

GLASS BOTTLE PUSH-UPS AND PONTIL MARKS

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INTRODUCTION

Originally this study started as an attempt to explain the varied markings on bottle bases found in the National Historic Sites Service collection. These markings appeared to have been left on the glass by glassmakers during the formation of the base and while holding the bottle on the pontil. In the process of identifying the marks, some relationships between the marks and certain types of bottles and their country and date of manufacture became apparent.

Because most modern authors, with the exception of Dr. Julian Toulouse, have not discussed in detail the question of base formations and empontilling techniques, I have had to concentrate on bottles excavated by the Canadian National Historic Sites Service. I have also looked at some local private collections and the "wine" bottles in the Bristol City Museum and the Guildhall Museum in London. In general, these collections corroborated some of the conclusions in this paper.

The National Historic Sites Service collection has a built-in bias because very few of our excavated sites predate the 1720s and from that date to 1760, the predominant trading influence was French. After 1760, when New France passed into British control, the trading emphasis shifted to Great Britain. This means that there are few English bottles in the collection from before 1760, and after that date, very few French bottles. Because of this situation, the attempt to assign the different tools and techniques to specific countries and dates should be regarded by the reader as a question and a challenge, rather than as an immutable fact.

Although there are many variations in technique, a bottle is made in the following basic manner (Figure 1). A sufficient amount of glass is gathered on the end of a blowpipe. The glass is given a preliminary shape, called a parison, by marvering (turning) on a flat stone or metal slab and by preliminary insufflation. The parison is then usually inserted in a mould which may form only the body or almost the whole bottle. After the partially formed bottle is removed from the mould, if the base has not already been mould-formed, the base is pushed up. A tool, such as a pontil or a sabot, then holds the bottle at the base while the blowpipe is detached from the bottle. Extra glass is added at the mouth and then the glassmaker forms the finish (Figure 9). The completed bottle is carried to the annealing oven where it is slowly cooled to remove the stresses in the glass.

The two stages of the bottle-making process that are discussed in this paper are the formation of the base and the techniques used to hold the bottle while the finish is being made.

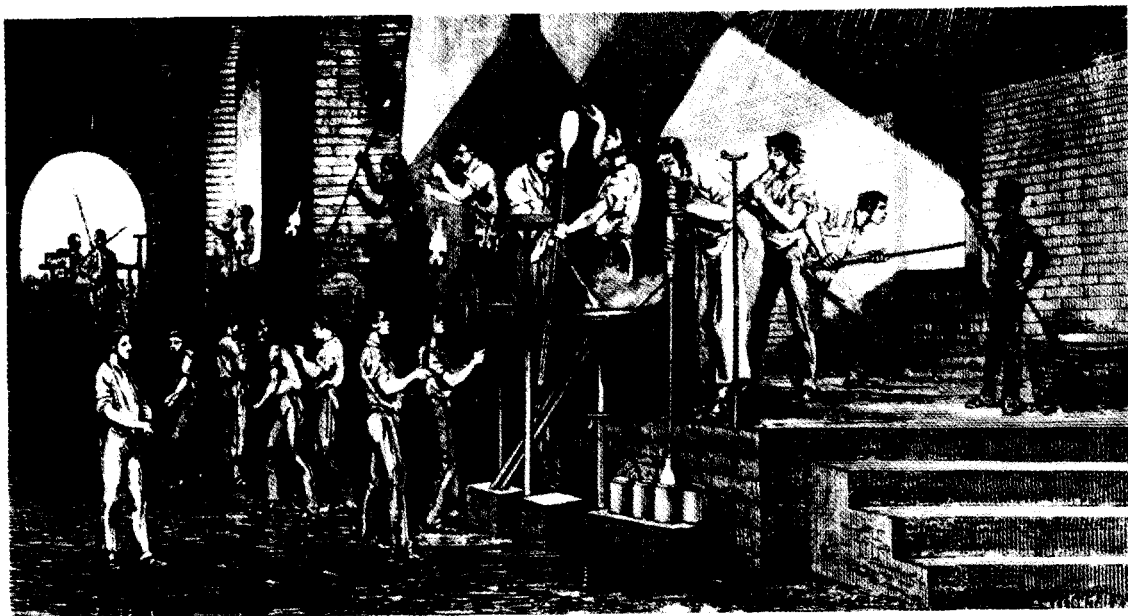


FIGURE 1. Interior of a 19th century French bottle factory (Peligot 1877:299).

