A History of Non-Returnable Beer Bottles

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Just as archeologists piece together the story of the past from fragments of ancient pots, so future historians might well glean insights into the way we live today by studying the shapes, materials, and surface designs of the "vessels" which contain our products (*Modern Brewery Age* 1964).

The repeal of Prohibition in 1933 was welcomed by glass bottle manufacturers because it meant the revival, in the midst of the depression, of what had once been an important market. This initial optimism was quickly followed, however, by concern over the rise of a significant new competitor for that market: the tin can. The ensuing competition resulted in dramatic changes in the form and use of the beer bottle. In creating these changes, glass manufacturers – once the passive recipients of designs suggested by bottlers – invested heavily in engineering research and in marketing, and they were greatly influenced by changes occurring in popular culture, tax codes and (from 1942 to 1946) wartime restrictions. At the same time, standardization of bottle forms, strongly favored by the glass industry, ultimately came in conflict with proprietary diversification favored by brewers. These changing influences produced a rapid evolution in beer bottle forms.

Although the general historical context of these developments has been documented by Busch (1983), the sequence and chronology of the various bottle styles has been little studied. These once-ubiquitous containers will certainly become of increasing interest to 21st-century archaeologists. Furthermore, the evolution of these bottles is related to an amazing variety of developments in the glass and brewing industries, and in American culture generally. Consequently, we have investigated the evolution of non-returnable bottles from their appearance on the American market until their evolution ultimately fell afoul of bottle deposit laws in the 1970s.

Historical Background

National Prohibition (1919-1933) failed to stem the demand for alcohol consumption in the United States, and a return to legal drinking offered a new era of prosperity to breweries and

other alcohol-related industries, including those industries that supplied them with equipment, transportation and containers. On the eve of Repeal, bottle manufacture had declined to about 70% of its high in early 1929. The industry estimated that the return of legal beer would create an initial market for 6,000,000 gross of bottles, which would justify the reopening of numerous glass plants and employ about 24,000 additional workers (Ceramic Age 1932; 1933).

The glass industry's relief at the restoration of a major market, however, was quickly threatened. In October, 1933, the American Can Co. confirmed rumors that it was developing a practical beer can. Over the following few months it became apparent that the company's experiments had produced a container with a new type of body seam and can end, capable of withstanding high pressure, and an interior enamel lining ("Keglining") to protect the taste of the beer. Continental Can Co. soon began a similar program, and other can makers followed suit (*Modern Brewery* 1933:17; *Wall Street Journal* 1934; 1935a; 1935b; 1936b; *Food Industries* 1935a; *Fortune* 1936; Beer Can Collectors 1985:2-11).

Cans had several advantages. They were disposable, thus eliminating the customer's (and the retailer's) inconvenience in dealing with returns and deposits. They were also lighter than bottles and therefore cheaper to ship, saved the brewer the shipping costs of returning empties and the cost of bottle-washing equipment, were unbreakable, and the same volume of beer could be shipped or stored in a smaller space than was possible with bottles. In September, 1934, the Krueger Brewing Co. revealed market research indicating that most of these factors appealed to the great majority of beer drinkers. Furthermore, it had developed a "draught" beer for packaging in cans, which the majority of surveyed consumers preferred over bottle beer.

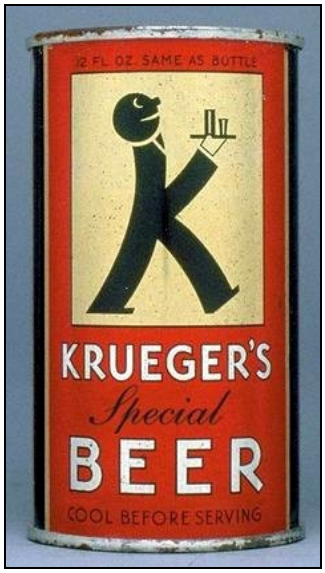

Figure 1 – Kruger can
(Selectism: Pinterest)

Krueger introduced canned beer in Richmond, Virginia, in January, 1935, the first canned beer on the market (Figure 1). Results astounded the industry. Within six months, Krueger sales had reached 550% of pre-can production, and the company was unable to keep up with demand (*Fortune* 1936:82). By the end of the year, many additional breweries had adopted the can for part of their container sales, and orders were outpacing the ability of the can companies to provide equipment. Daily production had reached 3,500,000 beer cans (equivalent to 40% of total can output), with

expectations of even brighter prospects to come (*Food Industries* 1934; 1935a; 1935b; *Wall Street Journal* 1936a). (See Maxwell [1993] for a the subsequent development of the beer can.)

Bottle makers – already keenly aware of the active competition between glass and tin in the packing industry – recognized the threat to their previous monopoly on beer containers. With cans a viable option, new bottle development began in earnest.

The first non-returnable bottles were introduced to the market in August, 1935. These compact containers were specifically intended to incorporate the advantages of cans: compactness, disposability, light weight, and elimination of deposits. Additionally, the glass industry stressed less tangible advantages over the can, such as "true brewery flavor, no metallic taste, and social acceptability" (*Glass Packer* 1939d:332). A further advantage was that the non-returnable bottle was "sealed with a regular bottle cap and will open with any kind of bottle opener" (*NYT* 12-9-35:11).

A more successful variety of non-returnable bottle was introduced in 1936. By October of that year, of 613 breweries that packaged their product, all were still using returnable bottles, but 81 were also using cans, while 98 were using one of the non-returnable glass containers (*Western Brewing World* 1936b; 1936c). As the competition between bottles and cans continued, additional non-returnable styles were developed.

According to Glaenzer (1960:49), non-returnable bottles went through eight stages by 1960 (Figure 2). This provides a relative (though simplified) sequence for non-returnable beer bottles over a 30-year period, but no specifics on the chronology of individual styles nor on the rationale for changes. This study assesses this sequence and investigates the chronology of design changes in non-returnable beer bottles through the eventual abandonment of standardization of configurations in the 1960s, and the relationship of these changes to larger forces in the American economy and American culture.

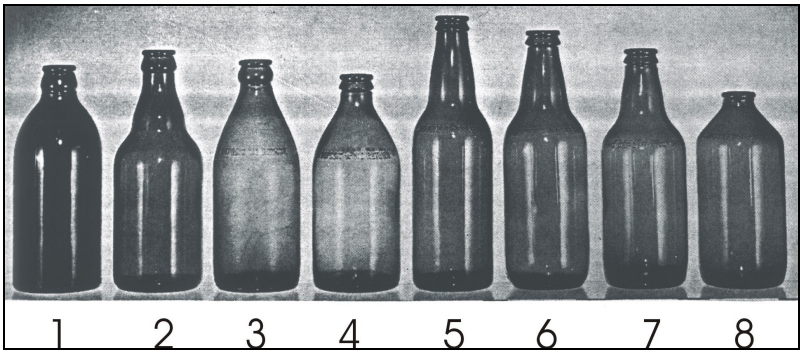

Figure 2 – Non-returnable bottles (*American Brewer* 1963:18)

Methods

Investigation of the chronology of non-returnable beer bottles, and the factors which led to their evolution, involved both literature and artifact analysis. The former involved extensive investigation of glass and brewery trade journals from the repeal of prohibition through the 1980s, as well as newspapers available on searchable databases. Additionally, non-returnable bottles were examined in archaeological, museum and private collections, and collectors and glass industry employees were interviewed.

Returnable Bottle Styles

Prior to discussion of non-returnable containers, it is necessary to first describe the beer bottle styles that preceded and accompanied these developments. At one time, "rushing the growler" (i.e., taking beer home in a bucket) was the norm, and returnable bottles had been the only other option. Returnable bottles immediately reappeared after the end of Prohibition and began to be popular with the home trade. Although returnables reappeared in much the same variety of styles and sizes that had preceded the advent of Prohibition, three customary forms dominated the market.

The end of Prohibition left brewers (unlike distillers) with no federal regulations regarding the nature of the containers to be used for their product. In a few cases, their choices were idiosyncratic. Rainier Brewing Co., for example, decided to exploit their stocks of the short, broad ("Squatty") bottles used during Prohibition for near-beer, and it shipped the appreciable unused stock to its San Francisco plant for use on the California market (*Western Brewing World* 1936a:11). Brewers within a few years were reportedly using 120 styles and sizes of bottles (Williams 1942a). Most brewers, however, fell back on styles that were formerly the customary containers of the industry, and three general styles dominated the market. They are referred to in the trade literature as Export, Ale, and Select bottles.

Export Bottles

The Export beer bottle was reportedly developed in 1871 by Valentine Blatz, a Milwaukee brewer who in that year produced the first bottled lager beer in America (*National Glass Budget* 1909). These first bottles were of "quart" size and made of aqua glass. Evidently

patterned on black glass ale bottles, they had well-defined shoulders and slightly bulbous necks. As bottled lager caught on, bottles of Blatz's style were soon imitated by other brewers and designated "export" beer bottles, based primarily on the exporting of beer to the western territories of the continental U.S., although such beer was also exported to other countries. Smaller sizes were eventually introduced, and amber glass gradually became more popular than aqua. By the turn of the century, this was the most common beer container style in America. Following Repeal, it was so dominant that it was frequently referred to as the "standard" beer bottle, although by then 11 oz. and 12 oz. bottles were in far more common use than larger sizes.

