

The Evolution of Jar Machine

Barry Bernas

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Most fruit, packer and product jar enthusiasts are familiar with the name Philip Arbogast. Tradition has it that his so-called “press and blow” concept served as the starting point for the development and subsequent introduction of the machine into the wide mouth segment of the glass container industry, eventually supplanting the time honored hand blown method of production. Building upon prior innovations, he matured his idea and was granted a patent (260,819) for it on July 11, 1882.¹

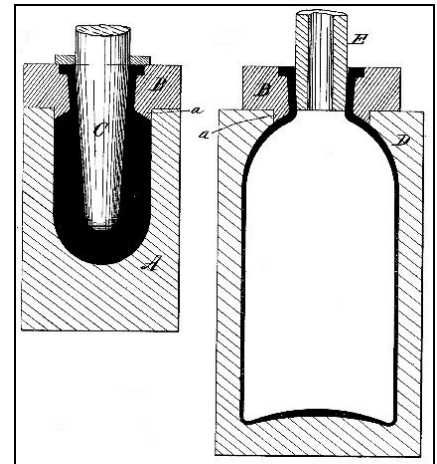


Figure 1

Titled the “Manufacture of Glassware,” his Letters Patent called for the initial pressing of the neck region of the article in one mold and then blowing the item to full shape in another. Taken from his patent application, Figure 1 shows step one on the left and step two on the right.

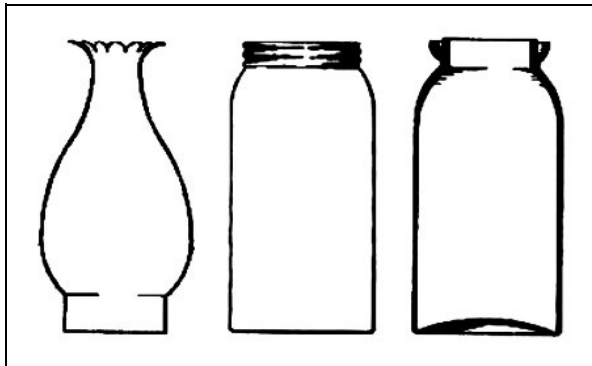


Figure 2

While a narrow mouth bottle was used in this instance, Mr. Arbogast stated and depicted three other pieces (see Figure 2) in his request to the United States Patent Office (USPO) which could be manufactured by his process. On the left is a crimped and beaded lamp chimney. The middle example is a screw top Mason fruit jar while the right-hand model is a grooved-ring fruit jar.

Between 1882 and 1896, many individuals built their own rudimentary machines based largely upon Mr. Arbogast’s idea. None of these efforts was hugely successful until the latter

year when Charles E. Blue provided the spark which led to the formation of a firm in that year - the Atlas Glass Company (ATGC) in Washington, Pennsylvania - which used his patented machine to manufacture fruit jars on a commercial scale. His breakthrough also compelled other makers of glass containers to develop and create their own mechanical versions to compete more equally within this part of the glass trade.

In this article, I want to review the intervening fourteen year period between 1882 and 1896 to determine which men helped to usher in the “machine age” for wide mouth jar production. With USPO records as an authoritative baseline, I intend to meld into the mix glass trade journal reporting along with other author's material to ascertain when and where machines displaced hand blowers, what products were turned out, any Union opposition to the introduction of the machines and the success of the individual efforts. Hopefully, along the way, more information will be added to the sparse database on this topic than currently exists. Perhaps, a mystery or two will also be resolved.

Leading up to 1882

Mr. Arbogast’s concept for forming bottles, jars and lamp chimneys in separate molds wasn't a standalone, moment in time, type of creation. He benefited greatly from others who came years before him and who contributed improvements to the tableware portion of the trade.

Between 1825 and 1829, the initial United States patents were issued for the pressing of objects from glass. Where the first molds and presses were designed and built by mold makers, mechanics and machinists and subsequently put into operation remains an elusive data point to verify. Regardless of this deficiency, firms in the New England states and the Pittsburgh area quickly began to use molds and simple machines to press flint glass into various pieces. Over the next several decades, mold improvements and machine enhancements permitted more flint and flint lime glass items to be made by the pressing technique. These advancements in tableware production were essential precursors to Philip Arbogast’s innovation.²

I believe as others do that the evolution of his concept can be traced from the “mold and blow” technique, introduced in a February 11, 1862 patent (34,345) granted to J.S. and T.B. Atterbury and James Reddick, all of Pittsburgh. These men used a two-piece mold (solid bottom

half and hinged top portion) to first press the lower part of a lamp bowl in the bottom half and then blow the top portion in the hinged top section which sits atop the solid lower half. See Figure 3.³

The next progression towards the 1882 starting point came on December 5, 1865 when William T. Gillinder of Philadelphia was issued a patent (51,386) for an “Improvement in Blow-Pipes.”

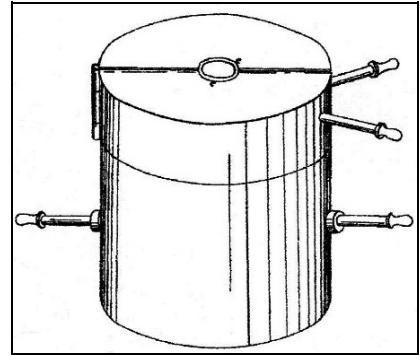


Figure 3

His idea had a “...perforated plunger with a blow-pipe attached...”

The text of his patent carried the further comment:

“...The object of my improvement is to enable the glass-blower to shape or form such vessels with their handles or other similar projections attached or simultaneously formed with the vessel in the mold... “

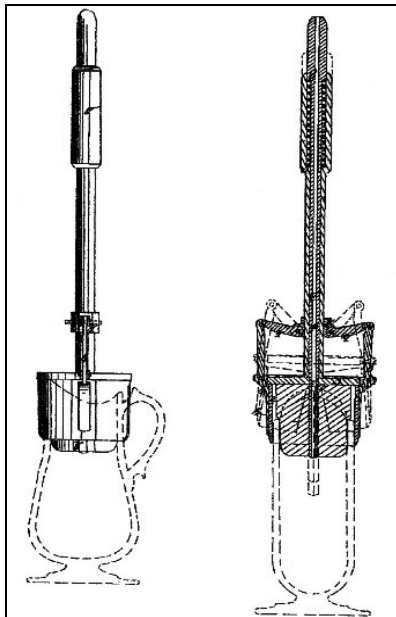


Figure 4

Figure 4 has a drawing of this novel but simple device. In operation, the skilled workman would use the plunger device to press the top portion of a handled pitcher in a mold (right side sketch). Directly thereafter, he would expand the more bulbous center segment by the free-blown approach (left-hand profile), in essence, employing a “press and blow” technique.⁴

Less than three years later, Daniel C. Ripley was issued a patent (75,577) on March 17, 1868. His idea pressed the top region of a syrup jug and attached it to a free-blown body. On the left in Figure 5 is the mold for pressing the top of this item. The finished segment is drawn in the center. Beside it to the right, the pressed top is joined with a blown body to complete the tableware piece.⁵

Once again, James and Thomas Atterbury reentered the picture with a June 17, 1873 patent (139,993) for “Methods of and Molds for Manufacturing Glassware.” As they stated in their application, “...The object of this invention is to produce out of glass, by processes of casting or pressing and blowing combined, such articles as pitchers, bottles, and other vessels which present contracted necks and bulging bodies, and which it has only been considered practicable heretofore to produce by the process of blowing alone...”⁶

About this innovation, the Welkers wrote.

“...This is the first press-and-blow mechanism which is completely contained in a molding assembly in which all operations are performed by simple mechanical manipulation without removing the article or part of it until it is completely made. The mold consists of a two-section hinged body (A), a moveable base (B), a cap ring (C) and a plunger (D) through which air can be introduced. The mold is closed and a gob of glass large enough to make the entire finished piece is dropped into the mold cavity. Plunger (D) is driven down to a predetermined point at which the body of the container being made begins to bulge outward, with the moveable base piece at the top position as per Fig.1. This pressing forms the neck, lip and handle. As quickly as possible, and while the residual glass below the plunger is still hot enough for blowing, the base (B) is dropped as shown in Fig.2. Air is forced through the plunger against the residual glass and forces it into the bulbous shape of the body (h); thus completing the article...”⁷

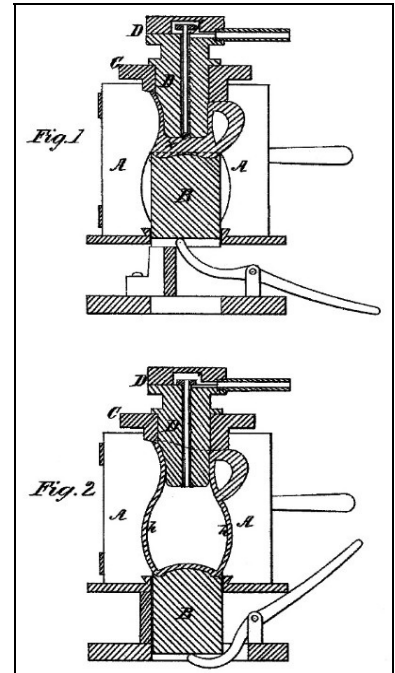


Figure 5

Figure 6 has the drawings which accompanied this patent. I’ve stripped out the extraneous numbers/letters so that you can follow along with the Welkers’ description more easily.