PUSH-UPS

One of the familiar aspects of bottles is the base that has been pushed up into the body cavity. This formation is called a "push-up" (Toulouse: personal communication; Moody 1963:303) or "kick". Several explanations have been given for its presence:

- 1) Because glassmakers had difficulty making a bottle base flat enough for a bottle to stand upright without wobbling, they partially solved the problem by indenting the base.
- 2) A push-up helped to produce a stronger bottle. Part of the reason was that the glassmaker, while the bottle was being made, often rested the bottle on its base which allowed the glass to flow towards the basal area (Bontemps 1868:510). In pushing up the base, the glass was redistributed and thinned. If glass is too heavily concentrated in one place the annealing process is less effective and stresses are set up in the bottle which make it weaker. It is also possible that the push-up is structurally useful in helping the bottle withstand great internal pressure from contents such as sparkling wines.
- 3) Many authors suggest that push-ups were made deliberately deep, particular-

ly in dark green glass bottles, so the bottles looked much larger than they actually were.

- 4) Many people also believe that the push-up assists in the sedimentation of wines (Mendelsohn 1965:51).

The practice of making a deep push-up probably continued long after its need was over because of conservatism on the part of the glassmakers and the consumers.

The push-up seems to have been formed by a variety of tools. In Diderot's *Encyclopédie* (1967:109), the base was formed by a *mollette*, "morceau de fer plat, d'environ un pié de longueur" (Figure 2). As forming the push-up could cause distortion in the body of the bottle, it was rolled again on the *marver*. Although there were no really distinguishing marks left by this process, bases which were formed in this way probably resemble those in Figure 3. This type of base is found on the familiar French "flower pot" wine bottles (Noël Hume 1970:71; Diderot 1772: Pl. V, VI) which have been excavated on many sites in Canada that were occupied by the French. The bases are normally very regular, with symmetrical, rounded conical profiles and a small pontil mark, usually between 25 mm. and 35 mm. in diameter, in the top of the push-up.

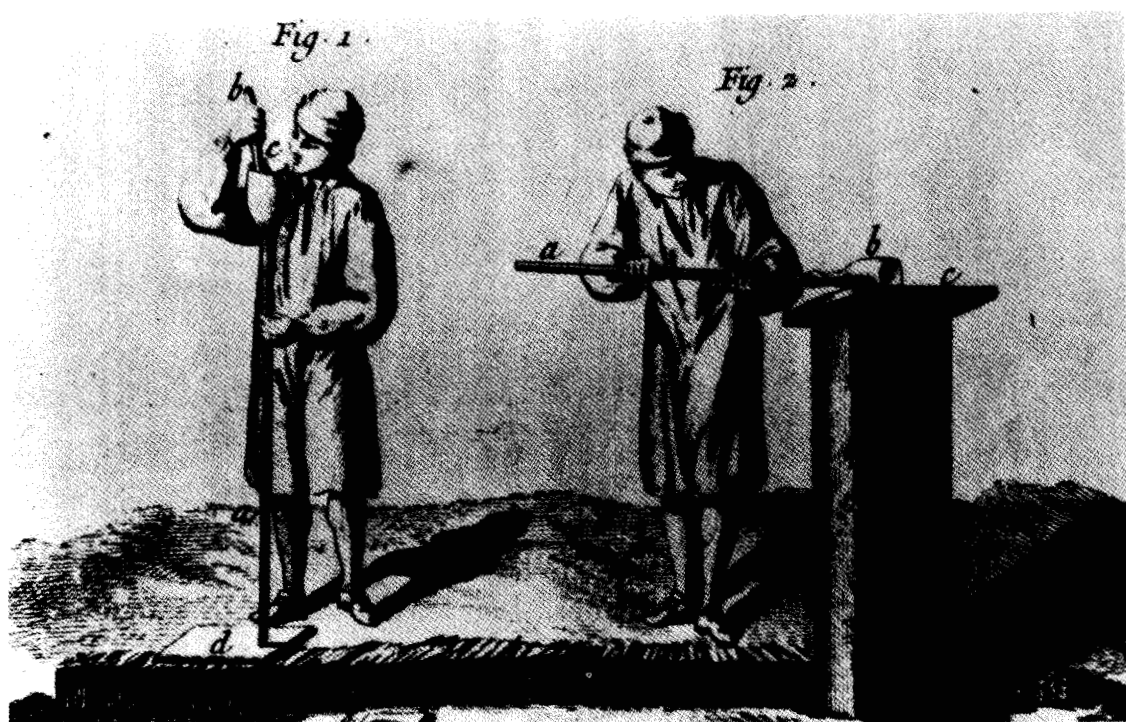
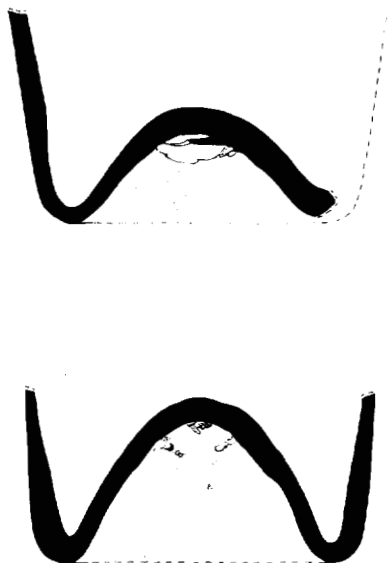