Ale Bottles

The Ale bottle, like the Export, had well-defined shoulders, but differed in having a straight-sided tapering neck. Almost always made in amber glass, its origins are less clear, but the post-Repeal industry clearly favored its use for ale and porter. As these heavier beverages were less popular than lagers, this style of bottle was less extensively used than the Export bottle.

Select Bottles

The Select bottle—usually made in colorless glass—has only vaguely defined shoulders, the sides narrowing gradually to blend into the neck. The style is probably based on the Champagne and Apollinaris styles of the 19th century, modified to produce an even more "elegant" container. It was used by the Pabst Brewing Company in the early 1890s for their Blue Ribbon brand (with an actual ribbon tied around the neck). In 1895, Pabst changed the label on these bottles to read "Pabst Select" (*Modern Packaging* 1983:86), and this was undoubtedly the origin of the style name. Judging from post-Repeal advertising, it was probably the least commonly used of the three general styles.

The Crown Finish

Although the evolution of the crown finish is dealt with below, it is important to establish a standardization in terminology. The finish—so called because it was the final part of the mouth-blown process—is that part of the bottle at the top of the neck that actually interacts with the closure used. The crown finish—the exclusive finish used on pre-1960s non-returnable beer bottles—is divided into two segments. The upper section—the crowning ring or locking

ring—is the rounded ring that affects the seal with the crown cap. The lower section—the reinforcing ring—is so called due to its function in absorbing the pressure created during the capping process. As discussed later in this paper, the crown finish evolved as a direct result of the development of non-returnable bottles.

Pre-War Non-Returnable Bottle Styles

1. The Stubby (1935-1970s)

In August, 1935, Owens-Illinois, the nation's largest bottle manufacturer, announced the development of the Stubby, "a new, one-trip, no-deposit, non-returnable beer bottle" intended to hold as much beer as standard returnable bottles, but explicitly created to compete with cans in disposability and reduced size (*Wall Street Journal* 1935c; *Brewers Technical Review* 1935:275-276). Its promoters urged that the "principal advantages" of the Stubby were its "compactness and light weight, which make possible shipment and delivery at less cost than any competitive package for distances up to 1,000 miles" (*Glass Packer* 1935a:545). Sponsored and advertised by the Glass Container Association, blueprints for the new style were distributed to all beer bottle manufacturers (*Glass Packer* 1936a).

The Stubby (Figure 3) was notable for its compact size compared to the tall, returnable, Export bottle. The shoulders of the bottle were well rounded; the finish was a crown with a tapered reinforcing ring. The 12-oz.-capacity bottle weighed 10½ oz. (compared to 12-14 oz. for the export bottle) and was 6 13/16 inches in height as opposed to the 9 ½-inch export bottle (*Food Industries* 1935c:446; Gass 1939). The surface of the bottle was smooth with no stippling or embossing. It held 12 oz. throughout most of the country, but 11 oz. in the far west where that was the traditional capacity for beer bottles (*Western Brewing World* 1936d:20). A half-gallon version of the bottle, called a "Picnic Stubby" was placed on the market in 1936 (*Brewery Age* 1936:25-28).

Figure 3 – Stubby

Aside from differences in size, a single variation in the design of the Stubby bottle is distinguished by an embossed ring around the shoulder. This variation was evidently restricted to the Pacific Coast. The Owens-Illinois Pacific Coast Co. was offering such bottles by late

1935 (*Oakland Tribune* 1935), and other western glass companies soon followed. This embossed line was evidently the "bead" mentioned by Toulouse (1941:24) as distinguishing 11-oz. from 12-oz. bottles. It is noteworthy that on the Pacific Coast, where the 11-oz. bottle was standard, all the Stubbies illustrated in brewery advertisements exhibit the ring.

The Stubby was also used for other purposes. Mission Dry Corp. began packing orange juice in Stubby bottles in late 1936 (*New York Times* 1936a). Grape juice, too, was bottled in slightly modified Stubby bottles. By 1938, "practically all grape juice packers [were] using stubbies" (*Glass Packer* 1938b:599). Grape juice Stubbies shown in ads, however, had two notable characteristics that set them apart from those used for beer. First, they were colorless, rather than the amber color preferred for beer bottles. Second, they had tear-drop-shaped embossed ribs "flowing" down the shoulder (Figure 4). The Brockway Glass Co. even called these "Grape Juice Stubbies." By 1939, the colorless Stubby—with a tomato plant embossed on the shoulder—was also a popular container for catsup, and a modified Stubby with a continuous-thread finish and grape vines embossed on the shoulder was even used for bottling wine. Most of these were packed in larger bottles than the ones used for beer (*Glass Packer* 1939a:197; 1939b; 1939c:321; 1939e:451; 1939f:709-711).

Figure 4 – Stubby vinegar (eBay)

Though widely advertised, Stubby market penetration was never great. Highest sales were in July 1937, when Stubby bottles accounted for 2.8% of the package beer market. In 1938, however, that fell to 1.5%. In comparison, sales of the Steinie, introduced less than a year after the Stubby (see below), accounted for 31.7% of the 1938 market. Sales of cans remained steady during the period, around 10%, peaking at one point during 1937 at 12.4% (*New York Times* 1937; 1938). By June 1939, just one month after introducing a third non-returnable style, Owens-Illinois ads had already eliminated the Stubby. Anchor Hocking and Latchford-Marble, however, advertised the Stubby along with subsequent non-returnable styles until 1942. By this time, however, it was just one of many minor styles that fell afoul of wartime standardization efforts. Limitation Order L-103 from the War Production Board banned the making of additional molds for these non-standard styles effective May 11, 1942, and banned production of the bottles entirely effective January 1, 1943 (Williams 1942b:5).

It is noteworthy that the Stubby's status as a non-returnable—one of the principal justifications for its creation—quickly came into question. Within a few months of its introduction, a detailed review of the tin vs. glass competition reported that

> The bottlemaker . . . doesn't let the brewer forget that while Stubby is theoretically scheduled for one trip, it actually may travel frequently in and out of his brewery. For bottles are seldom destroyed. And any bottle, Stubby or otherwise, may eventually find its way back to the brewery through junkmen and second-hand bottle dealers at greatly reduced rates (*Fortune* 1936:80).

Despite this casual reuse, no evidence has surfaced that a formal conversion to returnable status actually affected the pre-war Stubby. This fate did, however, quickly overtake its more popular successor, the Steinie (see below).

Although the Stubby was eliminated from the market as a war economy measure, the style experienced a post-war revival—as a returnable bottle—in the western states (especially in the Pacific Northwest), and later in Canada. The Northwestern Bottle Co. made Stubby bottles from at least the 1950s to 1973 based on date codes on the bases of bottles as well as beer ads. The bottles all have stippled bases, pioneered by Owens-Illinois Glass Co. on other styles, in 1940. Bottles found in Oregon include the "fill line" or ringed shoulder variation and one with stippling on the heel. Although they are non-returnables, these bottles lack the "NO DEPOSIT NO RETURN" embossing that was required by the Glass Container Association in 1941 (see below).

> Interestingly, Canada adopted the Stubby as the national beer bottle:
> The stubby beer bottle was Canada's national beer bottle from 1961 to 1984. In 1961 the Dominion Brewers Association (now the Brewers Association of Canada) replaced the heavy, bulky, non-standard 12 oz "pint" and 22 oz "quart" beer bottles with a new more efficient [*sic*] designed "stubby" bottle to be used by all Canadian breweries. These were returnable bottles intended to be refilled numerous times (Whistler 2001-2006).

Stubbies (in 11 oz and 12 oz capacities) continue to be used today by a few breweries.

One problem with the Stubby was that its markedly shorter size required significant adjustment of bottling machinery. This difficulty was addressed by the F.E. Reed Glass Co., which in November, 1935, offered two styles of 12-oz. "no deposit" bottles modeled after the Export style, but substantially shorter. Style 173 was 7½ inches tall; Style 183, 6-25/32 inches. They were advertised "for brewers who wish to meet present day competition of other containers without having to make expensive changes in their present bottling machinery" (*Brewery Age* 1935). However, since Style 183 was only 1/32-inch taller than the Stubby, it would seem that the actual appeal was to a conservative preference for more traditional form. It is unlikely that many of these bottles were actually adopted by breweries; style 173 was so similar to the Steinie, introduced by the industry a few months later, that any subsequent production would be difficult to distinguish.

2. The Steinie (1936-1960s)

Presumably inspired by the Stubby's limited market penetration, Owens-Illinois within a year introduced an alternative: the Steinie. Available in April, 1936, and heavily advertised, the Steinie was an instant success.

The Steinie's neck was "an abbreviated but very recognizable adaptation of the neck of the standard export bottle" and therefore could "take advantage of the traditional acceptance which the longer necked standard bottle has built up through years of use" (*Glass Packer* 1936a:94). Press reports supported the idea, noting that "it is said to have made rapid progress because it combines the traditional beer bottle shape with the smaller height and less weight" (*New York Times* 1936b). The principles guiding the new design were detailed by one of the engineers involved in its production:

> We were enabled to sketch in a bottle that would satisfactorily operate in each of the [bottling] machines that we studied. In order to make the bottle as compact as possible, we followed the limiting contour as closely as we could. In order to develop the bottle as a beer bottle, we tried to make it as near the traditional shape as possible, still keeping in mind that we were creating an entirely new concept of a container for beer (J.H. Toulouse, in *Brewers Digest* 1938:57).

