neill machine, the parison base was dragged slightly to one side creating the off-center scars. The blowing continued and formed the final shape of the bottle. The final bottle thus had two concentric circles incised into it, slightly off-center and in exactly the pattern found on the El Paso and Silver City bottles. The mystery is solved.

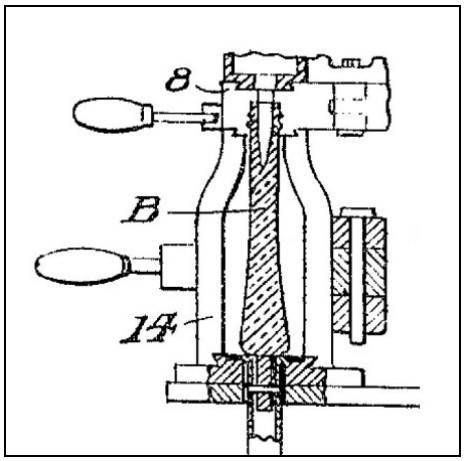


Figure 7 – Finished parison – O'Neill 1911 patent

The O'Neill Machine Factory

I have been unable to find any record of the O'Neill Bottle Machine Co. at Terre Haute – aside from the reference in the patent drawing. According to O'Neill's obituary (*Toledo Blade* 1954), O'Neill opened his first plant on Locust St. at Toledo, Ohio, in 1911 but later moved to 2090 Auburn Ave. At some point, he shifted to a larger plant on Hawthorne St. and developed a strong export market after the close of World War I. All references I have found for the firm use either the name O'Neill Machine Co. or O'Neill Engineering Co. The insertion of the word "bottle" was likely an error made by O'Neill's patent attorney.

The December 9, 1912, issue of *Industrial World* (1912:1501) noted that the O'Neill Machine Co. had recently been incorporated at Toledo in the general machine and foundry business, with a capitalization of $10,000. The principals of the firm were Frank O'Neill, Marion O,Neill, William N. Graham (no apparent relation to the Graham Glass Co. family), Curtis R. Guernsey, and Charles A. Guernsey. Subsequent information (see below) shows that the firm made at least one machine during 1911.

According to Paquette (2002:369), however, "a new 'O'Neill Machine Company' was established in Toledo late in 1915 to manufacture the new automatic." The 1912 firm may have been on Locust St., with this 1915 company at 2090 Auburn Ave.

Chasing the Glass Factory

Although the mystery of the base scar is solved, I am still left with a loose end: Which glass factory made the bottles? Although there is no absolute answer, there are historical hints.

1. The bottles were made using the 1911-patent O'Neill process.
2. Each of our two examples was independently dated to the 1910-1915 period based on historical and empirical data connected with the respective soda bottlers.
3. *Some* historical documentation exists.

Two lines of evidence – that *should* have been helpful – complicated the process. One was a list of firms that ordered O'Neill machines in 1916 (*National Glass Budget* 1916:21).

Those included:

Acme Glass Co., Olean, New York
Diamond Glass Co., Royersford, Pennsylvania
East Stroudsburg Glass Co., East Stroudsburg, Pennsylvania
Glenshaw Glass Co., Glenshaw, Pennsylvania
Imperial Glass Co., Charleroi, Pennsylvania
Maring, Hart & Co., Dunkirk, Indiana
W.H. Newborn & Co., Royersford, Pennsylvania
Salem Glass Co., Salem, New Jersey
Toledo Bottle Co., Toledo, Ohio

Next was a list of glass factories that made "soda water, soft drinks, etc." from the 1912 Thomas Registers (Thomas Publishing Co. 1912:488). Unfortunately (from a research viewpoint), the source listed 46 glass factories that made soda bottles in 1912. Six factories were on both lists (although some of the firms ordering O'Neill machines used them to make other types of bottles), but a search of our records failed to make any strong connection between the 1916 list and the *early* machine.