FIGURE 2. The glassmaker forming the bottle base with the mollette and then remarrowing the bottle to restore its symmetry (Diderot 1772: Pl. V).



0 1 2 3 cm

FIGURE 3. Two bases, probably formed by a mollette, showing the regular, rounded conical profile and the pontil mark in the tip of the push-up.

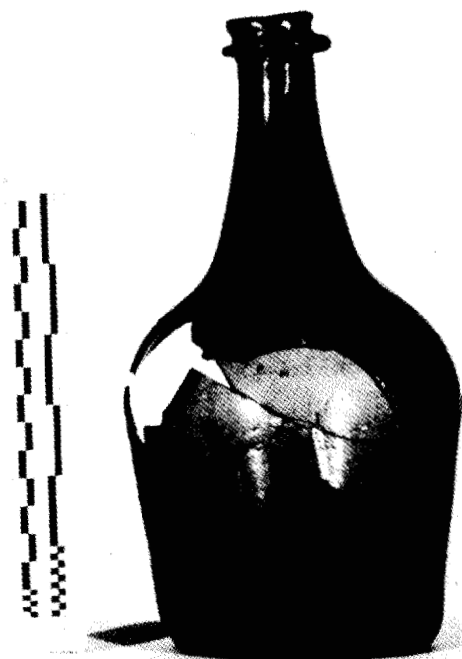


FIGURE 4. An 18th-century French "flower pot" wine bottle excavated from a site dating from 1732 to 1745.

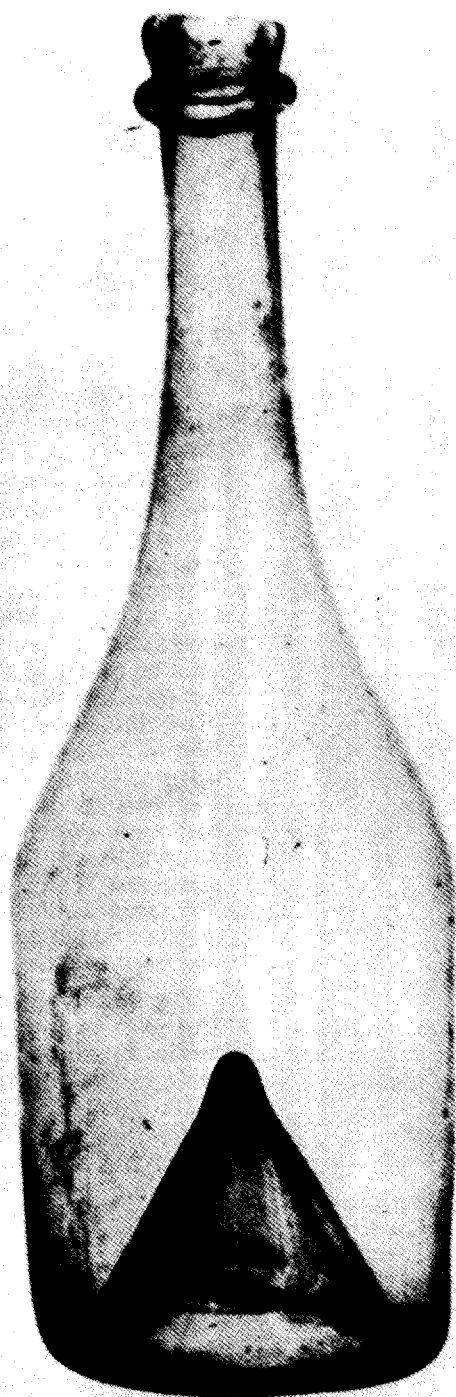


FIGURE 5. A bottle showing how the base has been indented by a sharply pointed rod and the position of the pontil mark partway down the push-up.