Other related ideas followed and were granted patents. One was by Augustus A. Adams. It was for an “Improvement in Manufacture of Glassware.” His patent (177,087) was issued on May 9, 1876. As described in the application, an oil lamp bowl with an annular grooved

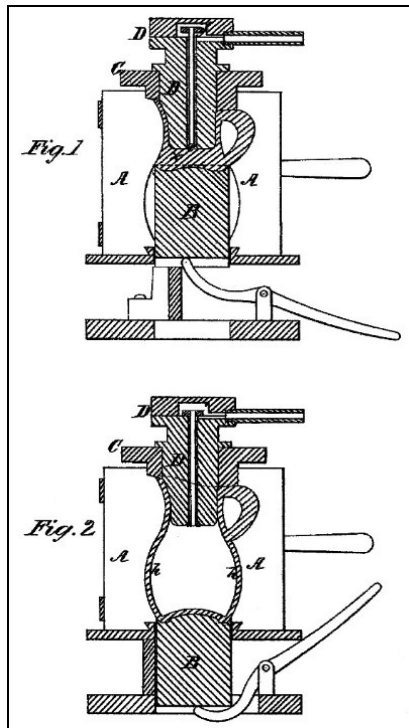


Figure 6

drip-flange was first pressed in a mold. The mold was next removed from the press and another mold placed on top of it. A blower would finally blow the top in the consolidated mold, uniting both sections.⁸

Figure 7 has a sketch of Mr. Adams' patent which he assigned to Adams & Company, a Pittsburgh glass maker.

The top drawing illustrates the pressing of the bowl

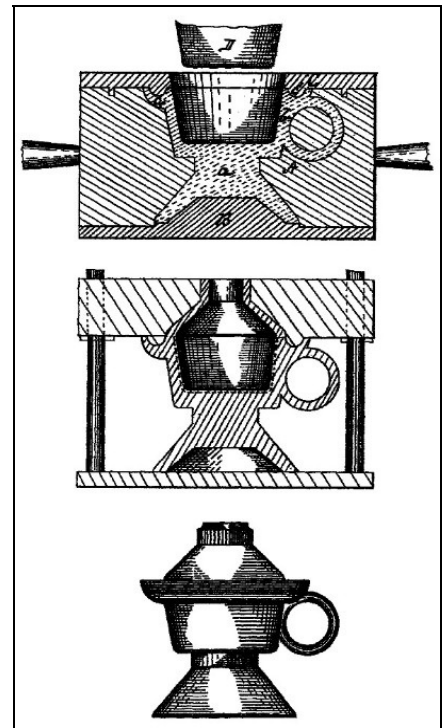


Figure 7

and base. In the center, another mold is brought into place over the partially formed item for the blowing of the top. A finished "pressed and blown" piece of ware is depicted on the bottom.

Two more patents (179,951 and 224,555) were granted on July 18, 1876 and February 17, 1880, respectively, to Thomas C. Pears. He described the rationale for his contribution to the "Manufacture of Glassware" for the latter in the following manner.

"...My invention relates to the manufacture of articles of glassware having a solid or pressed foot, or foot and stem, and a seamless blown bowl. Heretofore such articles have been made by pressing the foot or foot and stem, and then removing it from the mold, placing it under the bowl-mold with the peg projecting into such mold, blowing the bowl onto the peg, and rotating the bowl, and within the foot and stem, at the time of blowing the same. An objection to this way of making the article is that the removal of the pressed foot or foot and stem from its mold, and its exposure to the air, chills it more or less, and prevents the formation of a perfect joint in some cases between the bowl and foot, and causes breakage and loss..."

His quoted explanation described the problem he encountered with the first patent (179,951). To correct this deficiency, Mr. Pears' subsequent idea (224,555) functioned as such. The hollow foot and stem of a lamp is pressed in the bottom section of a heated mold. The mold is inverted and a top part is set above it. The blower then blows the top portion which fuses with the foot and stem part. In doing this, he carefully rotates the fused pieces of glass to eliminate any mold marks.⁹ Figure 8 has 179,951 on the left and 224,555 on the right.

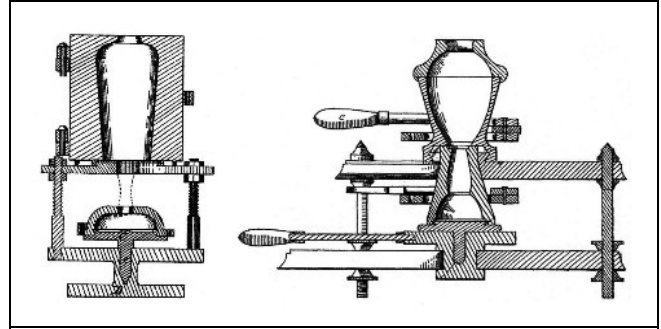


Figure 8

Still another idea was submitted by William L. Libbey. On November 9, 1880, he earned a patent (234,300) for a "Mold and Process for the Manufacture of Glassware." He outlined the workings of his invention thusly, "...molten glass of the desired character, quality, and color or colors is placed in the hot font space, and the plunger is caused to descend, forcing the glass in the font through the passages into the intaglio recesses in the hot metallic mold. This done, the plunger is raised, the font is opened and removed from the end of the mold, the core is removed from the mold, and, preferably while the mold is inverted, a ball of glass on the usual blowing-rod is placed within the cavity of the mold, and is blown so as to fit the interior of the mold and form an article of glass shaped externally in accordance with the interior of the mold...the mold is opened to permit the removal from it of the article so finished..."¹⁰

Figure 9 is germane.

In my mind, the aforementioned patents set the stage, so to speak, for Philip Arbogast to use some of their notions and apply them to the making of bottles, jars, and packers' ware.

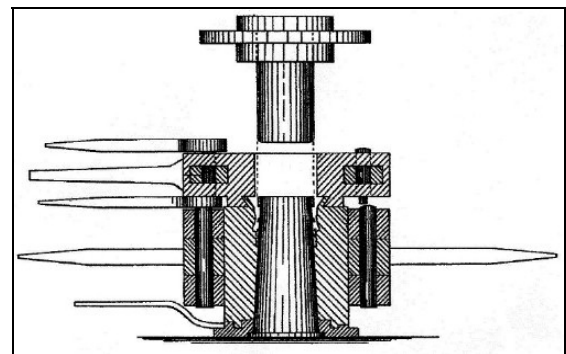


Figure 9

Machines to Match the Molds

Although lacking a substantial amount of information on this subject, it seems Mr. Arbogast had his principle made into a crude but simple to operate machine. The extent of its usage in the Pittsburgh vicinity or outside of it, if there was any, continues to be unclear. For all intents and purposes, it appears the glass container and lamp chimney segments of the industry showed little interest in it.¹¹

Apparently at some point in 1884, Daniel C. Ripley, Jr., a friend of Philip Arbogast, began to experiment with this machine, or an adaptation thereof, and in the next year (1885) purchased the patent rights for \$450 as a friendly gesture. Mr. Ripley's employees at Ripley & Company in Pittsburgh allegedly turned out "...certain kinds of table ware, and large containers such as druggists' jars..." on this apparatus.¹²

If the last quotation was accurate, D.C. Ripley put the Arbogast principle to good use. One of the pieces of tableware that could have been made using the 1882 "press and blow" concept was a syrup jug for which a patent (75,577) was issued to him on March 17, 1868. Figure 5 refers.

Likewise, Mr. Ripley also developed an improved process to make a globular shaped and footed storage jar. On December 31, 1886, he signed and sent forth two patent requests. The USPO filed and started to process each on January 15, 1887. A design patent (D17,243) was issued to Mr. Ripley on April 5, 1887 for the storage container. Several months later on June 7, 1887, he was granted a patent (364,298) for a method for making his design patented jar. Here is how his innovation was described in the text of his patent application.