At seven inches, the Steinie was noticeably taller than the Stubby (but dramatically shorter than Export bottles) and similarly had a smooth surface with no stippling or embossing (Figure 5). The crown finish could have either a rounded or tapered reinforcing ring. Like the Stubby, the Steinie weighed 10½ oz. Steinies were also available as half-gallon bottles in August, and in quarts by October 1936 (*Glass Packer* 1936b:631; *Brewers Technical Review* 1936:34; *Western Brewing World* 1936c:25; Toulouse 1937:345). Steinie quarts were advertised in *Modern Brewery Age* until at least December 1943 (Figure 6).

Figure 5 – Steinie

Almost from the beginning, the Steinie saw use as both a non-returnable and a returnable container. A February 1936 article noted that the "Stubby will retain its place as the no-deposit container for beer, while the Steinie may, in local areas, be used as a deposit bottle" and "make many trips through the brewery, thus lowering bottling expenses" (*Glass Packer* 1936a:94). By the fall of 1936, the Steinie was being used as a returnable in California and the Midwest. By the following May, brewers in New York had followed suit, in each case reducing the deposit from two cents (the standard for returnable bottles) to one cent. Press accounts noted that "the recently introduced 'steinie' bottle, originally planned to be 'non-returnable,' to compete with cans, will also be redeemed at 1 cent." The movement toward returnable status appeared to be a nationwide trend (*Glass Packer* 1936c:722; *Los Angeles Times* 1936; *New York Times* 1937). In October, 1937, a national ad for applied color labels selected the Steinie to illustrate the legend "IDEAL FOR RE-USE CONTAINERS" (*Glass Packer* 1937:621). Conversion to returnable status was so rapid and so complete, that a 1947 trade review of non-returnable bottle styles erroneously reported that the Steinie was "never used as a single-trip container" (*Modern Packaging* 1947:105).

Figure 6 – Steinie quart ad (*Modern Brewery Age* 1943)

Steinie popularity rapidly increased, and it became the fastest growing beer container (Figure 7). While cans slightly outsold Steinies at the beginning of 1937, by July, Steinies had gained 24% of the beer container market. That gain had increased to 31.7% by December 1938. Stubby sales fell to just 1.5% (*New York Times* 1938). Unlike Stubbies, Steinies seem to have had limited appeal to bottlers of other products, but they were used for bottling sauerkraut juice in 1938 (*Glass Packer* 1938a:238).

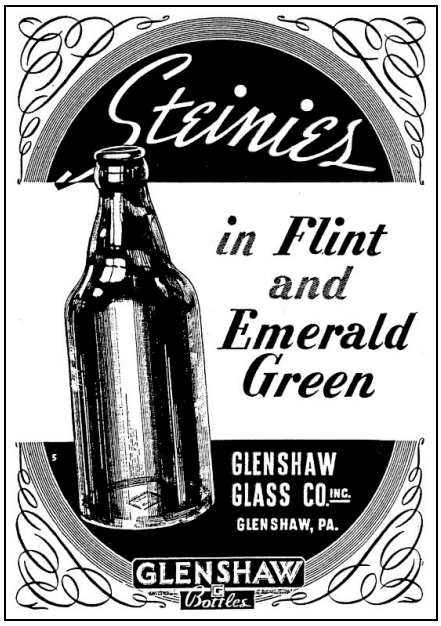

Figure 7 – Steinie ad (*Modern Brewery Age* 1940)

In the 1941 industry standardization (see below), Steinies were limited to 7, 11, 12, 32, and 64 oz. sizes; when the government imposed standardization the following year, only 12, 32 and 64 oz containers were allowed (Toulouse 1941:37; Williams 1942b).

The only known variation in the Steinie bottles (other than in size) has an embossed ring encircling the swelled area of the neck, a decorative effect in use by September 1936 (*West Coast Brewer* 1936). Apparently limited to the western states, it is likely that—as with the Stubby—the ring indicated 11-oz. capacity. It is possible that there were minor variations in the neck design, but that has not yet been positively determined. At least two breweries used Steinie bottles made from green glass, although amber remained the standard color. Green was typically used for ale bottles.

Steinies continued to be used by American brewers, although in ever decreasing numbers, into the late 1960s. Ironically, they were adopted in 1969 by Dormunder Actien-Brauerie (DAB), a German brewery. In the 1970s the Steinie became a standard beer bottle style in Europe, where it was favored because its relatively low center of gravity made it particularly effective in high-speed filling lines. It continued to be manufactured in Europe into at least the mid-1970s (*Modern Brewery Age* 1969c:27; Kazakov and Kulagina 1975:524).

3. No Deposit ("Packie") Bottle (1939-ca. 1949)

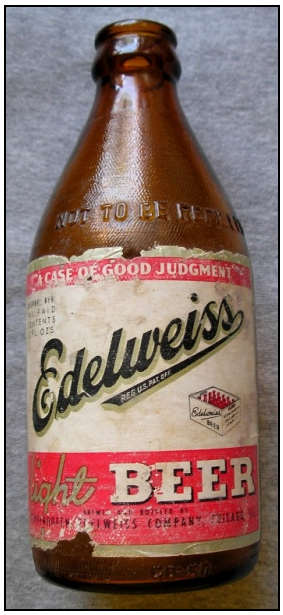

Figure 8 – Packie

On May 26, 1939, the Glass Container Association announced the availability of a new non-returnable bottle (Brewers Digest 1939:52; *Glass Packer* 1939d:332). Often referred to in the glass and brewing industries as the Packie (an Owens-Illinois term) and sometimes as the Brownie by the Brockway Glass Co. (*Modern Brewery Age* 1944c:11), the new container was more often called simply the No Deposit bottle. It was slightly taller than the Stubby, and the shoulder was much more conical in profile. The reinforcing ring on the crown finish was rounded (Figure 8). The two most notable features that set the No Deposit apart from the Stubby were its stippled surface and the embossed "NO DEPOSIT - NO RETURN // NOT TO BE REFILLED" (NDNR) message on the shoulder (Figures 9 & 10).

Three years of preliminary research and market testing preceded the 1939 announcement. The 12-oz. bottle was 6 ¾ inches tall and 2 ¾ inches in diameter, with a weight of 7 ⅜ oz. One reason for the stippling was to make the bottle more difficult to wash and reuse because bottle makers had learned from the Stubby and Steinie that non-returnable bottles could be converted to returnables. Both the thinness of the glass walls and the stippling helped prevent this with the No Deposit bottle (Gass 1939:69, 73). Although usually touted simply as signaling its no-return status, the stippling also strengthened the bottle by localizing the force of any impact and decreasing breakage (*Glass Packer* 1940:229). Since the heel provided the most common impact location, the bottle was strengthened by providing a more rounded heel than in previous beer containers and by a slight thickening of the walls at that point (Ghering 1939).

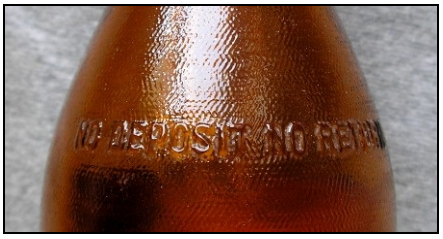
Figure 9 – NR embossing

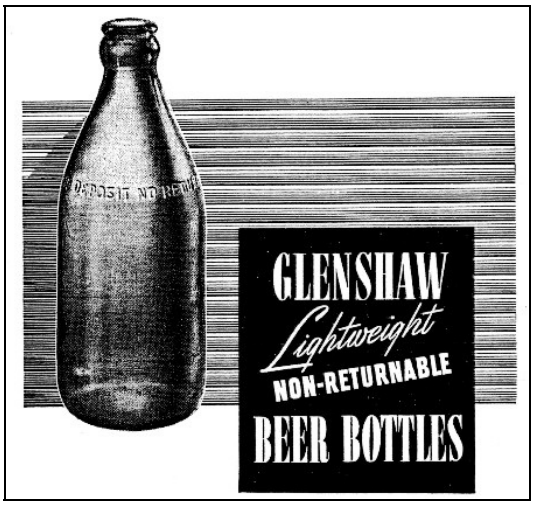

Figure 10 – Packie ad (*Modern Brewery Age* 1941)

According to the designers (Toulouse 1939:62-66), lighter weight was "more than a matter of employing thinner glass walls": the shape with "nearly uniform distribution of glass in its walls," was even more important. Although a perfect sphere was the ideal shape for strength, a short cylinder came close in efficiency. The No Deposit beer bottle provided an excellent example:

> We can point to our new single-trip beer container as an example of these principles. This bottle almost approaches a tear drop in shape. It is almost unbelievably strong. . . . There are no sharp corners, the height is not too great for its diameter, and the neck has about the same taper that would be produced in a globule of glass cooling as it was suspended from a gathering iron (Toulouse 1939:66).