Another tool used to form the push-up appears to have been a thin, sharply pointed rod of wood or metal. As shown in Figure 5, the tip of the push-up often has a distinct, sharp point, visible on both the exterior and interior surfaces. The pontil mark is visible about two-thirds of the way down from the tip. On some small bottles, the push-up was so narrow that the pontil had to be applied on the resting surface. These sharply pointed push-ups appear primarily on medicine bottles and vials, occasionally on small rectangular bottles with chamfered corners and on olive oil bottles. Push-ups formed in this way are never found on the "wine" bottles. The use of this tool appears to have become less common during the 19th century as it was replaced by moulding techniques.

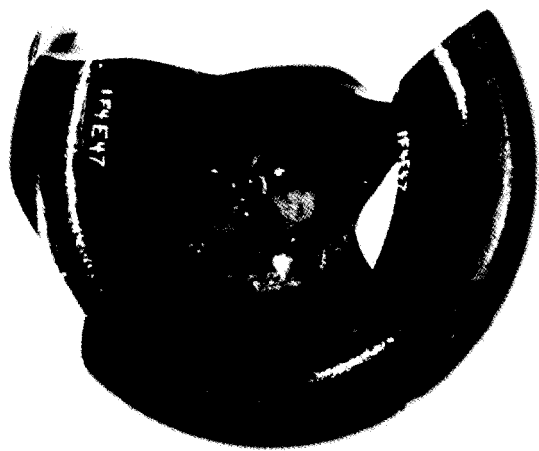
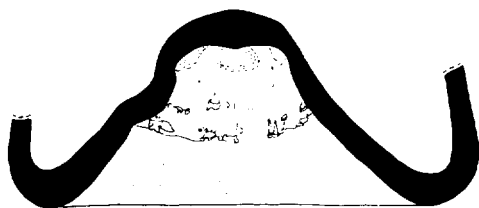


FIGURE 6. The basal view of a bottle showing the quatrefoil impression in the tip of the push-up. The pontil mark can be seen as rough chips of glass.

A third type of tool used to form push-ups appears to have been a circular iron rod, like a pontil, with the working end split into quadrants. The Canadiana Gallery of the Royal Ontario Museum, Toronto, has such a rod about 34 in. long with a working end about 7/8 in. in diameter. The separated quadrants left a quatrefoil impression in the top of the push-up. On some kicks the mark can barely be felt and on others, as in Figure 6, it is unmistakable, even to the extent of distorting the profile. Occasionally iron oxide deposits from the iron tool are found in the impres-



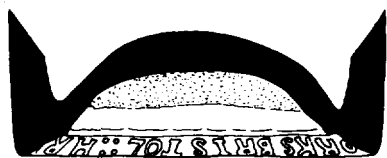
0 1 2 3 cm

FIGURE 7. The same base as Figure 6 showing the relationship of the quatrefoil impression and the pontil mark. Note the distortion in the profile.

sion (Toulouse 1968:140, 141). From above, on the interior surface, the push-up top often looks roughly square. In 75 examples from one Canadian site, the diameters of the impressions ranged from 16 mm. to 51 mm. In addition to the quatrefoil impressions, there is invariably a pontil mark consisting of an area of rough glass which encircles the push-up towards the resting surface. The pontil mark diameters range from 38 mm. to 64 mm. Figure 7 illustrates a base in which the push-up profile was distorted both by the forming tool and by the application of the pontil. Although split iron rods are still used today as pontil rods, the presence of both a distinct pontil mark and the quatrefoil impression on the same base suggests that the quatrefoil mark is logically explained if the split rod was used to indent the base.

The quatrefoil marks have been appearing almost exclusively in dark green glass "wine" bottles manufactured in the English shapes, such as Noël Hume's types 12, 15, 21, 22 (Noël Hume 1961:100-101). The earliest bases in the National Historic Sites Service collection with these marks date from the 1720s and they continue throughout the 18th and into the 19th century. Generally speaking, as the diameters of the bottles decreased towards the end of the 18th century, the quatrefoil marks also became smaller.

A fourth way of forming the push-up was by using a specially designed mould part which fit into the bottle mould. An example of this method was developed by the H. Ricketts Company of Bristol in 1821. The patent included a lettered ring which could be placed close to the circumference of the base and "according to the thickness or



0 1 2 3 cm.

FIGURE 8. The base of a bottle formed in the Ricketts mould showing the marks left by the device.

thinness of the said ring is the body of the mould shortened or increased, and the various sizes of bottles produced" (Ricketts 1821: 3). On the ring could be cut such information as the address of the manufacturer or the volume of the bottle.