"...the steps of my improved process consist in first forming a pressed blank...in the mold...then forming a foot...in the mold...and, lastly placing the foot under the mold...reheating...it in the mold..., and blowing it out to the required shape until it unites with the foot...It will be noticed that the body of the article is at first a pressed blank. This enables me to produce this part of the article not only with great cheapness, but with great uniformity, which will govern and characterize the finished article. In like manner the foot is made at small cost. All expense of handwork is dispensed with in connection with it; and as the blank...is

separate from the foot, and is the only part under manipulation during the blowing operation necessary in making the globe or expanded body, it is the only part that is reheated. This enables me to preserve the molded character of the foot and to prevent distortion in the finished article. Moreover, I am enabled, for the same reason, to make very large articles having large heavy feet and stems, which would be impossible if the foot were pressed as a part of the blank...because the reheating of the body of the blank which is to be expanded by the blowing would soften the stem, and, by reason of the weight of the foot, would cause not only the stem, but the body, to be distorted...”¹³

The quotation clearly shows that the “globe” jar was made to D.C. Ripley’s June 7, 1887 patent, most likely on a basic machine which he had constructed.

Figure 10 shows Mr. Ripley’s container (D17,243) as the top drawing and the pictorial process for 364,298 following thereafter. In the middle four sketches, Figs. 1. and 2. depict the pressing of the blank and foot of the jar which are represented as formed by Figs. 3. and 4., respectively. The bottom left diagram has the pressed blank or neck and body (Fig. 3.) sitting in the blow mold which is atop the already formed foot (Fig. 5.). The completed globe jar is under Fig. 6. on the lower right. Clearly, the tableware and large containers mentioned previously as being made at Ripley & Company could have been 75,577 and D17,243.

Records show that Mr. Ripley’s firm employed American Flint Glass Workers’ Union of North America (AFGWU) members as the skilled portion of its workforce.¹⁴ How the Union men and their factory committee reacted to D.C. Ripley’s invention isn’t clear. It had been the norm that Union members would make articles from an approved list of products and in numbers agreed upon for a move by either machine pressing them in a mold, hand blowing them in a mold or a combination of both methods, to include finishing, and receive a set wage (list or price list) for their

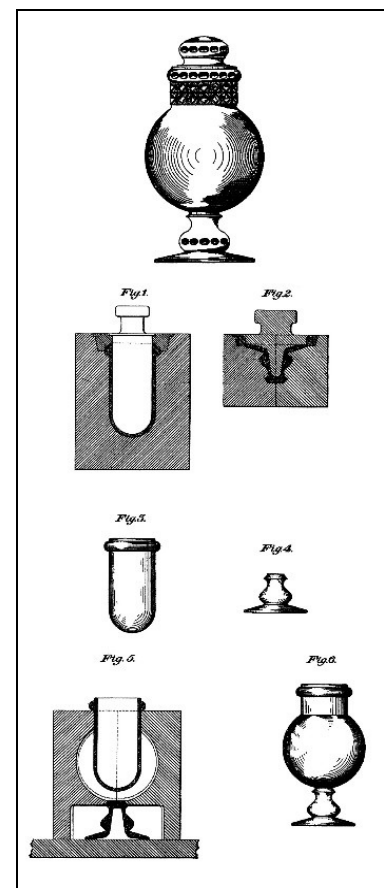


Figure 10

piecework per move. Based on the negotiations between the AFGWU and a group of flint and flint lime glass manufactures during the December 31, 1887 to April 28, 1888 strike or lockout, any article not discussed in the annual sessions between representatives of both parties would be handled locally by a worker's committee and the firm's management. In the event an arrangement couldn't be reached at this level, the issue would be kicked upstairs to the AFGWU-flint and flint lime glass manufacturer's committee for adjudication. Pressers and blowers at Ripley & Company each had a predetermined set of items to turn out. The addition of another one which involved both skill sets but with a more mechanized scheme than they were accustomed too would probably have triggered a local session to discuss this initiative and then come to an agreement as to how to handle this novel situation.

According to the text of D.C. Ripley's patented innovation of June 7, 1887, he had several objectives in mind for it. These were: to produce a large item which couldn't be formed solely by pressing; to make the article more cheaply by dispensing with the handwork that would be associated with a hand blown piece and to fabricate a piece of ware that had better uniformity. Of course, Union hands wanted to operate according to the by-laws and agreements of their organization which were intended to protect their jobs in the trade. Any task that would take away work from them, especially if it involved machinery of some sort which could eventually replace some or all of them, would naturally be resisted. Although primitive in design and nature, Mr. Ripley's consolidated and somewhat mechanized approach to turn out a new product or ones currently made by strictly hand operations no doubt caused a stir within his work force. While I could find no trade journal reporting or AFGWU literature on Union hesitation to support this experimental effort of D.C. Ripley, I feel certain there was probably little to nil effort put forward by AFGWU members to make it successful. As a result, Daniel C. Ripley was most likely forced to terminate turning out, at the least his "globe" jar (D17,243), by a machine process for the time being.

Most authors give credit to Messrs. Arbogast and Ripley as the focal point within the United States for follow-on initiatives that would soon bring about more mechanization to the production line to make wide mouth glass containers for domestic or commercial packers' usage. There were undoubtedly others tinkering within the glass industry toward the same goal. However, up to this point in time, only these two gentlemen had gone forward and patented their ideas.¹⁵

Undaunted by earlier likely Union issues that caused a premature stoppage to his machine tests, Daniel C. Ripley evidently still thought enhanced mechanical methods could be used to lower costs and defeat AFGWU stubbornness to face the looming introduction of the advanced equipment into the production of glass containers.

On January 8, 1891, he sent forth a request to patent his “Machine for Blowing Glassware.” Letters Patent No. 458,190 was issued to him for it on August 25, 1891. Here is how Mr. Ripley explained his machine.

“...The object of my invention is combining the advantages of pressing and blowing in the manufacture of the same article. The advantage of pressing is that a better and sharper finish and greater uniformity of product can be obtained. For instance, the article shown in the drawing is a salt-dredge, which is designed to be fitted with a metallic screw-top; and as such tops are made of a uniform size and thread a similar uniformity of size and shape is required in the top of the glass bottle. This can be obtained with cheapness and certainty only by pressing in a suitable mold. The body of the dredge, however, is of greater diameter than the mouth, and such an article cannot be made by pressing because a plunger of that size cannot be inserted through the top. I therefore produce an article by expanding the lower part or body in a blow-mold of the desired shape. In carrying out the operation I first form the blank in a press-mold composed of upper and lower section, the upper section giving the required final shape to the upper end, and then lift such upper section with the hot article in it and place it on the blow-mold of my machine and expand the body of the article by blowing to the shape of the same. Thus, I obtain the advantages of both methods of manufacture in the production of one article and am able to produce with great rapidity, cheapness, and mechanical precision superior articles of many shapes which have heretofore been possible to make only by slow and expensive operations...”¹⁶

Figure 11 has two drawings taken from 458,190. On the left-hand is a vertical section profile of the basic machine, showing a completely “pressed and blown” salt-dredge. On the right, the mold depicted holds the pressed parison. The top part of the mold along with the preformed blank will be lifted and placed over the bottom section of the blow mold for completion as shown on the machine.

A little over three months later, he followed with another request on April 22, 1891 for a “Pneumatic Machine for forming Glassware.” On October 20, 1891, patent 461,489 was authorized for this device. This apparatus had two side-by-side sliding arms. At the end of one was a plunger for forming a parison or blank. The second arm had a blow head attached. After a glass gob was placed in the blank mold, pneumatic power caused the plunger to be shot forward, precisely centered over the forming mold, downward to press the parison, back upward and returning backward to the starting position. The pressed blank was then lifted by hand and placed on top of the forming mold adjacent to it on the same table or supporting platform. The same pneumatic process formed the parison by compressed air in the body forming mold. Mr. Ripley used a “vaseline bottle” as the example for this part of his patent. As he explained in the patent’s text,

“...The use of pneumatic pressure for thus accomplishing the various operation of assembling the operative parts, pressing the blank, blowing the article, and disassembling the parts insures greater rapidity and certainty of operation, secure the use of any desired amount of power without labor on the part of the operator, and results in a greatly-increased and uniform output of highly-finished ware at a very low cost...”¹⁷

Figure 12 contains the illustrations from 461,489. The top sketch looks down on the two arms and pressing (top) and blowing (bottom) molds. Below it, the next drawing is a side view of the pressing arm, blank mold formation and the machine assembly. The final outline is another side view but of the blowing arm with the completed item in the mold as shown. The bottom left side article is the parison (Fig.4) completed by the process connected with the middle machine. Next to it, the finished “vaseline bottle” (Fig.5) comes from the last mechanical device.