Quart bottles in the No Deposit style were introduced in 1940 (Gass 1941:30).

The NDNR legend pioneered by the No Return bottle was formalized by the industry in 1941, when a joint committee of the United States Brewers Association and the Glass Container Association adopted standards for all beer bottles. The new requirement stipulated:

> [A]ll single trip bottles shall be of such shape and design that they will be readily distinguishable from standard deposit bottles or multi-trip bottles. Single trip bottle must be lettered on shoulder, "NOT TO BE REFILLED–NO DEPOSIT–NO RETURN" (Toulouse 1941:37).

A point of interest is a star between the "NO DEPOSIT (star) NO RETURN" embossing on some bottles. The star appears in bottle ads from Owens-Illinois Glass Co., Brockway Glass Co., and Glass Container Corp. but not in those of Anchor Hocking or Glenshaw. No Return production reached 138,000,000 bottles in 1941 and 435,000,000 in 1942 (*Modern Brewery Age* 1944a:89).

Although wartime restrictions interrupted production of the No Deposit bottle for civilian use (see below), the container remained in production until 1947 for export to the military. In 1944, more than 600 million bottles (mostly No Deposit bottles, but including an unknown number of One-Ways [see below]) were shipped overseas. Total wartime overseas shipments of beer in No Return bottles was 1,500,000,000 (*New York Times* 1943b; Fowler 1946).

Date codes on bottle bases, as well as advertisements, make it clear that some brewers continued to use the No Deposit bottle after World War II, and such bottles were made by Anchor Hocking and Thatcher for civilian use until at least 1949. It is likely, however, that increasingly fewer No Deposit bottles were used after the late-1944 introduction of the One-Way bottle (see below).

In 1947, the Anchor Hocking Glass Co. developed a "Ruby Red" version of the No Return bottle at Plant No. 2, Lancaster, Ohio. At least two "salesman's samples" were not stippled. Regular production was limited to 1949 and 1950, and those bottles *were* stippled. Aside from the red coloration of the glass, the bottles are identical to other No Return containers, except that the reinforcing ring is squared at the base (Hopper 2000:102-115; Toulouse 1969:14-15).

The Owens-Illinois Glass Co. offered citrate of magnesia bottles in this style in the early 1960s—the only non-beer use we have seen for the No Return bottle. Except for being made in colorless glass, these 12-oz. containers were identical in every way to the No Return bottle, including the stippled body and NDNR shoulder embossing (Owens-Illinois 1962:3).

Beer Bottles and the War

At the entrance of the United States into World War II, the government was faced with real or potential shortages of raw materials in a variety of industries that could affect the war effort, and it moved rapidly to control use of those materials. Once the War Production Board (WPB) was created in January 1941, it quickly began to place restrictions on the use of war materials for commercial purposes. Restrictions that affected beer containers were those on sheet steel (and hence tin plate) and cork. The canning industry was an important user of steel and tin needed for consumables and war materials. To prioritize essential functions, use of tin cans for beer (and some other commodities) was banned by Tin Conservation Order M-81, issued Feb. 11, 1942 (*Canning Age* 1942a).

Endangered Crowns and Victory Quarts

Elimination of the beer can was a boon to the glass industry, but two factors limited the benefit to beer bottle producers. First, tin can use was restricted (in some cases prohibited) for a variety of other products previously packed in cans, leading to a 1942 reduction of

10,000,000,000 units below previous annual levels (*Canning Age* 1942b). This meant a dramatic rise in demand from packers in those industries for glass containers—at a time when container production was at or near capacity, and when machine production was restricted as well.

A second development, rising from the need to conserve tinplate and cork, was a restriction on the manufacture of crown caps, production of which was reduced to 60% of pre-war levels by weight in May, 1942. On April 4, 1942, the *Wall Street Journal* warned, "There won't be any more shiny beer bottle caps. A curb on tinplate for crown caps on beer, soft drinks and canned jellies, jams, and preserved fruits will rob the bottle of its crowning glory." The military, too, began to feel the pinch. In 1943, Post Exchange officers were ordered to "have all cooperage, bottle caps, bottles and containers in which these beverages are delivered, salvaged and returned to the sources from which they were received" (*Modern Brewery Age* 1943b:18).

This restriction inspired innovative approaches to reusing crown caps and to recycling used tin cans for conversion into crowns, and new substitutes for cork (Aronovsky et al. 1944a; 1944b; Haffenreffer 1943; *Modern Packaging* 1942a:37; 1943:74-76; San Antonio Brewing Association 1942). Although it had no effect on styles of beer bottles, it did lead directly to an increased use of larger container sizes.

Large bottles had been in use almost since Repeal, and, in 1935, several breweries began using half-gallon containers ("picnic bottles") to package draft beer. These bottles, although cost-effective for both brewers and consumers, proved cumbersome to handle and difficult to store properly. Brewers consequently began experimenting with quarts to overcome these difficulties. In 1937, 4.3% of package beer by volume was being sold in quart bottles, an amount that increased steadily to 7.9% in 1940, by which time at least half of all breweries were using such containers. It was to supply this trend that the No Return bottle was almost immediately produced in quarts as well as 11- and 12-oz bottles, and it was successful in the larger size as well (*Brewery Age* 1936:25-28; de France 1935; Gass 1941).

In May 1942, Limitation Order L-103 restricted beer bottle sizes to 12, 32 and 64 oz capacities (see below). When these restrictions were immediately followed by the rationing of crowns, brewers promptly responded by heavy advertising for quarts, promoting the need to conserve crowns in wartime and stressing the economy of purchasing beer in larger packages. The bottles were labeled with evocative names such as jumbo bottles, guest bottles, hostess

bottles, bumpers, and victory quarts, and early ads featured instructions for consumers on how to reseal the bottles to keep the beer fresh (*Brewers Digest* 1942:20; Crandall 1942a; 1942b; 1942c; *Modern Packaging* 1942b:53; Williams 1942a; 1942b).

The Packie Goes to War

Production of container glass involved no essential war materials, but the industry had been increasingly urging that standard forms and sizes of containers would allow more efficient production since lighter bottles required less glass and allowed lower prices, while standardization would reduce problems in bottling operations (Algeo 1939a; 1939b; Toulouse 1939; 1941). The WPB, under Limitation Order L-103, standardized beer bottles effective May 11, 1942, restricting bottles to 12-oz, 32-oz and 64-oz capacities, and limiting the permissible weight of containers in each size category. The order only permitted four styles of bottle (Exports, Selects, Ales, and Steinies). The same order banned the manufacture of non-returnable bottles after May 21. The deadline in the latter part of the order, however, was extended several times, and in January, 1943, the NR container was adopted as a standard bottle, to be available in 12-oz and 32-oz capacities. The order also mandated into regulation the NOT TO BE REFILLED NDNR embossing that had been adopted by the United States Brewers Association and the Glass Container Association just two years earlier (*Modern Brewery Age* 1942; 1943a; *New York Times* 1943a; Williams 1942b).

It soon became apparent, however, that with increasing demand for glass food containers, bottle factories were operating nearly at capacity. At the same time, NR containers consumed about 27% of the glass used to make beer bottles, but actually bottled only 5.5% of package beer. In March 1943, therefore, the WPB announced a long-expected amendment to Order L-103 removing the "one trip" bottle from civilian use within the United States. It was still allowed for "export sales, principally to the armed forces." Bottle makers were given until April 15 to cease production for domestic vending (*New York Times* 1943c).

4. The One-Way Bottle (1944-1950s)

Known originally as GB-6 (the manufacturer's style code), the One-Way beer bottle was developed by Owens-Illinois for use by the military near the end of World War II. The primary goal of the development was to save space and weight on containers shipped to the war zone.

The bottle was similar to the previous No Deposit bottle in having stippled sides and the NDNR shoulder embossing, but was shorter (7 inches) and lighter in weight (6½ vs. 7-⅜ oz.). It had a smaller radius at the heel, while its shoulders were more dome-like (less conical), leading to a short but perceptible neck (*Brewers Digest* 1944; Toulouse 1945).

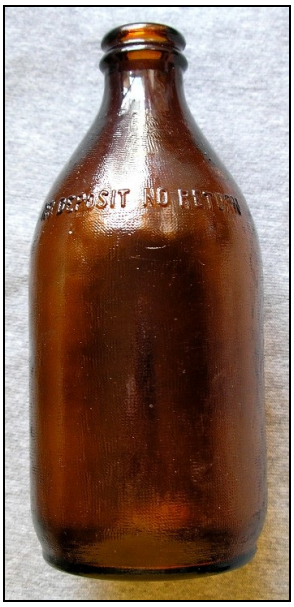
Figure 11 – One-Way

An unanticipated side effect of the stippled body was a labeling problem (Figure 11). The glue on paper labels must be strong enough to retain the label but must also be soluble in a washing solution so that the label is removed during the cleaning process. The uneven surface caused by stippling also encouraged the labels to fall off. By the later 1940s, this was in part overcome by making stippling lighter (*Modern Packaging* 1948:95, 100).