As the Ricketts "three-piece" mould formed only the base, body and shoulder, the neck and finish were completed in a separate operation by hand. After a bottle was withdrawn from the mould, therefore, a pontil was attached to the base while the neck was finished. The base in Figure 8 illustrates the different markings left by the manufacturing process. The speckled area is the pontil mark and the raised ridge inside the lettering is the edge of the removable lettered plate. There is also a raised mould line on the resting surface which is not visible in the draw-

ing. Incidentally, these bottles negate a popularly held belief (Kendrick 1968:138) that basal lettering and pontil marks cannot be found on the same bottle.

Originally the Ricketts mould was "An Improvement in the Art or Method of Making or Manufacturing Glass Bottles, such as are used for Wine, Porter, Beer, or Cyder;" (Ricketts 1821:1) in other words, it was used to make the dark green glass "wine" bottle. Later in the 19th century and even in the early 20th century, however, this mould type was used for bottles holding other products, including solids. The Ricketts mould was used very widely. The French writers De Fontonelle and Malepyre (1854:272) recommended the Ricketts mould because it made bottles of exact capacity and was easy to use, saving of both time and fuel. As well as in France, the Ricketts type of mould appears to have been used in the United States by several companies (McKearin 1970:106-7).

In Figure 12,d is another example of a base formed in what appears to be a special multi-piece conical tool which may have been part of the mould or which may have been used separately. This type of base has distinctive characteristics. A distinct mould line is visible as a slight projection at the base of the body. A rounded ridge is visible on the push-up close to the resting surface. A small but distinct impression is located in the tip of the push-up. This mark is usually dome-shaped, as in Figure 12,d, but may be slightly square or pointed and will sometimes have an iron oxide deposit caused by being formed by a hot bare iron tool. All these marks have obviously been made deliberately but why this somewhat complicated arrangement was chosen is not known. In addition, the glass distribution is often very uneven and, if a pontil mark is present, it is usually large and consists of many sharp bits of embedded glass or sand. These bases, found mainly on dark green glass "wine" bottles, were probably manufactured during the second and third quarters of the 19th century. Their country of origin is not known.

Obviously the above discussion does not include all of the tools or moulds that have been used to form bases. For example, Bon-tempts (1868:509) mentions that the glass-makers used the handle of the battledore (see McKearin and McKearin: 1948, xv) or "un crochet special", and Peligot (1877:301) writes, "il comprime le fond plat de la bouteille avec un crochet en fer." The bases made with these tools may or may not be



FIGURE 9. The bottle is being held on the pontil while additional glass is added to the neck (Diderot 1772: Pl. VI).

identifiable. Toulouse, in his article on mould seams, mentions other types of moulds used to form bases (Toulouse 1969:526-35, 578-87).

PONTIL MARKS

The pontil is a long iron rod used to hold a glass article during the finishing process after it is detached from the blowpipe (McKearin and McKearin 1948: xvi). In Figure 9, from the Diderot *Encyclopédie*, the bottle is empontilled while the bottlemaker adds additional glass to the neck to form the finish. When the pontil is detached from the bottle, usually by a sharp tap on the rod, there is a scar left in the base which is called a pontil mark. Figure 10 illustrates four empontilling techniques: (a) the plain glass-tipped pontil; (b) the sand glass-tipped pontil; (c) the blowpipe as pontil, and (d) the bare iron pontil. Each of these processes leaves a characteristic pontil mark.

The plain glass-tipped pontil (Fig. 10,a), hereafter called a "glass-tipped" pontil, con-

sists of a solid iron bar with a slightly widened end which is dipped in molten glass. The glass on the pontil rod adheres to the glass of the base. The mark left by the glass-tipped pontil is comparatively small, usually no larger than 30 mm., although this will vary according to the size of the vessel being held. Usually there is evidence within the pontil mark that the whole area has been in contact with other glass, either because there is excess glass left when the pontil is detached (Figure 11) or because bits of glass are torn out of the base. This empontilling technique was commonly used on tableware, medicine and toiletry bottles, and on flasks. The small glass-tipped pontil mark in the centre of the push-up is not found after the 1720s on dark green glass "wine" bottles manufactured in the English tradition (see Noël Hume 1961:100-101, Types 12-16, 19-22). Some of the French "flower pot" wine bottles discussed in the push-up section do appear to have been empontilled in this way (Figure 3). The technique is still used for objects manufactured by hand.