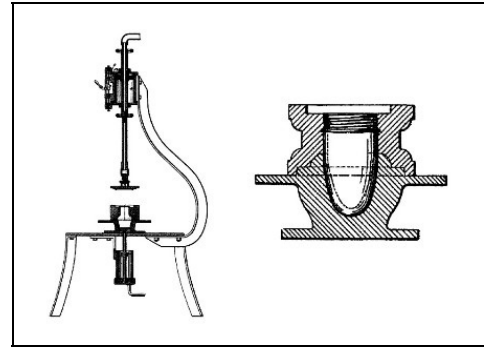


Figure 11

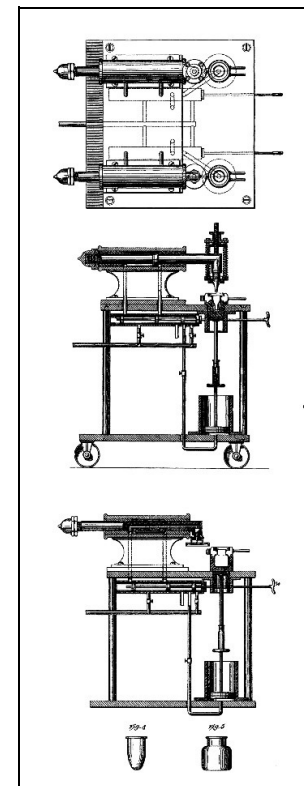


Figure 12

While both of Mr. Ripley's patent applications were being reviewed in Washington, the District of Columbia, the long discussed "glass pool" of Pittsburgh and upper Ohio Valley tableware manufacturers took effect on July 1, 1891. The regional cartel would operate under the name United States Glass Company (USGC) with Daniel C. Ripley as its first president. Ripley & Company was one of the thirteen original charter members, joining as Factory F, and served as host for USGC's central office in its Southside Pittsburgh company headquarters building.¹⁸

USGC officials envisioned better economies of scale for the unified grouping of glass makers with regard to combined procurement of raw materials, consolidated clerical staffing, centralized mold making, unified production levels, single point for production distribution, stabilized worker wages, selling price equality and controlled marketing which, they hoped, would turn into higher profits for all concerned owners.¹⁹ One facet of this consolidation was the 1882 Arbogast patent, now owned by D.C. Ripley. It was conveyed to the USGC.²⁰

At some point in 1891 or later, D.C. Ripley began again to explore the use of his "press and blow" principle but this time to make small packers' jars (wide mouth bottles - pomades and/or two ounce bottles).²¹ I haven't been able to find out which machine he employed; however, odds are that his pneumatic machine (461,489) set up in Factory F was his equipment of choice.

This innovation progressed further that his previous machine (458,190) which utilized blower, presser and gatherer skills (finisher was eliminated) to one where only the presser and gatherer were needed (blower and finisher both eliminated). Small help could also be reduced.

This issue caught AFGWU attention. According to Union president William J. Smith, shop brothers along with child labor were able to produce nine hundred pieces during a one-half of a day's worth of work. However, this was not satisfactory for Mr. Ripley. He wanted twelve hundred turned out in the same period of time. Since there was no approved move and wage contract to cover these items and to protect the interests of Union blowers, pressers and finishers, national officers decided the machine operator wages needed to be maintained at the current handmade levels and the output of items from the machine kept to the applicable handmade move agreements. Both would be based on prescription bottle standards. In effect,

the quality, quantity and cost reduction incentives offered by the machine were nullified by the AFGWU which wanted the list prices and production to remain the same whether the item was made by the time honored hand process or mechanically by the machine.

The Union's holding action temporarily forestalled but didn't stop the inevitable. As a result, Mr. Ripley soon discontinued his experimentation with this machine.²² In testimony at a later date, he uttered the following comments about the AFGWU's policy.

"...The policy of the labor organization has been that no device that lessened the amount of skill would be operated except for the same amount of money as was paid for the full exercise of skill in the manufacture of the article by new processes. Also any new device which enabled the workmen to make more with less labor could not be used to advantage from the fact that the numbers (of jars made) were limited to the number determined by the labor organization."²³

As a result of the Union's stance, D.C. Ripley began to license several other glass manufacturers to make wide mouth packers' ware using the USGC's "press and blow" patent.²⁴ An interesting aspect to his decision was a stipulation for the licensee.

"...In all cases where we have granted licenses it has been necessary that the parties operating the device first rid themselves of the domination of the union."²⁵

One of the first to be licensed was the West Virginia Flint Bottle Company (WVFBC) of Central City, West Virginia. There, officers decided to make flint lime glass wide mouth bottles by machine vice by hand.²⁶ As a result of this change in production method, the firm's leaders released their union glass blowers and entered into an agreement on November 22, 1892 with the USGC to license six machines for one year.

Under the terms of this contract for use of the machines, WVFBC officers would pay a royalty of \$125 per month for each of the mechanical devices (totaling \$9,000) and, in addition, would issue a bond to USGC for double the royalty or \$18,000 for one year.²⁷ Per USGC officials, the six machines were employed for a one year period or until around November 1893.

At the July 1893 annual AFGWU convention, William J. Smith, the Union's president, commented on this event in his opening remarks. He concluded that the operation of the Central City machine wasn't as successful as firm officers had anticipated it would be but the machine wasn't the root cause of this setback. It worked satisfactory when operated by the right workforce.

In his mind, the greatest obstacle faced by WVFBC leaders was their inability to attract a substantial number of experienced pressers. Some were obtained from non-union plants in Rochester and Washington, Pennsylvania; however, not in the numbers required. Likewise, there was an insufficient quantity of qualified gatherers available to work alongside the pressers. As Mr. Smith stipulated, the latter skill set was essential if unskilled press operators were employed. A final weakness was the WVFBC factory manager. He was unfamiliar with the press trade and couldn't explain to his workers how to run the machines efficiently.²⁸

Although not identified further, the six machines could have been constructed to one of two D.C. Ripley patents (458,190 or 461,489). Since the former depicted a salt dredge and the latter showed a "vaseline bottle" being made in the respective patent drawings, I suspect the latter machine (461,489) was a good candidate for the Central City operation.

My presumptive assessment is based on two considerations. The first is that Mr. Ripley's pneumatic powered machine, which was depicted as making "vaseline bottles," required little effort on the part of the operator. And the second was another statement made by William J. Smith at the same 1893 convention.

"Machine-Made Bottles. For some time several manufacturers have been trying to make certain class of bottles by machinery, and if the truth is told the ware are first class and no doubt will be introduced upon a much larger scale shortly, from the fact, if the statement be correct, that boys can run the machines and make a good article. We should give this question some consideration and try to counteract this movement. I have seen the bottles myself and they are perfect in every particular. What we want is to put the cost of production equal on the machine-made and hand-made article. There may be no cause for alarm on the subject, as the only ware made by this machine is but wide mouth ware plain; but I understand the firm at Huntington, West Va., are making vaseline bottles for the Chesebrough Manufacturing Co. If they manage to get such

orders as this and other wide mouth ware also, it will take a large percentage of orders from the different factories and consequently force a large number of our members in idleness.”²⁹

The year 1892 also saw Charles N. Brady show interest in the mechanical process for making wide mouth glass containers. He was the owner and operator of the Hazel Glass Company (HGC) in Washington, Pennsylvania, a non-union manned and run factory. As such, Mr. Brady certainly qualified for a USGC machine license and he purchased one.³⁰ John S. Algeo provided the following insight.

“...Mr. Brady was one of those who felt that a practical machine could and would be built. In 1892 he gave Mr. Charles E. Blue, founder of the Wheeling Mold and Foundry Company, a general idea of what he wanted and asked Mr. Blue to experiment - with money supplied by Mr. Brady...The Arbogast principle had been patented in 1882 but made no headway until the U.S. Glass Company built a machine around 1890 or 1891 and used the principle. In fact we used the U.S. machine, sometimes called the Ripley, and made our first Chesebrough bottles on it about 1892. The U.S. was not a rotary machine and had only one blank and one blow mold. The parison of glass including the finish was pressed in the blank mold. The neck ring, which held the parison of glass, was then lifted out of the blank mold by hand and placed over the blow mold where the body was blown to final shape...”³¹

From Mr. Algeo’s description of the USGC, a.k.a. Ripley, machine, it would appear that D.C. Ripley’s pneumatic apparatus (461,489) was the device used by workers at the HGC.