I searched the Bottle Research Group records for information about each firm on the 1912 list. At the eighth one on the list, I found a possible answer. The North Baltimore Bottle Glass Co. opened at North Baltimore, Ohio, in 1888 and moved to Albany, Indiana, in 1893. The firm built a new plant at Terre Haute, Indiana, in 1900 and remained in business until ca. 1926. Because the main product line was beer bottles, the company was forced out of business by Prohibition – even though it tried to market enough near-beer bottles to survive.

The North Baltimore Bottle Glass Co. installed a single O'Neill semiautomatic machine at the Terre Haute plant in 1911 and initially used it to make pint export beer bottles. The management noted that "the most pleasing feature . . . is the superior quality of the product" (*National Glass Budget* 1911:3). The company used both O'Neill semiautomatic machines and mouth-blown production in 1913 to make "beer and water [i.e., soda]" bottles on three continuous tanks and 107 pots (*Journal of Industrial and Engineering Chemistry* 1913:952). The "107 pots indicates a large hand production unit.

By 1917, however, the plant operated three tanks with "26 one-man O'Neill machines," making "green and amber beers and sodas" (Bristow 1917:13). The plant used an N.B.B.G.Co. logo either on the heel or base of its bottles. The mark was certainly present on a large number of mouth-blown containers, but the Bottle Research Group has not recorded it on machine-made bottles.

Of course, North Baltimore was not the only factory to install the new machines. On May 20, 1911, the *Massillon Evening Independent* reported that the Rhodes Glass & Bottle Co. of Massillon, Ohio, was remodeling to accommodate the installation of six O'Neill machines at a cost between $20,000 and $30,000. Felix R. Shepley, a company representative, said that the new machines would produce between "250 and 270 dozen pint bottles per day," increasing the factory production by 50%. He noted that three men were required to operate each machine (probably two men and one boy in actual practice). The firm expected to install two machines by August 15, with two more to follow in 30-60 days – assuming that the first machines operated successfully. Shepley stated that the demand for beer bottles that season was "greater than it ever had been."

Unfortunately for this research, both glass houses made soda bottles. Although I have not been able to find any other 1911 installations, it is logical that O'Neill sold more machines. However, additional machines may have been used for other bottle types. The term "pint beer bottles" could also indicate these soda bottles from El Paso and Silver City. Both were "pint" sized and both had the company information in a round plate on the front of the bottle. These interchangeable plates could be used on the same "beer" bottle for any type of drink. Even though either North Baltimore or Rhodes could have made the Silver City and El Paso bottles, the North Baltimore Bottle Glass Co. – with its single 1911-patent machine – probably produced the containers during the 1911-1913 period – then installed upgraded machines, probably ca. 1916 (see continued O'Neill history below).

Another Glass Machine

On December 7, 1912, O'Neill applied for another patent for a "Machine for Manufacturing Glassware. However, he did not receive Patent No. 1,147,539 until July 20, 1915 – two years and eight months later (Figure 8). O'Neill noted that the invention was a "machine

for pressing glass articles which may be fully formed by such pressing, or only partially formed thereby and may be completed by blowing or any other shape-imparting manipulation." An important aspect included "mechanisms of novel construction for separating a quota of glass for the gather . . ." (Figure 9). This was O'Neill's initial voyage into what would soon be known as gob feeders – fully automatic devices for feeding glass into the parison molds.