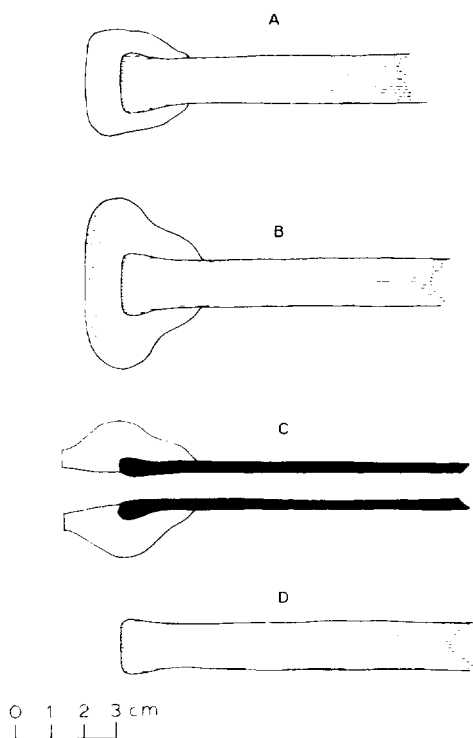


FIGURE 10. Four empontilling techniques: a) the glass-tipped pontil; b) the sand pontil; c) the blowpipe as pontil; d) the bare iron pontil.



FIGURE 11. Tumbler base showing excess glass left on the base after removal of the pontil.

The sand glass-tipped pontil (Figure 10, b), hereafter called a "sand" pontil, consists of a gather of glass on the pontil which has been shaped to conform to the basal profile and then dipped in sand (Toulouse: personal communication; Larsen, Riismøller and Schlüter 1963:397). The sand prevents the glass on the pontil from adhering too closely to the bottle.

The sand pontil mark is larger than the glass-tipped one, although again the size varies according to the size of the bottle. It consists of a thin line of glass chips encircling the push-up and enclosing a pebbled surface caused by the grains of sand (Figure 12). Some of the sand may also be embedded in the base (Toulouse: personal communication). Toulouse also points out that this type of pontil will conform to the shape of the already formed base without distorting it.

Sand pontil marks are very common on English dark green glass "wine" bottles, octagonal bottles and occasionally case bottles. The four "wine" bottle bases in Figure 12 have sand pontil marks (Toulouse: personal communication). In the upper two, dating from the 18th century, the pontil has been applied closer to the top of the push-up, which is usually hemispherical or dome-shaped. In 128 examples from one Canadian site, the diameters of the sand pontil mark ranged from 40 mm. to 71 mm., but 86 per cent were between 50 mm. and 64 mm. Sometimes one can feel a quatrefoil mark in addition to the pontil mark, but more often there is a pinch mark or wrinkle in the centre of the push-up which may be indicative of the tool used to form the push-up. In the lower pair (Figure 12, c, d), dating from the late 18th and 19th centuries, the sand pontil mark is less distinctive. Almost the entire basal surface is disturbed and is frequently roughened by embedded grains of sand or glass chips. The pontil mark usually begins close to the resting surface. In 76 examples from the same site, the pontil mark diameter ranged from 46 mm. to 71 mm., but 80 per cent were between 50 mm. and 60 mm. Sand pontils are still used on glass manufactured by hand (Toulouse: personal communication).

The third type of empontilling technique (Figure 10, c), probably no longer in use, consisted of using the glass left on the blowpipe after the bottle had been snapped off. In other words, the blowpipe itself was used as a pontil. The bottle was laid on a V-shaped structure (Figure 13) while the glass-