Available information indicates Charles L. Flaccus, the owner of the C.L. Flaccus Glass Company (CLFGC) in Tarentum, Pennsylvania, was the next manufacturer to dabble with making flint lime glass wide mouth bottles and/or jars by machine. He allegedly purchased a license from the USGC in late 1892.³² Since his Tarentum operation was manned by AFGWU brothers, Mr. Flaccus needed another venue, one run as non-union, to move forward with his initiative. The location he choose was Beaver Falls, Pennsylvania, a town about thirty-two miles northwest of Tarentum in a region labeled by the AFGWU president as “...congenial to scab glassworkers...”³³

A deed dated May 18, 1892 recorded that the idle Beaver Falls Glass Company, Limited (BFGCL) and its property were sold to Frank F. Bierly or Brierly. Subsequently, another deed dated March 30, 1893 between the same two parties cleared up an issue with the property's boundary.³⁴ At some point soon thereafter, C.L. Flaccus, Henry Hemple or Hemphill and perhaps others purchased the property which included the idle factory from Mr. Bierly or Brierly. These men formed what they called the Enterprise Glass Company (EGC).³⁵

If Mr. Flaccus' agreement with the USGC was the same as those transacted with the WVFBC and HGC, he would be renting a Ripley machine. Which one isn't known; however, it could have been the newest model available.

On January 3, 1893, staff members at the USPO filed D.C. Ripley's next patent application for an "Apparatus for forming Articles of Glassware."³⁶ This side lever activated machine was

"...an improvement in forming articles of glassware by pressing and by pressing and blowing; and it consists in pressing one or more articles or blanks from a fount or reservoir of plastic glass and separating the article or blank from the fount, and, where the article is to be blown as well as pressed, so blowing the blank in a mold as to form the desired article without any reheating of the blank and without the removal of the blank from a part of the mold during the entire operation..."

Sketches included with the request showed six bottles being pressed and blown simultaneously in a single mold. See Figure 13.

Another reference seems to confirm that eventual Letters Patent 593,857 issued to D.C. Ripley for this machine may have been the equipment issued to C.L. Flaccus for either trials or further development. An article in the pharmaceutical magazine, *The Spatula*, had this to say.

"...The glass industry is one of the latest to be invaded by the machine. The pioneer in the manufacture of bottles by machinery was Mr. C.L. Flaccus, of Pittsburg, who produced them in Beaver

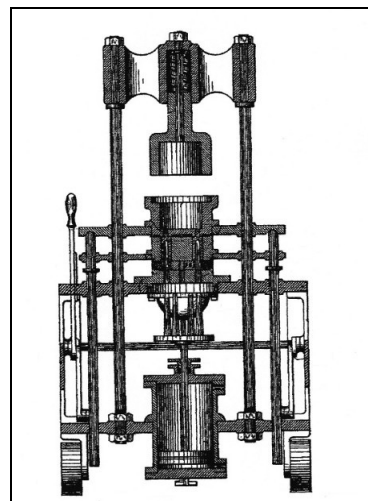


Figure 13

Falls, Pa., during the year 1893. The machines are known as ‘side lever’ machines, the operation consisting of pressing or prepressing the neck or finish of a bottle in what is known as a blank mold and then transferring the glass to another mold where it is blown out by compressed air. This machine is only adapted to the manufacture of wide mouth bottles and jars....”³⁷

Per USPO records, Nos. 364,298, 458,190 and 461,489 issued to Daniel C. Ripley between 1887 and 1891 for glass pressing and blowing machines came with mechanical drawings that showed they were not operated by a side lever. The only patented Ripley machine that depicted a side lever was the one (593,857) just discussed. Even though Mr. Ripley’s idea was still being reviewed by the USPO, this circumstantial evidence suggests this machine was the type employed by C.L. Flaccus.

The May 24, 1893 issue of *China, Glass and Lamps (CGL)* reported the employees of the EGC have been working the factory formerly occupied by the BFGCL for about two weeks (or around May 10, 1893). Glass hands manning eight shops were producing wide mouth bottles described as “salt mouths” that were mostly used in drug stores. Although it wasn’t mentioned by the writer of this account, I think this ware was being made, at first, by hand instead of via machine. Soon, this older method would be reversed and flint lime glass “vaseline bottles” for the Chesebrough Manufacturing Company (CMC) began coming off the mechanized production line in the EGC’s plant.³⁸

The cumulative developments concerning the machine and the potential impact it presented in the future caused the president of the AFGWU to expend more than a passing comment about it at the Union's 1893 convention. In the case of the C.L. Flaccus project at the EGC, William J. Smith stated that four thousand two ounce capacity bottles could be made by one shop in a day’s work. Obviously frustrated by this fact, he expressed angst by directing some brief but caustic remarks towards the factory manager of the EGC.

“...its manager is a thoroughly practical press house man not over nice in his scruples about the even balance of labor and compensation. With a successful machine being operated near a non-union locality, under a thorough but unscrupulous manager acting under the incentive of self-gain, the progress of the Beaver Falls plant can hardly be in the direction of anything else than detriment to the prescription trade.”³⁹

Obviously, the EGC factory manager (not further identified but probably Henry Hemple or Hemphill, the former plant manager at the O'Hara Glass Company in Pittsburgh)⁴⁰ was well-known in the pressed ware trade, possibly a prior AFGWU member, who had moved out of the journeyman state and up the ladder to a management position. Mr. Smith's near slanderous comments, while probably momentarily satisfying, did nothing to help come to a longer term solution to this hugely looming problem.

By mid-1893, there were at least four firms (WVFB, HGC, EGC and USGC Factory F) in the United States⁴¹ producing or attempting to produce with non-AFGWU labor flint lime glass, wide mouth packers' ware (bottles and/or jars and fish bowls) via a machine most likely patented by D.C. Ripley. While none of the early endeavors were viewed as a wide commercial success, they set the stage for further development of the machine.

In particular, the EGC effort spearheaded by C.L. Flaccus was singled out for additional praise by the editor for the National Glass Budget (NGB). In an editorial column that appeared in the May 23, 1903 issue of this trade newspaper, the following remarks were made.

"...The earliest efforts in mechanical fruit jar blowing machinery were made by C.L. Flaccus, at whose works Blue, Shirley and Johnson all made their first contributions, and whose efforts were hampered at every point by the restrictions and antipathies of the flint workers' union..."⁴²

It was to be Mr. Blue that next caused a commotion in the wide mouth glass container field. From sketchy factoids, he seemed to have labored on the Brady project at the EGC and then shifted his work to the HGC. Once satisfied with the progress he made toward his goal, Charles Edwin Blue took an initial step and submitted a patent application in late-June 1894 for a "Mold for the Manufacture of Glassware." His innovation had two objectives. Verbiage in the patent text identified these as follows.

"One object of my invention is to provide a mold for the manufacture of glassware having primary and secondary movable bottoms, the two being so constructed and arranged that when the primary bottom moves downward within the mold the secondary bottom is simultaneously moved in place. Another object of my invention is to so construct the mold that when the plunger

is raised either by steam or hand or other motive power, air is automatically admitted within the mold for expanding the glass, and at the proper time the flow of air is automatically cut off...”

Figure 14 shows Mr. Blue’s invention which was issued a patent (531,609) on December 25, 1894.⁴³

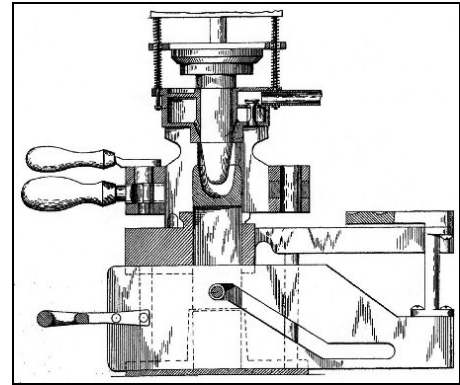


Figure 14

With a mold now in place, Charles E. Blue put his mechanical talents to good use and over the next year came up with a machine to employ it. Follow-on experimentation resulted in what the trade came to call the Blue or Beatty-Brady or Atlas piece of equipment. A request to patent this apparatus was sent forward in January 1896. Approval was granted on September 1, 1896 as Letters Patent No. 567,071.⁴⁴

Figure 15 has a drawing of the machine’s side profile at the top (Fig. 1.) and a top down look at the five stations on the rotating table (bottom or Fig. 2.) for making a fruit jar. Charles E. Blue described the purpose(s) of his machine as follows.

