

Birmingham. Their technique is virtually the same except the newly opened cylinder is annealed and then cut with a conventional glass cutter, is heated slightly to open the cut and then passed through another kiln for flattening. The glass in these pictures is red on clear.



Figure 3.2: 'Broad' or 'muff' glass blowing at the English Antique Glass Co. 1st series



9 - Swinging 1



10 - Swinging 2



11 - Reheat 1



12 - Swinging 3



13 - Reheat 2



14 - Necking the cylinder end



15 - Opening out



16 - Ready for annealing

Figure 3.3: 'Broad' or 'muff' glass blowing at the English Antique Glass Co. 2nd series

The 'crown' method commenced in much the same way as the cylinder method. The principal difference came once an appropriate pear-shaped bubble had been achieved. At this stage, a solid punt, or pontil, rod would be attached to the centre of the wider end by means of a blob

of molten glass, and the blowing iron would be broken off from the narrower end. The glass would then be reheated at the furnace via one of the openings, being continuously rotated the while. The centrifugal forces thus generated would result in the glass initially adopting a sort of mushroom shape finally ‘flashing’ [opening] out under the continuing application of heat and rotation to form a circular “table” in the order of a metre and a quarter in diameter. It would be kept rotating until no longer malleable. The pontil rod would be broken off, leaving the characteristic “bull’s-eye” in the centre and the glass would be annealed in an annealing kiln, both surfaces being “fire polished”, racked on ‘drossers’. Rectangular panes would then be cut from the circular table to get the least wastage. The off-cuts would then be used as cullet in due course.

Unfortunately, while Burgoyne and Scoble, p.5, show a well-known illustration of a marked-out table, it is only about half the size of those actually described by Coathupe in his *Notes*. Equally unfortunately, while he mentions what are obviously various different sizes on pages 104-109, he does not say what those sizes are; see Appendix 1. However, Col. Seddon (Royal Engineers, Retd.) published some information, reproduced in Appendix 2. Furthermore, the Massachusetts Historical Society holds a copy of an 1804 price list for ‘Crown Window Glass and bottles’ from Nailsea. (See Appendix 3). [At the very last minute, so not followed up, references have been found via the ‘www’ to an 1809 version of the price list, and to a *Crown glass cutter and glazier’s manual*, by William Cooper, 1835. Both are in the Koerner library of the University of British Columbia as microforms.]

[Thomas, 1987, p.20 states, “The glassworks at Nailsea made only crown glass; it never produced flint or enamel glass ...”, which seems to infer that crown glass was a recipe, rather than a method. This seems to be supported by the Concise Oxford Dictionary, but has not seemed to be interpreted in this way by other writers. It is clear from later passages that Thomas knew that the cylinder method was also used at Nailsea, and that bottles, and, later, plate glass was also made. This apparent confusion may just have come about from careless use of the terminology by writers using a convenient shorthand description. Vose, p.60, and Harden, (1969, p.83) agree that the first window glass produced by the crown method was in the east in around the fourth century AD, whence it translated to Italy and much later to north-west Europe.] Coathupe, p.111 expected that, “a well made table of glass should be 50 inches in diamr. and weigh $9\frac{1}{3}$ lbs. it then contains 101.915 cubc. ins.”

To return to the chronology, Vose, p103 *et seq.* suggests that there is some documentary inference for glassmaking in Britain from this time, and the picture gradually becomes clearer. This is, initially, mainly from documentary evidence (inventories, orders for glass and the like), rather than archaeological, but the latter fairly quickly comes in to its own.

For example, from Vose, p.104, we learn that about 1420 Staffordshire white glass was bought for York Minster and that in the late fifteenth century Salisbury Cathedral had its own “glashous”. This leads conveniently in to the next phase, as it appears that production was still mainly small-scale, often close to the fuel source, which was primarily still wood. Production was, therefore, still in small units of a house size, possibly hence the term “glasshouse”. In the woodland especially, it would appear that these could be fairly temporary in nature, it apparently being cheaper to move the glasshouse than to transport the fuel when the local woodland was exhausted. It also appears in some cases that the operation of the furnaces may have been seasonal, to some extent. (Vose, pps.60, 137.)

Ashurst, p.9, from Crossley (1967, p.65), refers to, “two tons of wood billets being required to produce eight crowns of window glass” in Sussex. Eight crowns might weigh about 75 pounds [a little over 34 kilograms]. At this point it is appropriate to mention that according to Vose,

p.137, the glassworks at Knightons, Alford, Surrey (excavated by Eric Wood in 1973 and dated to the 1550s) had an annealing furnace “designed to take crown window glass sheets, the first example of crown glass manufacture in England.”