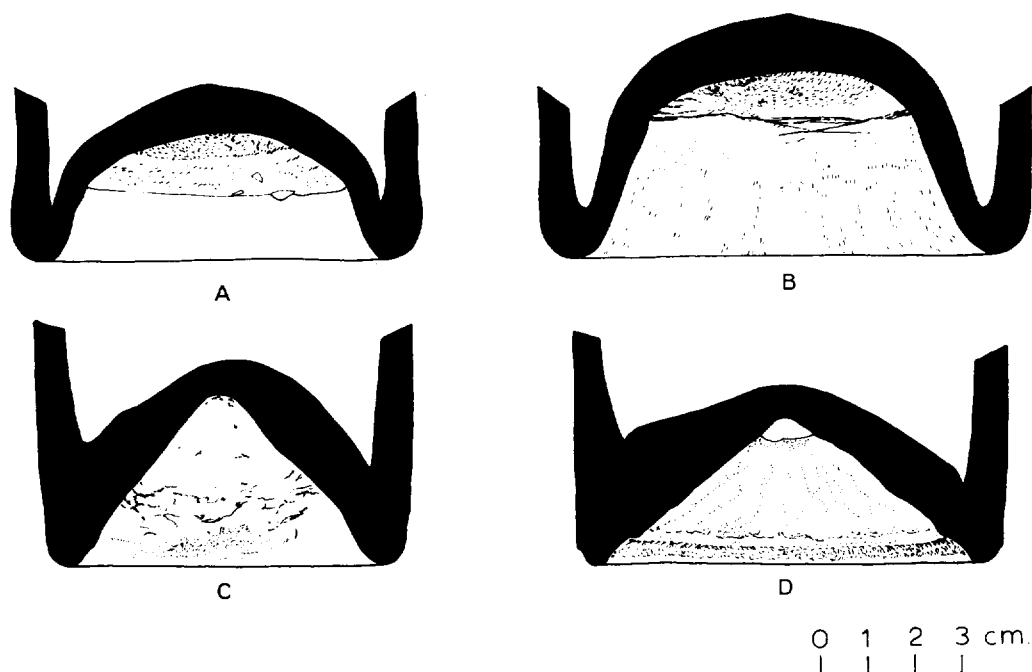


FIGURE 12. "Wine" bottle bases with sand pontil marks: a) and b) 18th century; c) late 18th, early 19th century; d) 19th century.



FIGURE 13. Bottle lying in a V-shaped structure while the blowpipe is attached to the base (Diderot 1772: Pl. V).

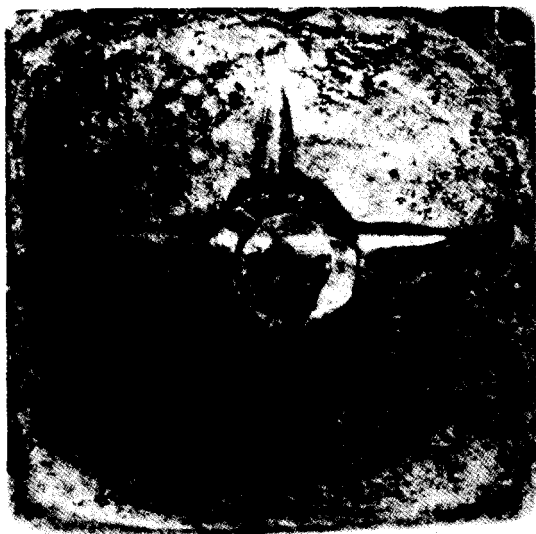


FIGURE 14. Base of a case bottle showing the ring-shaped mark characteristic of the blowpipe used as a pontil. The embossed moulded cross is as undisturbed inside the ring as outside.

maker applied the blowpipe with its excess glass to the base of the bottle. The pontil mark is a distinct ring-shaped mark about the same diameter as the neck (Toulouse 1968:139). When the blowpipe was removed from the base it either tore glass out with it or left extra glass behind. As the only area of contact is the ring of glass, any mould lines, embossed markings, and distinctive surface textures remain as undisturbed inside the ring as they do outside (Figure 14) (Toulouse 1968:139).

These ring-shaped marks are found on case bottles, champagne bottles, flasks, medicine bottles and other small vials, but they are not found after 1720 on the dark green glass "wine" bottles manufactured in the English tradition illustrated by Noël Hume (1961:100-101). This empontilling technique, described by Diderot (1772: Pl. V), was used for the French "flower pot" wine bottles, although the distinctive ring shape is not always obvious. Bottles of this type have appeared on a Canadian site occupied by the French be-

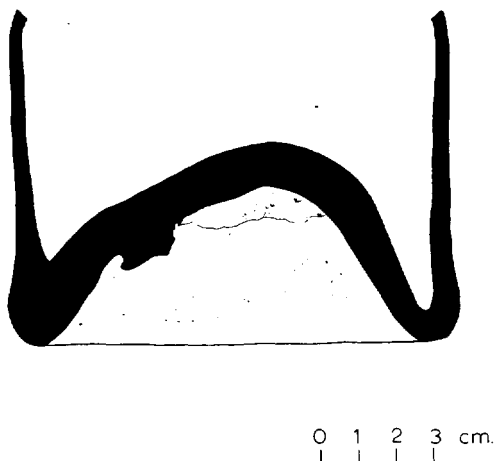


FIGURE 15. "Wine" bottle base showing distortion which may have been caused by using a bare iron pontil.

tween 1732 and 1745. The French writers Peligot (1877:300) and Bontemps (1868:509) described this technique, but whether this was straight copying from Diderot or whether the practise was still common has not been determined. Certainly it was still being used in the United States in the 19th century (McKearin 1970:89-91).