“...My invention relates to improvements in machines for manufacture of glass bottles, jars, and similar articles, and it pertains to that class of machines in which the article is blown to conform to the inner contour of the mold. The primary object of my invention is to increase the speed and decrease the cost of production by a continuous operation wherein a charging, pressing, blowing, and discharging operation, and preferably refixing or rearranging a discharge-mold, are separately but simultaneously carried on, whereby a completed article is delivered at each operation of the machine. A further object of my invention is to provide a table capable of and having a rotary movement in one direction, the table carrying a series of molds situated at practically equal distances apart, and to provide

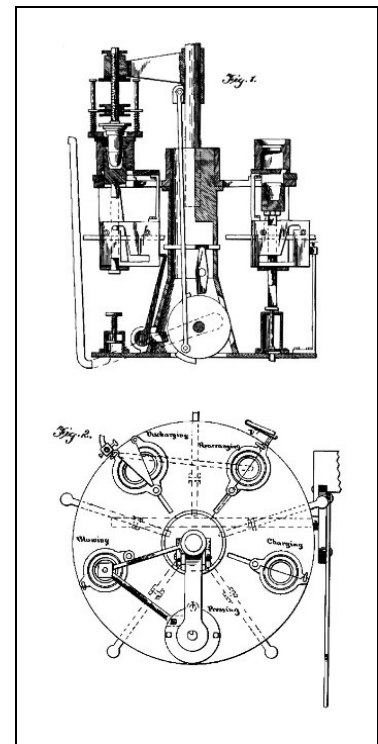


Figure 15

blowing and pressing heads at fixed distances corresponding with the distance between the molds upon the rotatable table, whereby the blowing and pressing heads will fit upon any two of the molds throughout the rotation of the table. I attain the speed in production and a decrease in cost by providing a series of molds arranged at equal distances upon a rotating table, so that each mold is successively and separately, at each operation of the machine, respectively a charging, pressing, blowing, discharging, and, preferably, a rearranging or fixing mold. The object of my invention further relates to an arrangement of mechanisms whereby the presser, by a single operation, presses the glass in one mold, and simultaneously, by the same movement, blows the glass in the succeeding mold, and also to an arrangement of mechanisms whereby the discharging or removing boy, while removing a completed article from the discharging-mold, can at the same time refix or rearrange the bottoms in the previously discharged mold. The arrangement of the machine is such that the presser, in addition to simultaneously pressing and blowing, by a single movement of the lever - that the return movement of the lever in the opposite direction to its normal position - causes the primary or pressing bottom to be dropped and the secondary or blowing bottom to be moved into position automatically, ready for the blowing operation when the mold in which the pressing operation was performed reaches the next step or movement in the rotation of the table..."

So impressive was this device that Charles N. Brady formed a glass firm - ATGC - to use it exclusively to turn out fruit jars. The April 8, 1896 issue of CGL reported the incorporation of this Washington, Pennsylvania organization within the Commonwealth. June 20, 1896 saw the first green (aqua) lime glass domestic canning vessels come off the production line in the Atlas plant. After the patent for the Blue machine was issued in September, the rights to make fruit jars on it were transferred from the HGC to ATGC while HGC retained authorization to manufacture packers' (vaseline, inks, polishes, jam and pickle jars) and other ware on this machinery.⁴⁵

John Algeo related, "...The Blue was not the first machine to make a glass container, but it was far ahead of the only other machine (Ripley) then making containers, and was thus quite a revolutionary development..."

Mr. Algeo also pointed out that:

“...The Blue machine had its limitations but nevertheless was outstanding and constituted a milestone in our history (Hazel Atlas Glass Company) as well as in the history of the glass container industry. It made wide mouth containers only and only wide mouth which had a pronounced and sharp shoulder at the junction of the neck and shoulder so that the top of the blank mold could make a tight joint with the shoulder of the blow mold. It was limited in making a shape other than round because the narrow diameter had to be considerably greater than the finish diameter...”⁴⁶

Regardless of its deficiencies, Charles E. Blue’s invention was the catalyst for the Ball brothers, the then superpower in the fruit jar field, to turn their focus toward developing their own machine and introducing it into their manufacturing plants.

Generally speaking, the early machine-made, flint lime glass, wide mouth bottle and jar experiments and production tests were conducted in non-union facilities concentrated in two regions. These areas were in the Pittsburgh District and in lower West Virginia. Activities in both brought heightened concern to the leaders of the AFGWU. At the July 1895 annual Flint’s convention, William J. Smith, its president, asked the question in his introductory report - How shall we treat machinery?

Before tasking the Committee of Officer Reports to tackle this issue, he gave a brief summary of the situation. As he saw it, machinery in the glass trade hadn’t yet been introduced on a scale commensurate with other national industries. Nevertheless, those that had been brought into flint lime glass plants that turned out wide mouth bottles and jars have affected presser and off-hand blowers. In particular, the prescription department of the AFGWU was seriously impacted.

Continuing his opening remarks, Mr. Smith took a moment to clarify the kind of machine upon which he was focusing the delegate’s attention in his opening query. He wasn’t including mechanical devices that finished bottles⁴⁷ because he considered them to be worthless. Rather, he wanted the Committee members to consider only the machines that produced bottles and/or jars by the dual process of pressing and blowing.

He singled out five patented pieces of equipment as being worthy of concern. The first, of course, were the Ripley examples (458,190; 461,489 and 593,857). Another version was said by William J. Smith to be being prepared so he couldn't get a description of it. This device could have been the one being developed by Charles E. Blue.⁴⁸ See the aforementioned endnote for details about the other individuals who worried the Union leader.

In closing, the AFGWU president verbally speculated in an interrogatory manner about what the position of the Union should be on this matter. He asked: Should we oppose the introduction of these machines or work them and try to make the best use of them for our benefit?

The Committee of Officer Reports responded to their president's query with the following statement.

"...That the National Office appoint a committee to formulate a list for machine made glassware, that will place Union made articles on a competitive basis with non-union made goods."

This pronouncement became the basis for AFGWU policy henceforth. Instead of standing in the way of their introduction into the workplace, the machines would be accepted and worked for the benefit of Flint brothers.⁴⁹

Closing Comments

Clearly not a fan of the AFGWU, Daniel C. Ripley, Jr., as USPO records and trade publications show, spearheaded the development and subsequent introduction of machines for producing wide mouth bottles and jars into the container side of the glass trade. His glass "pressing and blowing" machines plus the licensing of other firms to use them or develop their own based on the Arbogast process, triggered both competitors and Flint leadership to recognize the inevitable change from hand to mechanical production that was starting to transform their industry.

In my opinion, he inspired fellow flint lime glass bottle and packer jar manufacturers to act quickly to remain competitive. One of the first to move was Charles N. Brady. He swiftly recognized the potential of machines for making a standard item in bulk with quality being

sustained at a reduced cost. Likewise, natural Union reluctance to embrace machines was overcome by Mr. Ripley's confrontational policy of perfecting the mechanical devices in non-union plants.

During the same timeframe, a similar type of modernization was occurring in the green (aqua) lime glass, narrow neck bottle side of the trade as well. Of course, different players were involved but the overall hand to machine transition was playing out in a like fashion. This article didn't explore that portion of the glass industry's transformation but it was just as conflict riddled and controversial as the wide mouth arena.

I hope this research piece offered a window into the short and often fuzzy period bounded by the strictly hand and then nascent machine production of wide mouth bottles, jars and packers' ware. As always, if you would like to discuss this article or any aspect of it, please don't hesitate to contact me. BLB

End Notes

¹ United States Patent Office. Philip Arbogast, of Pittsburg, Pennsylvania. Manufacture of Glassware. SPECIFICATION forming part of Letters Patent No. 260,819, dated July 11, 1882. Application filed August 11, 1881 and *Chapters of Machinery and Labor*, George E. Barnett, Southern Illinois University Press, Carbondale and Edwardsville, Indiana, copyrighted 1926 by the President and Fellows of Harvard College, Boston, Massachusetts and reprinted 1969, pg. 68.

² *Pressed Glass In America Encyclopedia of the First Hundred Years 1825-1925*, John & Elizabeth Welker, Antique Acres Press, Ivyland, Pennsylvania, 1985, pgs. 3-5.