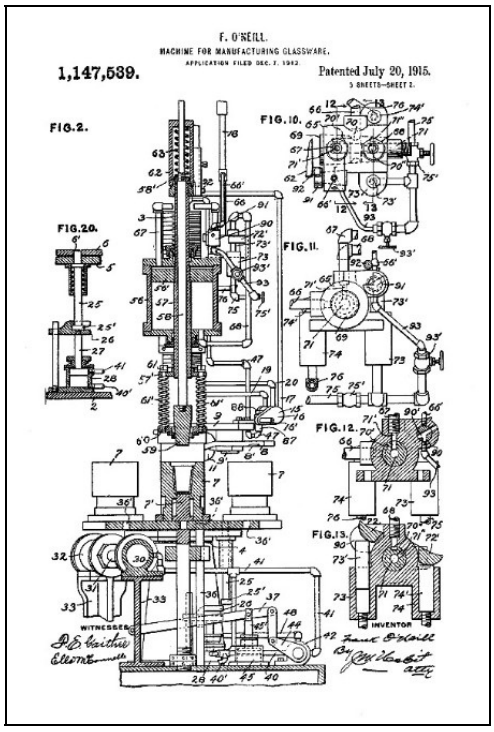


Figure 8 – O'Neill 1915 patent

The O'Neill "One-Boy" Machine and Other Ideas

Of course, not all of O'Neill's inventions were as inspired. He applied for a patent for a "Neck-Mold for Bottle-Blowing Machines" on July 18, 1916, and received Patent No. 1,231,188 on June 26, 1918.

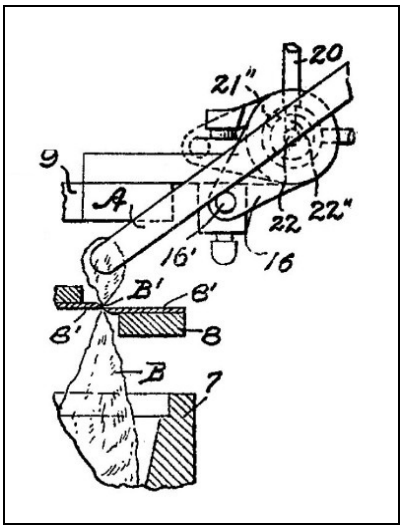


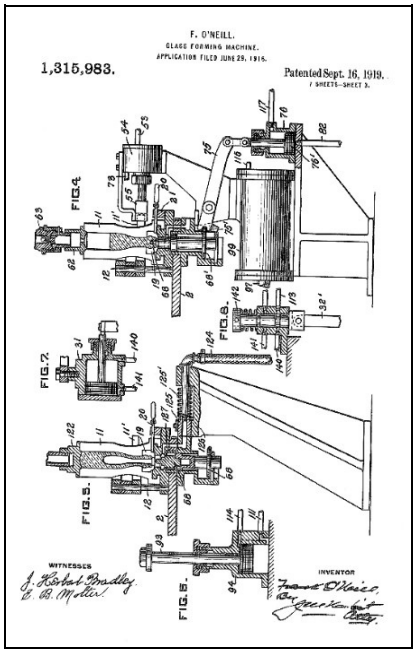
Figure 9 – Gob feeder – O'Neill 1915 patent

Unlike most neck-molds or neck-rings – that often served to form the finish on the parison in the parison-mold stage, support the bottle during the transfer to the blow mold, and continue to hold the bottle during the blowing stage – this one would be permanently anchored to the parison mold. The parison could then be transported *with a set of hand-held tongs* to the blow mold. The idea was certainly ultimately dropped.

Although O'Neill applied for the next patent on June 29, 1916 – three weeks earlier than for the neck-mold described above – he did not receive Patent No. 1,315,983 for a "Glass-Forming Machine" until September 16, 1919 (Figure 10). O'Neill bragged that

> the invention is to so construct and arrange the machine that but two operatives are required, a gatherer to feed the blank molds and start the machine on its cycle

of operations, and a boy to transfer the blanks from the blank to the blow molds and to remove the blown bottles after they have passed from the blowing mechanism.


F. O'NEILL.
GLASS FORMING MACHINE.
APPLICATION FILED JUNE 29, 1916.
1,315,983.
Patented Sept. 16, 1919.
7 SHEETS—SHEET 3.
FIG. 4.
FIG. 3.
FIG. 2.
FIG. 5.
FIG. 6.
WITNESSES
INVENTOR
Figure 10 – O'Neill 1919 patent

The competition was too fierce to wait for the patent; O'Neill probably went into production before he submitted the patent application. This was almost certainly the O'Neill "one-boy" machine that catapulted the firm into serious production. The machine was described on July 1, 1916, as "running double shift and turning machines out at the rate of 12 per month, [but] orders have accumulated at the O'Neill shop which will take some time to fill." The *National Glass Budget* (1916:21) added that

> an improvement has been added to the O'Neill machine which does away with one boy. It has proved a great success, and all machines installed before the improvement was made are being equipped with these attachments. In that boy labor is one of the hardest matters with which glass manufacturers have had to contend latterly, this eliminating of the use boys is a great advantage.