The fourth empontilling technique (Figure 10,d), probably discontinued, consisted of using a bare iron pontil with a suitably shaped end, usually a shallow arch, which was heated red hot and applied directly to the base of the bottle (Toulouse 1968:140). The pontil mark is a distinct circular mark covered with a reddish or black deposit which, when tested, indicated the presence of ferric oxide and occasionally ferrous oxide (Toulouse 1968:141). Toulouse (personal communication) also suggests that the bare iron pontil tended to distort the push-up more than any of the glass-tipped pontils (Figure 15). Some of the marks that I have seen on bottles in local collections are unmistakable, but others in the National Historic Sites Service collection have iron oxide deposits spread unevenly over the pontil mark area (Figure 15). The deposit could be explained in a number of ways. Possibly a bare iron pontil was used to hold the bottle; the push-up may have been formed by a bare iron tool, or the bottle may have been buried next to an iron object.

The distinct form has been found in American flasks, fruit jars and carbonated beverage bottles dating from about 1845 to 1870 (Tou-

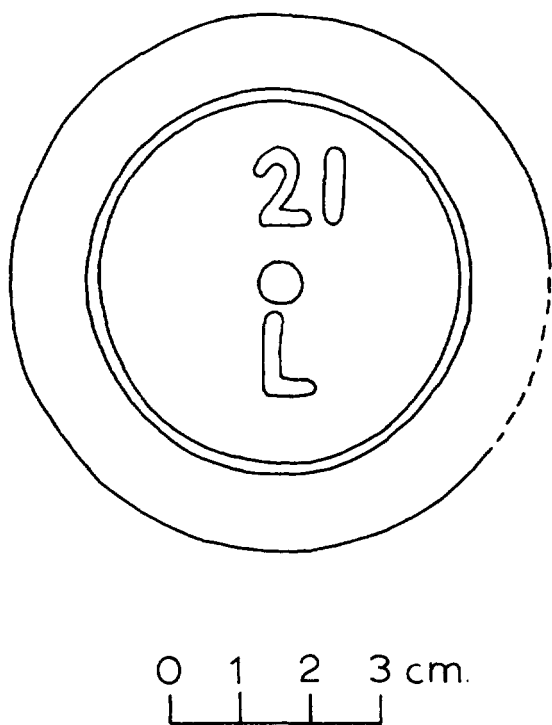


FIGURE 16. Moulded lettering in the centre of the base, a position formerly occupied by the pontil mark.

louse 1968:141-2). The indistinct marks in the National Historic Sites Service collection occur in 18th- and early 19th-century dark green glass bottle bases. Obviously further investigations will have to be carried out on this technique.

The pontil was gradually replaced by other tools, such as the sabot (Figure 1) and the snap case (Kendrick 1968:128), which held the bottle around the body and did not leave disfiguring scars in the base. These tools were introduced sometime between the late 1840s and the 1850s (Bontemps 1868:511; Larsen, Riismøller, and Schülter 1963:389; McKearin 1970:107; Scoville 1948:17), and by the 1870's had superseded the pontil for holding bottles during the finishing process (Toulouse 1968:204). With the disappearance of the pontil mark, the glassmakers began to use the centre of the base for moulded lettering and numbers (Figure 16).

CONCLUSIONS

Several relationships became obvious during the course of this study. Different empontilling techniques and methods of form-

ing push-ups were used for different types of bottles. Possibly these differences can be related to the size of the bottle.

A regular, rounded, cone-shaped push-up, probably made with a mollette, as described by Diderot, in combination with a small pontil mark, either from a glass-tipped pontil or from a blowpipe used as a pontil, occurs on 18th-century French wine bottles. I have seen the same combination on 18th-century European spa water bottles and suspect that the Belgian wine bottles illustrated in Chambon (1955: Pl. T, facing p. 113) were formed in a similar way. The combination, therefore, should probably be regarded as Continental rather than strictly French in origin.

The glass-tipped pontil or the blowpipe as a pontil appear to have been favoured by the French, and possibly the Continental glassmakers, for holding all bottles, even those of larger capacity (about 26 oz.). The English, however, favoured these two methods for their smaller bottles and used the larger sand pontil for bottles of larger capacity (about 26 oz.).

A separate mould part designed specifically to form the push-up appears to have been first introduced in England in the 1820s for the dark green glass "wine" bottles. Afterwards, however, this technique was used in many countries for most types of bottles.

The bare iron pontil appears to have been used in the 19th century. Iron oxide deposits on the bases of earlier bottles may be from the use of this type of pontil or from a tool used to form the push-up.

Obviously there are a great many questions left unanswered by the above study. The relationships between different bottle types, techniques, country and period of manufacture are very complex. Often the different types of marks are difficult or impossible to identify, and available literature on glass has, with few exceptions, not covered this aspect in detail.

In combination with other criteria such as body shape, size, and finish formation, the formation of the push-up and the empontilling techniques can be used as additional evidence in determining bottle types made during the 18th and 19th centuries.

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