³ United States Patent Office. J.S. Atterbury, T.B. Atterbury, and James Reddick, of Pittsburg, Pennsylvania. Improvement in the Manufacture of Hollow Glassware. Specification forming part of Letters Patent No. 34,345, dated February 11, 1862.

⁴ United States Patent Office. William T. Gillinder, of Philadelphia, Pennsylvania, Assignor to himself and Edwin Bennett, of same place. Improvement in Blow-Pipes. Specification forming part of Letters Patent No. 51,386, dated December 5, 1865.

⁵ United States Patent Office. Daniel C. Ripley, of Pittsburg, Pennsylvania, Letters Patent No. 75,577, dated March 17, 1868. Improvement in the Manufacture of Glass.

⁶ United States Patent Office. James S. Atterbury and Thomas B. Atterbury, of Pittsburg, Pa., Improvement in Methods and Molds for Manufacturing Glass-Ware. Specification forming part of Letters Patent No. 139,993, dated June 17, 1873; application filed March 17, 1873.

⁷ *Pressed Glass In America Encyclopedia of the First Hundred Years 1825-1925*, John & Elizabeth Welker, Antique Acres Press, Ivyland, Pennsylvania, 1985, pgs. 162-163.

⁸ United States Patent Office. Augustus A. Adams, of Pittsburg, Pennsylvania, Assignor to Adams & Co., of same place. Improvement in Manufacture of Glassware. Specification forming part of Letters Patent No. 177,087, dated May 9, 1876; application filed April 6, 1876.

⁹ United States Patent Office. Thomas C. Pears, of Pittsburg, Pennsylvania. Improvement in the Manufacture of Glassware. Specification forming part of Letters Patent No. 179,951, dated July 18, 1876; application filed June 27, 1876 and United States Patent Office. Thomas C. Pears, of Pittsburg, Pennsylvania. Manufacture of Glassware. SPECIFICATION forming part of Letters Patent No. 224,555, dated February 17, 1880. Application filed December 15, 1879.

¹⁰ United States Patent Office. William L. Libbey, of Boston, Massachusetts. Mold and Process for the Manufacture of Glassware. SPECIFICATION forming part of Letters Patent No. 234,300, dated November 9, 1880. Application filed March 15, 1880.

¹¹ United States Patent Office. Daniel W. Norris, of Elgin, Illinois. Machine for forming Glass Jars, Bottles, &c. SPECIFICATION forming part of Letters Patent No. 314,975, dated March 31, 1885. Application filed July 25, 1884. I couldn't find a patent for a machine to make bottles and/or jars between 1882 and 1885 except for this one. Essentially, this machine gave a uniform size and shape to the mouth of a previously hand blown bottle or jar. The absence of patent activity somewhat substantiates the lack of glass industry interest in the Arbogast principle. Likewise, a review of Dick Roller's files on glass firms throughout the United States at this time further affirmed this thought.

¹² *Flame and Heat, A History of the Glass Bottle Blowers Association of the United States and Canada*, Lee. W. Minton, Merkle Press Inc., 1961, pg. 26; *Chapters on Machinery and Labor*, George E. Barnett, Southern Illinois University Press, Carbondale and Edwardsville, Indiana, copyrighted 1926 by the President and Fellows of Harvard College, Boston, Massachusetts and reprinted 1969, pg. 68; *Fruit Jar Newsletter*, July 1997, pg. 877 and *The Commoner and Glassworker*, November 11, 1899, pg. 4. The first reference indicated the machine used compressed air to blow the item; however, the July 11, 1882 patent text stated a blow-pipe was used as the expansion source. Dick Roller in the penultimate source above stated Mr. Ripley paid \$250 for the Philip Arbogast patent rights. The last reference contradicted Mr. Roller and indicated the sum was \$450.

¹³ *American Pressed Glass and Figure Bottles*, Albert Christian Revi, Thomas Nelson Inc., Camden, New York and New York, New York, 1964, pg. 290; United States Patent Office. Daniel C. Ripley, of Pittsburg, Pennsylvania. Design for a Bottle. SPECIFICATION forming

part of Design No. 17,243, dated April 5, 1887. Application filed January 15, 1887, Serial No. 224,498 and United States Patent Office, Daniel C. Ripley, of Pittsburg, Pennsylvania. Manufacture of Glassware. SPECIFICATION forming part of Letters Patent No. 364,298, dated June 7, 1887. Application filed January 15, 1887, Serial No. 224,428.

¹⁴ *From the Flints: History of the American Flint Glass Workers Union and the Early Labor Movement*, 1853-1910, reprinted from *The American Flint*, June-July, 1910, West Virginia Museum of American Glass, Ltd., Monograph No. 90, 2009, pg. 19.

¹⁵ *Chamber's Journal of Popular Literature Science and Arts*, 1888, W. & R. Chambers, London & Edinburgh, January 28, 1888, pg. 62.

During the same timeframe that Mr. Ripley was exploring the mechanization of the 1882 “press and blow” concept to make wide mouth tableware and storage jars at his glasshouse in Pittsburgh, Howard Matravers Ashley was working on a machine for the production of narrow mouth bottles in England. He was successful in this equipment’s development so much so that his innovation was patented in that country in 1887 and similarly protected by patent processes in six separate European nations, Canada, Norway and three states in Australia. By January 1888, Mr. Ashley’s bottle machine was already being used by Messrs. Sykes, Macvay, & Company of Castleford, England. A little before September 26, 1887, H.M. Ashley submitted his invention for the “Manufacture of Glass Bottles, &c.” to the USPO. For some reason, he had to divide this application into smaller parts and forward the parts individually. He did the segregation and resubmitted. The Patent Office filed his new request on November 10, 1888. As a result, the United States authority granted him ten individual patents for various aspects of his machine for making bottles in 1889 (403,023; 403,024; 403,025; 403,026; 403,027; 403,716; 403,717; 403,718; 403,719 and 416,149), another in 1890 (433,062) and finally one more in 1894. The last one (517,016), which was filed in Washington, the District of Columbia on October 10, 1890 and garnered a patent on March 27, 1894, was assigned to the American Bottle Company of Woodbury, New Jersey. The evolution of the narrow neck bottle machine will not be covered in this article. If you would like the details I've found and assembled on this matter, please contact me separately.

¹⁶ United States Patent Office. Daniel C. Ripley, of Pittsburg, Pennsylvania. Machine for Blowing Glassware. SPECIFICATION forming part of Letters Patent No. 458,190, dated August 25, 1891. Application filed January 13, 1891, Serial No. 377,609.

¹⁷ United States Patent Office. Daniel C. Ripley, of Pittsburg, Pennsylvania. Pneumatic Machine for forming Glassware. SPECIFICATION forming part of Letters Patent No. 461,489, dated October 20, 1891. Application filed April 29, 1891, Serial No. 391,012.

¹⁸ *Pressed Glass in America Encyclopedia of the First hundred Years 1825-1925*, John & Elizabeth Welker, Antique Acres Press, Ivyland, Pennsylvania, 1985, pgs. 107-108.

¹⁹ *Crockery and Glass Journal*, August 19, 1889; *Pittsburgh Glass 1797-1891 A History and Guide for Collectors*, Lowell Innes, Houghton Mifflin Company, Boston, Massachusetts, 1976,

pgs. 460-462 and *Pressed Glass in America Encyclopedia of the First hundred Years 1825-1925*, John & Elizabeth Welker, Antique Acres Press, Ivyland, Pennsylvania, 1985, pgs. 105-108.

²⁰ *The Federal Reporter*. Volume 88, *Cases Argued and Determined in the Circuit Courts of Appeals and Circuit and District Courts of the United States August-October, 1898*, West Publishing Company, St. Paul, Minnesota, 1898, UNITED STATES GLASS CO. v. ATLAS GLASS CO. et al. (Circuit Court, W.D. Pennsylvania, April 13, 1898), pgs. 493-504. "...United States Glass Company, the owner of letters patent No. 260,819, granted July 11, 1882 to Philip Arbogast..."

²¹ *Proceedings of the Sixteenth Annual Convention of the American Flint Glass Workers' Union* held in Marion, Indiana, July 1893, Pittsburgh, pgs. 19-21 and 48.

²² *Chapters on Machinery and Labor*, George E. Barnett, Southern Illinois University Press, Carbondale and Edwardsville, Indiana, copyrighted 1926 by the President and Fellows of Harvard College, Boston, Massachusetts and reprinted 1969, pgs. 73-74 and *Proceedings of the Sixteenth Annual Convention of the American Flint Glass Workers' Union* held in Marion, Indiana, July 1893, Pittsburgh, pgs. 19-21. Mr. Smith was quoted as saying in the latter source: "...Under favorable conditions it is no exaggeration to say that a shop can produce four thousand 2 oz. bottles in a day's work...."