When the U.S. entered World War I in 1918, many resources were limited because of their use by the military. Despite military shortages, O'Neill prospered. At the end of the war, the firm developed a strong export market (Toledo Blade 12/1/1954).

The Toledo Bottle Co.

During the summer of 1916, O'Neill began construction of a glass house to demonstrate the capabilities of his new machine. The Toledo Bottle Co. opened on December 1, with O'Neill as president, W.H. Swetland as vice president and general manager, C.E. Struble as secretary, G.J. Seiss as treasurer, and C.E. Kearns as sales manager. George Arduser – probably the son of O'Neill's former employer – was the mold shop foreman (Paquette 2002:369).

Initially, the plant operated a single continuous tank, serving ten of the new O'Neill machines. U.S. entry into World War I created problems for the factory, and various shortages reduced its profitability. Shortly after the end of the war, O'Neill closed the plant permanently. On October 14, 1920, Donald Pugh announced the reopening of the factory as the Tri-State Glass Co., but that firm may have never actually made glass. The Buckeye Glass Co. began in February 1923, also under Pugh, and was apparently successful.

O'Neill's Glass Feeding Device

Although inventors began experimenting with automatic glass feeders (called gob feeders by the industry) in 1914, it was not until the early 1920s that really effective feeders hit the market (Holscher 1953:300). O'Neill joined the competition on May 14, 1919, when he applied for a patent for a "Glass Feeding Apparatus." Again, he had a long wait – almost six year, this time. O'Neill received Patent No. 1,537,961 on May 19, 1925. Once again, he did not wait for the patent before beginning production.

This was very likely the patent that sparked an article about O'Neill machines in 1921. The *Glass Industry* (1921:178) bragged about the new machine, styled the "No. 30." The device was "about three-quarters the size of the standard 'No. 25' (the older O'Neill machine), with five blank or parison molds. The machine could be used "with any feeder and the makers point out that it has been thoroughly tested out also with hand feeding." With the use of a feeder, the device was "absolutely automatic." It was "intended to for small ware ranging from 1/2 ounce up to 12 ounce capacity, and 8 inches in height under the finish."

The article also provided a cameo description of the factory (*Glass Industry* 1921:178):

> The Company's Toledo plant, where the machines are made, is housed in a modern day-light factory with every convenience possible for its employees. The building is fire-proof, equipped with a sprinkler system, and its employees have access to a lunch room in the building where good, wholesome food is supplied at a moderate cost.

By this time, the plant was selling bottles in the foreign market, including to England, Scotland, France, Switzerland, India, Canada, Mexico, Argentina, Venezuela, Brazil, and Japan (*Glass Industry* 1921:178). Business was so good in Canada that O'Neill opened the O'Neill Machine Co., Ltd., at Montreal (Toledo Blade 12/1/1954). It had to have been a *deja vu* moment.

More Patents

O'Neill continued his inventions, including a "Glass Flow-Off Controller" for tanks (Patent No. 1,413,183) on April 18, 1922 and a "Glass Feeding Apparatus" (Patent No. 1,551,526) to control the flow from the tank on August 25, 1925. On June 24, 1921, O'Neill applied for a patent for a "Plunger Gathering of Glass" (gob feeder) and received Patent No. 1,537,962 on May 19, 1925. O'Neill applied for another patent for a "Glass Feeding Device" (gob feeder) on January 2, 1923, and received Patent No. 1,551,526 on August 25, 1925. Unlike the others, he assigned this patent to the O'Neill Engineering Co.[5]

O'Neill continued to patent gob feeders and improvements on glass machinery throughout the remaining years of the firm (Table 1). The Owens-Illinois Glass Co. purchased the O'Neill Machine Co. in January 1933. There had been a long litigation between the two firms over the use of suction in the early O'Neill machines, and the sale settled the issue. Owens-Illinois now had the patent rights to many of the O'Neill inventions that it had coveted for some time (Paquette 2010:55).