The most notable feature of the One-Way bottle was a new finish: a double-ring crown finish (our designation) in which the lower (reinforcing) ring was reduced almost to the size of the upper (locking) ring, although it was slightly different in shape. This change was the result of specific engineering goals, reducing height and weight:

> In the early days of bottle making, a rugged reinforcing ring became standard because of the use of this portion of the bottle as a centering tool for filling and crowning operations. Improvements in bottle handling machinery make such design unnecessary for light weight, one-way bottles. As a result a new design of finish has been developed, shorter, lighter, and completely satisfactory (Toulouse 1945:45).

The bottle was in production by August, 1944, but because of wartime restrictions could only be used for beer shipped overseas to the military. Nonetheless, the Oakland plant of Owens-Illinois produced millions of the bottles for use in the Pacific Theater. Termination of Limitation Order L-103 as of November 1, 1946, permitted domestic use of non-returnable bottles, but a shortage of soda ash intervened to forestall this for several months. Production for the domestic market began in June, 1947 (Fowler 1946; *Modern Packaging* 1947:102-106; *Onewser* 1947).

It should be noted that competing glass manufacturers confused the post-war history of single-trip bottles by declining to standardize their names for these containers. Even though Owens-Illinois made the clear distinction (which we have followed) between the No Deposit ("Packie") and One-Way (GB-6) bottles, others were more ephemeral in their nomenclature (Figure 12). Anchor Hocking called the former style "One Ways" as early as 1940 and titled the later bottle the "Anchorglas 1-Way." The Thatcher Mfg. Co. used the term "One Way" for both styles (*Modern Brewery Age* 1940:28; 1945:4; 1948:4-5). The style faded out during the 1950s.

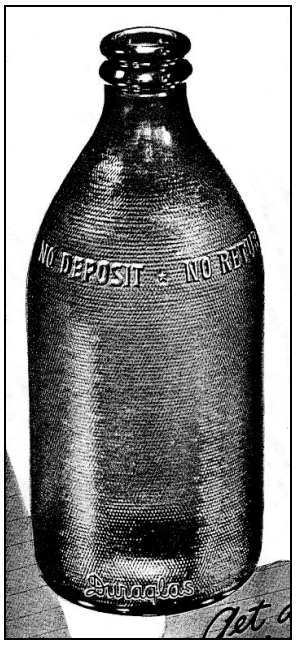

Figure 12 – One-Way ad (*Brewers Digest* 1947)

One-Way bottles were adapted for soft drinks in 1961, as bottlers became interested in the use of non-returnables. These containers were identical to those for beer except that they were of colorless glass and the NDNR label on the shoulder was in a substantially larger font, with the volume indicated above it (*Bottling Industry* 1961a; 1961b; 1961c). The style seems to have faded rapidly from popularity, however, as soda bottlers shifted to idiosyncratic styles for non-returnables as they long had done for returnable bottles.

Following the end of government-imposed standardization, the brewing industry sought new designs that would provide non-returnable bottles in more popular traditional forms.

5. Tall One-Way "Tavern" (1947-ca. 1955)

Often called "Tavern" bottles, these long-neck, non-returnable bottles were introduced by Anchor-Hocking and Owens-Illinois in 1947, and, after mid-1948, were frequently advertised along with the One-Way style (Figure 13). Some of these had "1-WAY" embossed on the base. Hopper (2000:116) recorded date codes on Anchor Hocking's Ruby Red variation of these bottles as late as 1955. The Tall One-Way resembled the

Figure 13 – Tall Tavern (*American Brewer* 1949)

traditional Export bottle in the shape of its long, slightly swelled neck and narrow body. Height was about 8 inches and weight 9¼ oz. (compared to 9½ inches and 12 oz. for Exports). Diameter was 2½ inches, slightly wider than the Export, but the walls were thinner (*Modern Packaging* 1948).

Although the NDNR was embossed at the shoulder, the style had a double-ring crown finish, and the body was free of the stippling that had characterized its two immediate predecessors. Along with the typical 12-oz. bottles, the new style was available in quart sizes (*Brewers Digest* 1954:10). These were also made in 11-oz. sizes for West Coast distribution by the Latchford-Marble Glass Co. and other western glass houses (*Western Brewing and Distributing* 1951:2).

Figure 14 – Modified Tavern (*Brewers Digest* 1954)

The tallest non-returnable made prior to the 1960s, the style was intended to provide a bottle that would compete with returnables in bars and restaurants, where retailers had long opposed the shorter, stippled non-returnable styles because they did not "look good on the table" (*Modern Packaging* 1948:96). Owens-Illinois designated the 12-oz. bottles as the GB-8, with GB-17 for the quarts.

6. Modified Tavern (ca. 1953-ca. 1956)

Also called "Tavern" bottles, the earliest date code we have found for these is 1953, and they were advertised by Owens-Illinois at least as late as 1956 (Figure 14). The 12-oz. size was slightly shorter and slightly wider than the previous style but clearly retained the image of the export bottle (Figure 15). The bottles measured 7 ½ inches in height and 2 ⅝ inches in diameter and still bore the embossed NDNR on the shoulders.

Figure 15 – Modified Tavern

One slight but important difference with this variation was the stippling of the heel area. Called shock bands or Murgatroyd belts, these are raised and/or stippled areas at the high-impact sections of a bottle—the heel and the shoulder. Their purpose is to strengthen these areas to help them withstand contact with other bottles in packing, shipping, and filling (Hanlon 1971:6-9).

In January 1954, Owens-Illinois introduced both returnable and one-way bottles in a 16-ounce size. The bottles were now produced in three sizes – 12, 16, and 32 oz. Although the 12-oz. size has a slightly swelled neck, both of the larger sizes have a straight taper from the shoulder to the finish (*Brewers Digest* 1954:10-11).

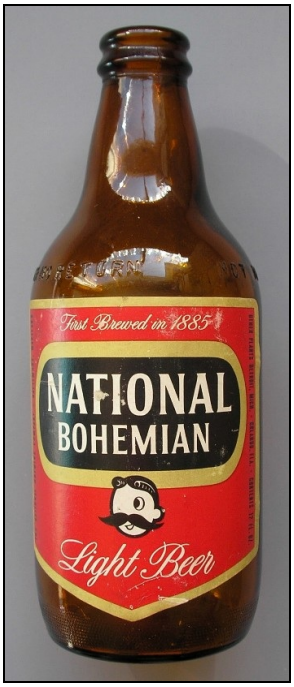

Figure 16 – Crossover Tavern

7. Crossover "Tavern" Bottle (ca. 1954- ca. 1965)

Non-returnable "Tavern" bottles again shrank in height to 6 ⅞ inches – mostly in neck length – although diameter remained 2 ⅝ inches (Figure 16). The bottles retrained the export look and NDNR on the shoulder. These were advertised by Owens-Illinois as early as 1954, and the style was still in use by 1965, when a Glenshaw Glass Co. ad showed the bottle along with the Handy bottle–the next style offered (*Modern Brewery Age* 1965:47). This was the last style to use the double-ring crown finish.

8. The Handy Bottle (1959-1976+)

The Handy bottle (sometimes called the "glass can" by brewers, or "G.C.M.I. 168" by the glass industry) was a reversion—with a vengeance—to the older One-Way design tradition. Developed under the auspices of the Glass Container Manufacturers Institute, and introduced on a limited basis in 1958, it was soon the most popular one-way beer bottle ever produced (Figure 17). By 1961 it was noted as "the most frequently formed glass container in the world" (Glass Container Manufacturers Institute 1960:42; *Modern Packaging* 1961). By 1963, Handy bottles were advertised

Figure 17 – Handy (*Modern Brewery Age* 1965)

in 10, 11, 12, 15, and 16 oz. sizes (Glass Container Manufacturing Institute [GCMI] ad, *Modern Brewery Age*:1963). Two years later, Owens-Illinois advertised the Handy bottle in nine sizes – 7, 10, 11, 12, 15, 16, and 24 oz., one quart, and one imperial quart (Owens-Illinois ad, *Modern Brewery Age*:1965b).

Figure 18 – Handy

This was the shortest of the designs up to this time with a low conical shoulder, tiny neck, and a single ring finish (Figure 18). By this time, glass strength had improved sufficiently to allow complete removal of the reinforcing ring from the crown finish. The bottle continued the NDNR wording embossed on the shoulder. Amber glass appears to be the only color used for these containers. Originally straight-sided and smooth-surfaced, the design was modified in 1962 to feature stippled shock bands (Murgatroyd belts) at the heel and shoulder, separated by a smooth, slightly inset label panel. The height was increased ⅛ inch to accommodate the panel inset (*Modern Brewery Age* 1962a:64; 1962b). These changes were an obvious attempt to reduce breakage while accommodating brewers' complaints about labeling problems associated with the stippled bodies of earlier formats. A decade after its inception, the Pabst Brewing Co. was the only "leading brewer" still using the Handy (Brewers Digest 1965:41), although some bottles were made until at least 1976. See Table 1 for a list of important events in non-returnable beer bottle development and Table 2 for respective bottle measurements.