²³ *Revolution in Glassmaking*, Warren C. Scoville, Harvard University Press, Cambridge, Massachusetts, 1947, pg. 202.

²⁴ *Chapters on Machinery and Labor*, George E. Barnett, Southern Illinois University Press, Carbondale and Edwardsville, Indiana, copyrighted 1926 by the President and Fellows of Harvard College, Boston, Massachusetts and reprinted 1969, pg. 74.

²⁵ *Ibid*, pg. 74.

²⁶ *Acts of the Legislature of West Virginia at its Twenty-First Regular and Extra Sessions commencing January 11, and February 25, 1893*, Moses W. Donnally, Charleston, West Virginia, 1893, pg. 70; *History of the American Flint Glass Workers' Union of North America 1878 1957*, Thomas W. Rowe (Part I) and Harry H. Cook (Part II), undated but circa 1957, pgs. 144-145; *The Commoner and Glassworker*, November 27, 1897; Central City, Lola Roush Miller, Arcadia, Charleston, South Carolina, 2006, pgs. 23-24 and *Images of America The Great Ohio River Flood of 1937*, James E. Casto, Arcadia Publishing, Charleston, South Carolina, 2009, pg. 24. The WVFBC was chartered as a corporation in West Virginia on June 19, 1891. AFGWU Local Union No. 67 was instituted in Central City (just west of Huntington, West Virginia) on March 18, 1892 probably to represent brothers working at this firm. The Company's factory had one furnace with twelve pots. A report in the September 24, 1892 issue of *The Baltimore Sun* indicated eight "iron men" had been hired to replace the blowers signifying the shift to machine production of bottles. This concern was listed as not in operation in late 1897. According to a later account, this organization's plant was later used by the

Huntington Tumbler Company which started operations around August 20, 1895.

²⁷ UNITED STATES CIRCUIT COURTS OF APPEALS REPORTS, VOLUME 32, West Publishing Co., St. Paul, Minnesota, 1899, UNITED STATES GLASS CO. v. MATHEWS et al. (Circuit Court of Appeals. Fourth Circuit. November 1, 1898.) No. 247, pgs. 365-366.

²⁸ *Proceedings of the Sixteenth Annual Convention of the American Flint Glass Workers' Union* held in Marion, Indiana, July 1893, Pittsburgh, pgs. 19-21.

²⁹ Ibid, pg. 48.

³⁰ *China, Glass and Lamps*, September 23, 1896, pg. 18.

³¹ *A Story of the Hazel Atlas Glass Company*, John S. Algeo, unpublished manuscript dated December 21, 1956, pgs. 19 and 24.

³² *The Dating Game: The C.L. Flaccus Glass Co.*, Bill Lockhart, Pete Schulz, Carol Seer and Bill Lindsay, Bottles and Extras, November-December 2007, pg. 2. (Information was distilled from the January 1910 issue of National Glass Budget.)

³³ *Proceedings of the Sixteenth Annual Convention of the American Flint Glass Workers' Union* held in Marion, Indiana, July 1893, Pittsburgh, pgs. 19-21.

³⁴ *Pressed Glass in America Encyclopedia of the First hundred Years 1825-1925*, John & Elizabeth Welker, Antique Acres Press, Ivyland, Pennsylvania, 1985, pgs. 28-29.

³⁵ *Proceedings of the Sixteenth Annual Convention of the American Flint Glass Workers' Union* held in Marion, Indiana, July 1893, Pittsburgh, pgs. 19-21.

³⁶ United States Patent Office. Daniel C. Ripley, of Pittsburg, Pennsylvania. Apparatus for forming Articles of Glassware. SPECIFICATION forming part of Letters Patent No. 593,857, dated November 16, 1897. Application filed January 3, 1893, Serial No. 457,040.

³⁷ *The Spatula An Illustrated Monthly Publication for Pharmacists*, Irving P. Fox, Volume XVI, October 1909-date obliterated, pg. 653. Dr. Julian H. Toulouse similarly documented the use of a side lever machine. Perhaps, he used the main source as the basis for his statement. *Bottle Makers and Their Marks*, Julian Harrison Toulouse, Thomas Nelson, Inc., Camden, New Jersey and New York, New York, 1971, pg. 190. It is interesting that both references give C.L. Flaccus the credit for being the first to make wide mouth bottles and/or jars by machine in the United States when D.C. Ripley was actually the forerunner in this regard.

³⁸ *Revolution in Glassmaking*, Warren C. Scoville, Harvard University Press, Cambridge, Massachusetts, 1947, pg. 324. In a latter testament, the president of CMC (a petroleum jelly producer), said the original EGC made vaseline jars were of inferior quality because they had rough, sharp edges along the mouth area.

³⁹ *Proceedings of the Sixteenth Annual Convention of the American Flint Glass Workers' Union* held in Marion, Indiana, July 1893, Pittsburgh, pgs. 19-21.

⁴⁰ *China, Glass and Lamps*, May 24, 1893, pg. 23.

⁴¹ *The Story of Ball Brothers*, George Myers, published by Ball Brothers Company, circa 1964, pg. 43. This reference stated the Ball Brothers Glass Manufacturing Company (BBGMC) of Muncie, Indiana purchased the Arbogast patent from the USGC in 1893. I'm not certain Ball purchased the patent outright but rather, firm officials purchased a license to use this technique as other concerns did at this time. The license method would be more in-line with the philosophy of Daniel C. Ripley. Regardless of means, there is no documentation which suggests BBGMC leaders began using it to experiment with any machine in their Muncie factory to make fruit jars or packers' ware until the late 1896 or early 1897 timeframe.

⁴² Blue was Charles E. Blue, the Wheeling, West Virginia foundry owner, who was hired by Charles N. Brady to develop a machine. Shirley was most likely David L. Shirley, who along with Jesse O. Johnson, eventually patented (781,685) a "Glass-Forming Machine" of their own on February 7, 1905.

⁴³ United States Patent Office. Charles E. Blue, of Wheeling, West Virginia, Assignor of five-eighths to Arthur E. Hubbard and Louis V. Blue, of the same place. Mold for the Manufacture of Glassware. SPECIFICATION forming part of Letters Patent No. 531,609, dated December 25, 1894. Application Filed June 27, 1894, Serial No. 515,872.

⁴⁴ United States Patent Office. Charles Edwin Blue, of Wheeling, West Virginia, assignor of one-fourth to Arthur G. Hubbard, of same place. Machine for Manufacturing Glass Bottles, &c. SPECIFICATION forming part of Letters Patent No. 567,071, dated September 1, 1896. Application filed January 18, 1896, Serial No. 575,999.

⁴⁵ A Story of the Hazel Atlas Glass Company, John S. Algeo, unpublished manuscript dated December 21, 1956, pgs. 25 and 45.

⁴⁶ *Ibid*, pg. 24.

⁴⁷ Examples of such devices would be Harry Semple's November 5, 1889 patent (414,451) for a "Machine for Finishing Glassware;" Charles N. Brady's December 3, 1889 patent (416,559) for a "Machine for Finishing the Necks of Bottles, &c.;" Thomas T. McCoy's patent (463,575) for a "Tool for Threading Bottle-Necks" that was issued to him on November 17, 1891 and Charles Leng's patent (480,774) for an "Implement for Finishing the Necks of Bottles" granted on August 16, 1892. The last device was used in the non-union bottle works of John D. Carter (John D. Carter Glass Works) in Rochester, Pennsylvania before it was patented. History of Beaver County Pennsylvania: and its Centennial Celebration, Rev. Joseph H. Bausman, AM, Volume II, The Knickerbocker Press, New York, New York, 1904, pg. 745 and *China, Glass and Lamps*, June 16, 1897, pg. 17.

⁴⁸ In second place was the H.M. Ashley designed and improved mechanical apparatus (433,062). Two green (aqua) lime glass bottle blowers (probably Messrs. Jones) from Pittsburgh held another (436,790). Still another Pittsburgh glass man (likely Thomas Atterbury), described as a flint lime glass blower, had devised and patented a different machine (484,131).

⁴⁹ Proceedings of the Eighteenth Annual Convention of the American Flint Glass Workers' Union, Liberty Hall, Toledo, Ohio, no printers information, July 1895, pgs. 59-60 and 257.