Many of O'Neill's patents remained in limbo for years in the patent office (Table 2). He had applied for three patents in 1926, one in 1928, and one in 1930 that did not make it through the patent system until after he had sold the business in 1933. O'Neill assigned all of those to the Owens-Illinois Glass Co., but inventing was still in his blood after he had officially "retired." He applied for another patent in 1934 and assigned it to Owens-Illinois upon its receipt.

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[5] The September 8, 1921 issue of *Iron Age* (1921:638) informed their readers that the O'Neill Engineering Co., Toledo, Ohio, has been incorporated by Frank O'Neill, Frank R. Smith, and others and will establish a plant in the Factories Building, Toledo, for the manufacture of special machinery. Aside from an increase in market shares the following year, I have found no other references to this firm.

Table 1 – O'Neill Patents between 1926 and 1933

Appl. Date	Patent No.	Patent Date	Invention
7/10/1924	1,573,212	3/9/1926	Mold Marker Mounting
3/1/1924	1,611,362	12/21/1926	Adjustable Glass Feeder
2/23/1926	1, 611,363	12/21/1926	Press Ware Manufacture
3/19/1927	1, 852,329	4/5/1932	Glass Gathering

Table 2 – O'Neill Patents After the Sale to Owens

Appl. Date	Patent No.	Patent Date	Invention
4/3/1926	1,988-699	1/22/1935	Glass Gathering and Forming Machine*
4/3/1926	1,992,963	3/5/1935	Glass Gathering and Forming Machine*
6/23/1926	2,034,055	3/17/1936	Glass Feeding Machine*
6/1/1928	1,992,321	2/26/1935	Glassware Forming Machine*
12/26/1930	1,981,244	11/20/1934	Glassware Forming Machine*
6/7/1934	2,018,030	10/22/1935	Glassware Forming Machine**
8/30/1935	2,111,296	3/15/1938	Glassware Forming Machine †
8/30/1935	2, 175,064	10/3/1939	Mold Operating Mechanism for Glassware Forming Machines †
3/16/1936	2,191,132	2/201940	Glassware Forming Machine*

* Assigned to Owens-Illinois Glass Co.

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† Assigned to Hartford-Empire Co.

O'Neill applied for two patents in 1935 and a final one in 1936. His wife, Marion, died in 1936, apparently heralding the end of O'Neill's inventing days. Although O'Neill's obituary stated that he moved to Florida in 1935, by March 15, 1938, when he received Patent No. 2,111,296, he was living in Montreal, Quebec, Canada. However, he was certainly at Miami

Beach by October 3, 1939, when he received Patent No. 2,175,064. His only son, Wilson, died in 1944, and Frank O'Neill, himself, died at the age of 91 on November 30, 1954 (*Toledo Blade* 12/1/1954).

Discussion and Conclusions

Frank O'Neill was a prolific inventor and a successful businessman. Although the achieved only a modest success with his initial wide-mouth container inventions, his narrow-mouth, semiautomatic machines (and later fully automatic ones) were a dramatic success. Many firms that were excluded from the Owens Automatic Machine contracts could remain in competition through the use of the O'Neill inventions.

Of specific importance for bottle identification, the 1911 O'Neill machine created a unique set of base scars that have puzzled a few of us for years. This study has connected those scars with the 1911 O'Neill machine. The machine was only used by a few glass houses during the 1911-1916 period and was replaced with or updated by O'Neill's later improvements. The later machines used a slightly different system that resulted in more typical basal scars.

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