Miller NR Select

The Miller Brewing Co. was an exception to the norm. The firm had adopted a colorless, select-style of container by at least 1942, when drawings of the bottle appeared in numerous ads. The timing is unclear for non-returnable bottles, but *Brewers Digest* (1968:40) noted that Miller had adopted the colorless one-way bottle "long before the 'handy' bottle" (i.e., 1959). Miller considered the Handy bottle when it was introduced but decided to stay with "the original tapered container since it was an established success" (Figure 19). By 1971, Miller ads showed a wider,

Figure 19 – Miller Select (eBay)

shorter select bottle with a continuous-thread, "twist-crown" finish, and the bottle had taken on the modified export shape by at least 1989.

Table 1 – Dates for significant changes in non-returnable beer bottles

Date Range	Event or Change
1935-1942	Stubby non-returnable bottle
1935-1942	Stubby variation with embossed shoulder ring
1936-ca. 1953	Steinie (used as non-returnable)
1936-ca. 1940	Steinie variation with ring around swell in neck
1939-1949	No Deposit bottle
1939	Beginning of body stippling
1939	Beginning of "NOT TO BE REFILLED // NO DEPOSIT - NO RETURN" on shoulder of bottle (stipulated by industry standardization in 1941)
1944-1950	One-Way bottle
1944	Double-ring Crown finish introduced
1947-ca. 1955	Tall One-Way bottle
1953-1956	Modified NR Export bottle
1954-ca. 1965	Crossover NR bottle
1959-ca. 1965	Handy bottle (possibly used much later)
1959	Single-ring Crown finish
1961	Michelob "tear drop" bottle
1964	Elimination of standardization; industry adoption of multiple NR bottle styles

The Confusion of Tongues

A major shift in attitude toward non-returnable bottles occurred in the 1960s, originating from brewers rather than the glass companies. Probably stirred by the 1961 Michelob bottle (see below), the glass industry increasingly moved away from standardization in bottle design

(adopted in 1941) and shifted to custom designs to fit the brand. Numerous distinctive bottle styles began to grace the shelves of supermarkets. These were reminiscent of the specialty or proprietary bottles used in the soft drink trade in the 1930s (cf. Paul & Parmalee 1973:25-28).

Table 2 – Non-Returnable Bottle Styles: Dimensions of 12-oz. Bottles

Style	Introduced	Height	Diameter	Source
Stubby	1935	6 13/16		Brewery Age 1935a
Stubby	1935	6-7/16	2-1/2	BRG Measurement
Pre-Steinie (Reed 173)	1935	7-1/2	2-7/16	Brewery Age 1935x
Pre-Steinie (Reed 183)	1935	6-25/32	2-3/4	Brewery Age 1935x
Steinie	1936	7	2-13/16	BRG Measurement
No Deposit	1939	6-3/4	2-3/4	BRG Measurement
One-Way	1944	6-1/4	2-3/4	BRG Measurement
Tall One-Way "Tavern"	1947	8	2-1/2	BRG Measurement
Modified "Tavern"	ca. 1953	7-1/2	2-5/8	BRG Measurement
Crossover "Tavern"	ca. 1954	6-7/8	2-5/8	BRG Measurement
Handy	1959	5-3/4	2-3/4	BRG Measurement

By 1964, the Glass Container Manufacturing Institute accepted the idea of miscellaneous styles, and the trend toward individual designs gained impetus in 1969. Various ads showed numerous styles of NR bottles. The Glass Container Manufacturers Institute told brewers, "You work hard to make your product superior, so why not make it easy for consumers to recognize it? Glass can give you that uniqueness so important with a product such as beer. With glass you decide on the shape of the bottle, and we'll make it." This was a major paradigm shift from the standardization mandated in 1941 (*Modern Brewery Age* 1969a:44). Apparently glass design and manufacturing techniques had advanced to the point where almost any pattern could be produced, virtually on demand. A Zapata ad (*Modern Brewery Age* 1969:26-27) showed even more variations. Below is a small sample of the range of designs.

Michelob (1961-2002)

Anheuser-Busch introduced a totally new shape for its pilsner-style Michelob brand on December 5, 1961 (Figure 20). The bottle was consciously designed to convey elegance and a departure from traditional form. The purpose was to help create a market for Michelob (previously only available on draft) in competition with European imports. The 12-oz. bottles were "tear" shaped with a pedestal base. Unlike previous beer bottles, there were no plumb surfaces. Problems with contact points in the bottling line were avoided by ensuring that the body bulge and heel were of identical dimensions. The reinforcing ring was entirely eliminated so as not to interfere with the straight tapering line from the body bulge to the crown, most of which was to be covered by a foil capsule. The embossed NDNR label was moved to the heel. Although the designers had contemplated using other colors of glass, they finally selected amber because of cost considerations (Ellis 1963; *Modern Brewery Age* 1962a:36-37).

Figure 20 – Michelob (eBay)

The Michelob bottle was originally introduced only in the St. Louis market, with gradual expansion nationwide by late 1963 (Ellis 1963). The unique design quickly struck a popular cord, and women began using the "pretty beer bottle" as a flower vase (McCormack 1964). Because the design was so successful, other brewers and even other types of products (e.g., shampoo and salad dressing) began copying the style (Anheuser-Busch 2003). A 7-oz version was introduced in 1974.

USA Today announced a new package for Michelob in 2002. This bottle resembled a thin version of the export bottle – without the swelled neck (McCarthy 2002). The new container heralded the demise of the teardrop bottle.

Chug-a-Mug Bottle

The American Can Co. developed a wide-mouth NR container, intended as a "service" bottle that would eliminate the perceived need for glasses or mugs in restaurant and home use. Quickly designated the Chug-a-Mug bottle, it was first used by Liebmann Breweries for

Rheingold Beer (Copyright Office 1963:38). The Chug-a-Mug resembled the Handy bottle in general shape but had a much wider mouth and lacked the stippled surface at the shoulder and heels (Figure 21). The entire surface was coated with the background for an applied color label. The bottle used a "Rip Cap" ring closure. This was a crown cap that tore open by pulling a ring similar to the ring-pull on beer cans (Figure 22).

Figure 21 – Chug-A-Mug (eBay)

Figure 22 – Rip-Cap (*Modern Brewery Age* 1977)

David L. Wener received Patent No. 2,652,165 for a "rupturable crown cap" on September 15, 1953, although there is no indication that the invention was ever put into practice. However, John B. Rander applied for a patent for a "combined bottle cap and opener" on December 7, 1961, and received Patent No. 3,120,899 on February 11, 1964. This became the "Rip Cap" first used by Schlitz in 1964 (*Modern Brewery Age* 1969b:43).

Mod-Handy

Following up on its unique Michelob bottle, Anheuser-Busch introduced a modification of the handy bottle in 1964. Designated the "Mod-Handy," the bottle had a gently tapered shoulder similar to a select style, with a second, more abrupt "shoulder" just below the short neck (Figure 23). The bottle had stippled shock bands at the lower shoulder and heel, with the Anheuser-Busch emblem embossed four times around the shoulder above the shock band. The bottle had the typical double-ring crown finish and a paper label on the body (*Brewers Digest* 1968:40).


Figure 23 – Mod-Handy (eBay)

Opener Bottle

One of the more unusual bottles of the period was manufactured by the Fairmount Glass Co. and introduced in 1964 by the Burger Brewing Co. The container was a modification of the Handy Bottle, using the same single-ring finish and standard crown cap. The shoulder, however, was beefed up and squared off to form a narrow neck, and a notch was formed in the base. The notch in the base of one bottle could be applied to the cap of another bottle, and, with very light pressure, using the shoulder of the bottle as a fulcrum, the lid could be popped off (Figure 24). A new coating, developed by the Ball Bros. Co., was fused into the glass to form a surface that would not bind during the decapping operation (Rau 1964:62-63; *Brewers Digest* 1964:20).

Figure 24 – Opener Bottle (*Brewers Digest* 1964)

Werner Martinmaas patented a "beverage container with integral crown cap remover" (No. 2,992,974) on July 18, 1961. The drawings showed a typical soda bottle with a notch built into the heel. On May 28, 1964, Martinmass applied for a patent for the same idea adapted to the Handy Bottle. However, he did not receive Patent No. 3,236,126 for the invention until February 22, 1966. He assigned the second patent to the Future Bottle Co. of South Dakota. Although not recorded on the 1961 document, he apparently also transferred the original patent to the Future Bottle Co. The Future Bottle Co. was apparently worried by the delay. On October 8, 1964, Cedric C. Rau applied for a design patent for the *shape* of the Martinmaas bottle. He received Design Patent No. 201,999 on August 17, 1965. The actual bottles were embossed on the heel with the Hexagon-F logo of the Fairmont Glass Co. and on the base with the number of the 1961 patent (see Rau 1964:62). By the time Martinmaas received the patent for the actual NR bottle, his invention had been completely eclipsed by at least two types of screw-on caps (see below).

Keg Bottle

The Keg Bottle, had a barrel-shaped body, a short ledge-like shoulder and a moderately long tapering neck (Figure 25). There was no body stippling, and the NDNR label was embossed on the heel. It was originally made by Owens-Illinois as a private-mold container for the Carling Brewing Company's Heidelberg brand. Introduced as a no-return bottle on the American market in 1967, it was successful enough for national distribution. Attempts to use it in Canada in 1970 fell afoul of the prior Canadian adoption of the Stubby for beer bottles, and it was phased out entirely the following year to be reintroduced in 1979 by the G. Heileman Brewing Co. (*Brewers Digest* 1979:50; 1979b:54; *Lethbridge Herald* 1971a; 1971b; *Modern Brewery Age* 1968:27; *Modern Packaging* 1967:151; *Winnepeg Free Press* 1971).

Figure 25 – Keg Bottle (eBay)

Oregon Bottle Bill

The Oregon Bottle Bill was not the first attempt to ban non-returnable containers. Although the dates are currently unclear, at some point prior to 1957, there was a movement in certain states to outlaw all but returnable beer bottles.

Some states actually "outlawed" the sale of the non-returnable beer bottles, which were proving extremely popular and showed great promise in winning back much of the market tin cans had taken from the glass industry. Other states threatened similar laws. A significant victory in this struggle came in the spring of 1957, when the Green Bottle Blowers Association and other forces succeeded in erasing a Vermont law banning a use of non-returnables. At one time or another, nearly all the New England states considered such laws, but in each case the discriminatory measures were defeated. A similar proposal in Maryland also failed (Minton 1961:123).

The passing of the Oregon Bottle Bill in 1971 created an entirely new situation in the beverage bottle industries. The Oregon law required a deposit and refund on all "beer and carbonated soft drink containers" sold within the state. Each container had to be labeled with the deposit value, generally 5¢. The primary purpose for the law was to cut down on roadside litter (Bottle Bill Resource Guide 2018).

Prior to this time, the division of beer and soft drink bottles was clear and distinct. There were returnable and non-returnable bottles. The Oregon law, soon replicated by other states, introduced a new dimension. The key point now became whether or not the bottle could be refilled, instead of whether it could be returned.

Now, beverage bottles fell into three classifications. Still available were returnable, refillable bottles. In most states, the second group of bottles remained as it had been: non-refillable and non-returnable were synonymous for all practical purposes. Under the Oregon system, however, there were no more non-returnable bottles, but some of the returnable, deposit bottles were non-refillable. As a result, the term "NO REFILL" replaced the "NO RETURN" label beginning in 1970.

At least one form of transitional bottle was made by the Northwestern Glass Co., a typical Handy Bottle had a “twist-crown” finish with NDNR embossed around the shoulder and “NOT TO BE REFILLED” on the base. By 1972, standardization vanished, although NO DEPOSIT NO REFILL was standard between 1971 and 1973. Beginning in 1973, NO DEPOSIT vanished from at least some bottles. See Table 3 for later changes in heel messages.

Table 3 – Variations in Heel & Shoulder Embossing, Early 1970s

Heel Embossing	Date
NO DEPOSIT NO REFILL PLEASE DO NOT LITER (heel)	1970
NO DEPOSIT NO REFILL PLEASE HELP FIGHT LITTER (heel)	1971
NO DEPOSIT NO REFILL PLEASE HELP FIGHT LITTER (shoulder)	1971
NO DEPOSIT NO REFILL KEEP AMERICA BEAUTIFUL (heel)	1971
NO DEPOSIT NO REFILL DISPOSE OF PROPERLY (shoulder)	1971
NO DEPOSIT NO REFILL DISPOSE OF PROPERLY (heel)	1971
NO DEPOSIT NO REFILL (heel)	1972
NO REFILL PLEASE DO NOT LITER (heel)	1973

The End of No Refill

By the early 1980s, non-refillable bottles became the norm, invalidating any requirement for specific labeling. The embossed "NO REFILL" vanished. An era had ended. In its place, the refund value in participating states began to appear on the paper or ACL labels. For example, a 2006 label required a 5¢ deposit for the bottle in Connecticut, Vermont, Maine, Massachusetts, Oregon, Iowa, New York, Delaware, and Hawaii, along with a 10¢ deposit in Michigan.

Shoulder vs. Heel

Rather than an exact move, the migration of the NO DEPOSIT NO RETURN from the shoulder to the heel appears to have been a process. By 1965, the Owens-Illinois had changed the location to the heel of Lucky Premium NR bottles, and the Glass Container Corp. used the heel location for Coors NR bottles. Some bottles continued to carry embossed NO DEPOSIT NO RETURN until at least 1972. The only exception was the "teardrop" Michelob bottle. From the inception of the container in 1961, the NDNR was embossed on the "foot" of the bottle. This may have been necessary because there was no actual shoulder, and the upper third of the bottle was covered by foil.

Evolution of the Crown Finish

An interesting subset of the development of the non-returnable bottle is the evolution of the Crown finish. The upper part (crowning ring or locking ring) remained virtually unchanged, but the lower part (reinforcing ring) gradually diminished in size until it vanished. Prior to the introduction of threaded crown finishes (twist-crown), all known changes to the Crown finish involve modifications to the lower or reinforcing ring. Almost from its inception, the Crown finish was made in two variations, one with a rounded reinforcing ring, the other with a tapered reinforcing ring. We have been unable to detect any temporal or regional pattern associated with the use of the two variations on returnable bottles.

The first notable change occurred with the design of the One-Way NR bottle in 1944. Toulouse (1945:45) noted:

> The next design feature was in the finish and the crowning ring. In the early days of bottle making, a rugged reinforcing ring became standard because of the use of this portion of the bottle as a centering tool for filling and crowning operations. Improvements in bottle handling machinery make such design unnecessary for light weight, one-way bottles. As a result a new design of finish has been developed, shorter, lighter, and completely satisfactory. It . . . completes the effort toward shorter height and space saving.

The new, double-ring finish (i.e., reinforcing ring reduced to the size of the locking ring) was used from 1944 to ca. 1965. Although some exceptions exist, the original crown finish disappeared from general use on non-returnable bottles with the final elimination of the No Return bottle in 1950 (although the regular larger reinforcing ring continued on returnable soda bottles). Thus, from 1950 to 1959, the double-ring Crown finish was the primary one used on NR bottles. Even after the invention of the Handy bottle in 1959, double-ring Crown finishes remained available until at least 1965.

The single-ring Crown finish was developed as part of the design for the Handy bottle in 1959. This finish eliminated the reinforcing ring entirely, leaving the locking ring as the entire finish. These were used from 1959 until at least the 1970s and probably later.

The Armstrong Cork Co. introduced the "Turn-Off" Crown cap and accompanying non-continuous-thread finish in 1966 (Everett 1982:168). The Glass Containers Manufacturers Institute advertised non-continuous-thread finishes on NR beer bottles by May 1969 (*Modern Brewery Age* 1969a:44). These were made to take a crown cap and came in at least three configurations. One style was the same as the typical crown finish, except that the locking ring (upper part of the finish) was flat (vertically) with thin non-continuous threads. A second style used the same locking ring, but the reinforcing ring (lower part) was reduced to a thin band encircling the neck. The final style eliminated the reinforcing ring altogether (Figure 26).

Figure 26 – Twist-off crown (eBay)

The closure industry also introduced the aluminum roll-on closure for use on beer bottles in 1966. These were 28 mm. closures for beer bottles, although a larger (38 mm.) size was available for other beverages. These were pilfer-proof closures, first commercially produced in

1933 (Everett 1982:185). The same ad mentioned above (*Modern Brewery Age* 1969a:44) showed either continuous-thread or non-continuous thread finishes under aluminum screw caps. These caps are not related to crowns, being much taller (vertically) and obviously intended *only* to be unscrewed. These are easily replaceable and were the forerunners of today's twist-off caps (Figure 27).

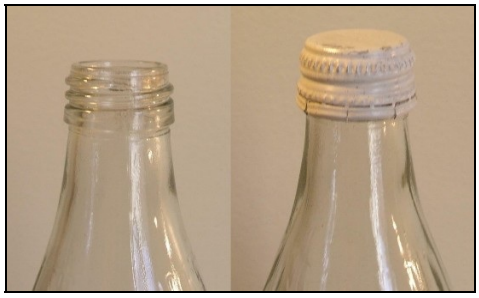
Figure 27 – Twist-off cap (eBay)

Larger Sizes

Large bottles were part of the glass industry's answer to "the challenge of the tin can." Quart bottles were in service by at least the early part of 1936 (if not earlier). These were made in both "long neck" (returnable) and Steinie shapes (*Glass Packer* 1936b:631). By at least 1941, the No Deposit bottle was also available in quart sizes (Gass 1941:30). Half-gallon bottles also made their appearance in 1936, although only in returnable bottle shapes (*Glass Packer* 1936b:631). Despite a tax increase on beer that spurred the use of larger containers in 1940 (*Wall Street Journal* 10/24/1940), the popularity of quarts did not last long. Although half gallons were still advertised in 1940, they were not mentioned by 1941.

Discussion

Container Wars

The non-returnable beer bottle was a response to competition with the tin can industry. All the earliest non-returnable bottles were designed to meet the perceived advantages of the can. Most obviously, they were intended to be non-returnable–appealing to consumers and retailers by eliminating deposits and returning empties. Their appeal to brewers lay in saving costs in shipping beer and eliminating the expense of returning empties, and they also removed the need for washing equipment.

Once established, NR bottles were also cheaper per package than either returnable bottles or cans. The reduction in size was advantageous to breweries in that more bottles could be shipped per delivery truck, but it also was related to consumers, since more NR bottles than

returnables could be stored in the home refrigerator – thus making glass containers more competitive with cans.

Arguments about these relative advantages were widely touted in the industry literature (*Glass Packer* 1935a; 1935b). It should be clear, however, that none of these arguments were entirely compelling, since the industry (except for the elimination of beer cans and NR bottles by government fiat during World War II) has accommodated both glass and tin containers ever since. Additionally, the emphasis on compact bottles was never more than partially successful. In this regard, the glass industry's insistence on standardization ultimately failed. As with similar attempts with other glass products, rationalization of containers fell afoul of consumer demand for both traditional and innovative design, and brewers' demands for uniquely recognizable products. Nonetheless, for more than two decades the development of bottles to meet this competition derived from the glass industry, not from the brewers.

This was a dramatic reversal of 19th century conditions, when large bottlers in many industries saw special embossing and special molds as a means of creating customer recognition. While glass factories were generally happy to supply those demands, they were typically content to produce traditional forms for consumption as stock containers. With the developing competition from cans, however, the glass industry's monopoly on container beer was directly threatened. Only industry associations and the largest manufacturers had the facilities and the engineering expertise to meet this threat. They met it by carefully engineered and tested designs intended to meet specific requirements and to be available to all brewers.

Machine production was vital to the entire process. The older, mouth-blown methods would have been unable to produce the consistency in size and especially glass thickness required to make the more compact shapes of the NR bottles. By 1935, hand production was virtually eliminated for all but a few specialty bottles, and the industry had been improving machines for three decades. Without this advanced mechanization, the glass industry would not have been equal to the challenge presented by cans.

According to Martells (1976), cans were tested in the 1920s by big brewers, but failed because it was believed they would effect the taste of the beer. By the 1930s can linings had improved, and 1934 saw the launch of the flat-top can by the American Can Co. with Continental's cone-top can arriving the following year. Bottle manufacturers, such as Owens-Illinois, perceived threat, leading to the introduction of the non-returnable Stubby in 1935 –

designed to have many of the advantages of cans. One advantage of cans over bottles was (and is) that they do not fracture as easily or produce potentially dangerous shards.

Standardization versus Free Will

From the inception of non-returnable beer bottles to 1964, the glass industry was set on standardization. The initial bottle styles were standardized in styles, although sizes varied according to the whim of the glass house and requirements of the breweries until 1941 when a joint committee of the United States Brewers Association and the Glass Container Association mandated a limit in the sizes of NR beer bottles. Because of the U.S. involvement in World War II, the War Production Board instituted standardization in both styles and sizes in 1942 – as well as restricting the use of steel for making crown caps. At the end of the war, the government eased regulations, but the glass industry was slow to add new variations to the four existing styles of NR bottles. The early 1950s saw the rise of three new styles – the tavern bottles – all based on the shape of the export beer bottle. These were followed by the Handy bottle in 1959, a squat container with a single-ring finish. While several of these were available concurrently, the industry standardization restricted any new ideas.

An interesting dichotomy of standardization divided the country at the end of Prohibition. While the standard smaller container in most of the U.S. was 12 ounces, the norm along the West Coast was the 11-ounce size. Prior to the inception of Prohibition, the norm had been the 26-ounce "quart" bottle. Present, but less common were "splits" – 8-10-ounce bottles as well as a few other sizes that were used even less frequently. Although we have never discovered a reason, the industry settled on the 12-ounce bottle in the majority of the country and 11 ounces in the West.

Prior to the 1941 standardization, there were as many bottle sizes as glass houses chose to produce. In 1941, however, that was reduced to 7, 11, 12, 32, and 64 ounces and restricted even further – to 12, 32, and 64 ounces – by the War Production Board the following year. As the restrictions lifted, the West Coast returned to its 11-ounce standard. By 1965, however, sizes for the Handi bottle had increased to 7, 10, 11, 12, 15, 16, and 24 ounces, one quart, and one imperial quart.

But the breweries were tired of being restricted. In 1961, the Anheuser-Busch Brewing Co. challenged standardization by introducing a narrow, tapering bottle with an indented heel creating a "foot." This unique container was to set apart the brewery's flagship brand, Michelob. For three years, the Michelob bottle remained the only harbinger of change, but the brewers had had enough of standardization, and advances in glass processes had evolved to the point where a bottle could be made in almost any shape – at least within reason. In 1964, the glass houses began advertising new styles. The dam soon burst, and almost any style desired was being made for different breweries.

Lose Weight, Grow Stronger

The heavy weight of glass containers has been an issue practically from the beginning of glass blowing. Specifically concerning beer, the original solution to the weight – primarily focused as the cost of beer bottles – was the returnable container. A major issue with bottling effervescent beverages (beer, soda, sparkling wines) was the pressure created by the carbonation. In the 1870s, when the serious bottling of lager beer began, the only solution was thicker glass, so beer bottles (like soda and champagne containers) had very thick sides and even thicker bases.

As more glass houses conducted more serious experimentation with glass formulas, bottles became gradually less heavy, but the key word at this point in history is "gradual"; the weight was certainly not sufficient to create any major changes in beer bottle styles or manufacturing between 1873 and 1935. Virtually all glass houses realized that lighter bottles would use less glass and increase profits – creating a "pull" toward lighter weights – but there was no "push."

The invention of the beer can created the push. The invention of the Stubby was a direct result of the threat that the glass industry felt from the can. Simply hefting a Stubby bottle in one hand and an Export beer bottle (from the same period) in the other will demonstrate that the major weight loss only derived from the shortening of the neck. The glass thickness was essentially unchanged.

The invention of the Steinie was another small step in lightening the load of the vessel – but it was not a sufficient improvement. Both of these were primarily reduced in weight by design changes, but the first major reduction included thinner glass because of stippling on the

sides of the bottles – the No Deposit bottle of 1939. Weight reduction was next, required during World War II, when the One-Way bottle came into being in 1944.

Development of lighter weights has continued since that time, of course, but the No Deposit and One-Way bottles were truly the vanguard of the current much lighter bottles of 2019. So, the Stubby may have been the father of light weighting, and the No Deposit bottle may have been the *real* turning point, but the light-weight, non-returnable beer bottle owes its existence to the beer can.

The War on Litter

Creation of a broader market coupled with the increasing use of disposable containers, had predictable (but evidently unpredicted) effects on the American landscape. These effects were being noted by the *Los Angeles Times* (7/13/1936) within 18 months of the introduction of disposables:

> A new problem is that of empty beer cans along highways. The beer can problem is serious in parks, national forests, tourist camps and camping grounds. Garbage pits in national forests and parks which before the advent of the beer can would have served for two years are now filled before the season is half over. At one recreation point, the container was not only filled with the empties but was completely hidden by them.

In the good old days, if drinkers did not save the empty bottles, small boys picked them up. Now the empties are thrown out anywhere, or tossed out in sacks at the most convenient spot. Many persons connected with institutions serving the pleasure-loving public are beginning to think "there ought to be a law against it" (*Los Angeles Times* 7/13/1936).

It would be inaccurate to suggest that the development of disposable beer containers was the origin of litter as a problem in America. It is likely, however, that this exacerbation – coming at a time when better roads and increased automobile use meant increasing public disposal of litter by strangers – was a significant influence on American perceptions. The period between the 1940s and 1980s saw a gradual increase in litter awareness advertising on television, in printed media, and on the road, itself, in the presence of additional signs. Despite all these

improvements in education, the litter problem grew worse, at least partly as a result of the continued population increase – more people equal more litter.

One direct result, found on the bottles themselves, can be seen in the broad impact of the Oregon Bottle Bill. Oregon passed its litter reduction and recycling program on July 2, 1971, in an attempt to counteract the bottle and can litter along the roads and elsewhere. The state did not implement the act until October 1, 1972, over two years later, when the mandate required a deposit of 5¢ for every plastic, glass, or metal beverage container – effectively reinstating the returnable bottle system. In 2009, Oregon included bottled water in the system and, on April 1, 2017, the state raised the deposit to 10¢. The required deposit was (and still is) shown on the paper, plastic, or Applied Color Lettering labels.

Soon, other states followed Oregon's example, most requiring a 5¢ deposit, a few eventually raising to the 10¢ level. In the decades between the 1970s and 2010s, various states enacted and/or repealed deposit laws. By 2019, ten U.S. states plus the protectorate of Guam required deposits for beverage and water bottles – California, Connecticut, Hawaii, Maine, Massachusetts, Michigan, New York, Oregon, and Vermont.

A Final Word

Although this study has presented a look at the system that developed non-returnable beer bottles between the 1930s and especially 1980s, more investigation is needed for a full view of the situation and impact created by gradual disintegration of the returnable bottle system that began in 1934. Such anomalies to the U.S. system as the Canadian adoption of Stubby bottles in 1961 and the DAB exports of Steinie and No Deposit bottles to the U.S. in 1969 leads to the obvious conclusion that the system of evolution for NR beer bottles in the U.S. cannot be generalized to the rest of the world. Because of the heavy increase of imports to the U.S., beginning in the 1970s, a larger variety of bottle shapes, styles, colors, and manufacturer's marks confounds accurate dating in archaeological contexts.

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