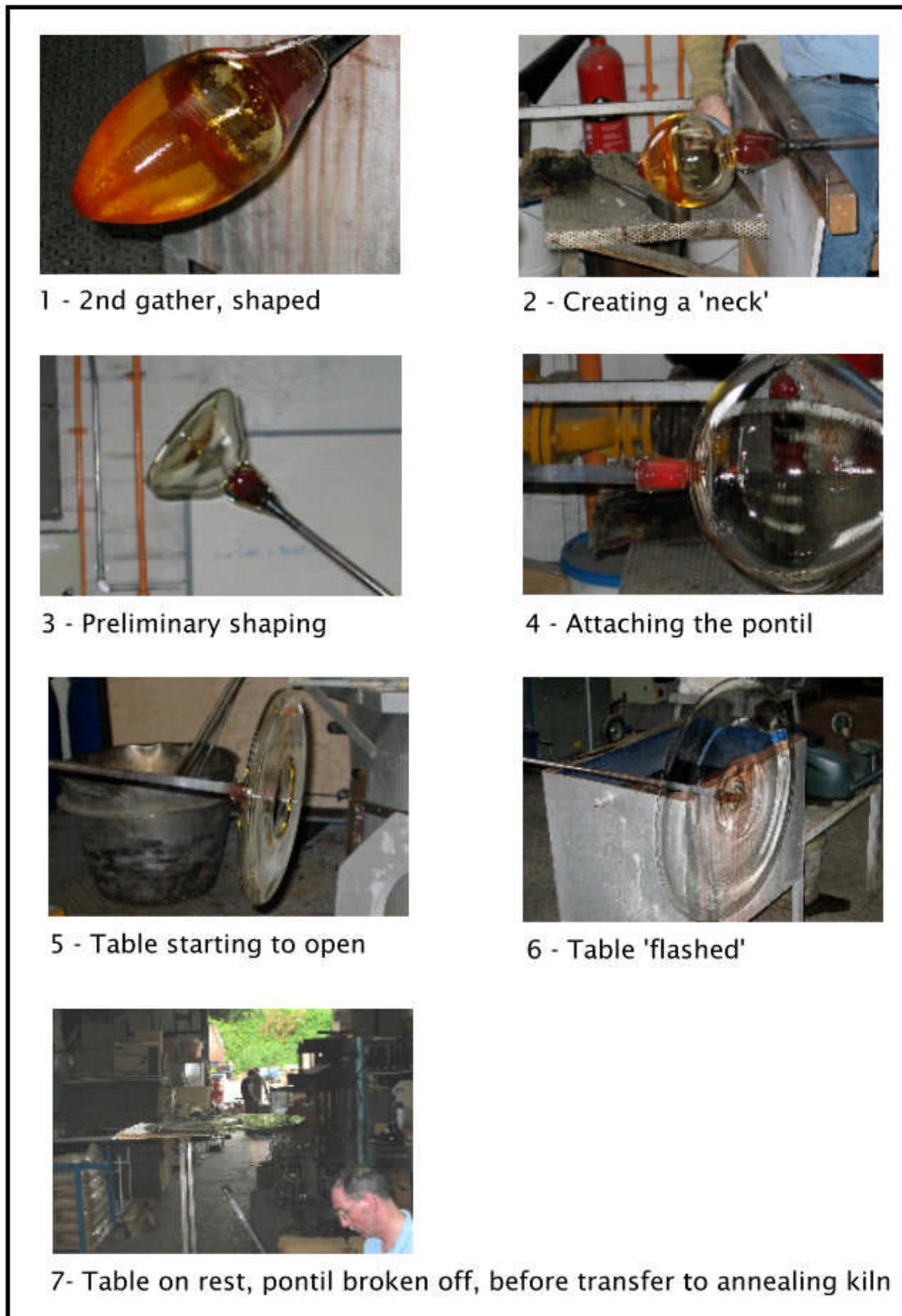


Figure 3.4: Crown table manufacture at the English Antique Glass Co.

Very good examples of clear crown glass window-panes, with orange-brown glass borders, may be seen on the first floor at Longleat House, Wiltshire, in the “Upper West Corridor, though the pot metal yellow borders do figure elsewhere in the House. This glass (with the armorial panels in the Grand Staircase lantern and the collection of early roundels etc formerly in the Chapel) were all introduced into the House when Sir Jeffry Wyatville was making his extensive alterations to the building for the 2nd Marquess of Bath in the early 19th century. The main glass supplier was Joseph Miller.”¹¹

Figure 3.4, above, attempts to capture some of the stages in the production of a modest sized table at the English Antique Glass Co. There is a detailed description, with a sequenced set of drawings, in Parkin, pps. 22-25. Other writers also give similar descriptions and there were probably certain local variations.

Post-medieval

Production seems still to be in the Weald and Staffordshire, primarily, but South Yorkshire made a tentative start early in the seventeenth century. While fine glassware still seems to be coming from outwith Britain, it is evident that window glass consumption is increasing. Its use is moving progressively down the social scale, and on p 105 there is an interesting paragraph on the use of window glass in Bristol in the first two-thirds of the sixteenth century¹².

Furnaces continued to be wood-fired, and competition for the fuel from the developing iron industry, in the form of charcoal, was becoming a consideration. Wood firing, due to the longer flame from wood, required a simpler furnace construction, the wood being fed in to a trough between the sieges that the pots sat upon in the furnace.

In 1614, James I and VI issued a patent to Sir Edward Zouch to use coal as a fuel to make every type of glass, and which prohibited the use of wood as a fuel and withdrew all previous patents. James went to the length supporting the prohibition by issuing a proclamation on 23rd May 1615 (Vose, p.115), to the effect that the way had been found to make glass, using coal as fuel, that was equally as good as that previously made by burning wood.

This use of coal led to a change in design of the furnaces. Coal burnt with a shorter flame than wood, so the fire had to be brought much nearer the pots, or crucibles. This was done by the introduction of iron bars forming a grate to support the fire just below the siege floor level. In addition a stronger draught was required. The result was the development of large airways below the furnace, to beneath the grate, often designed in a funnel shape, into the prevailing wind, and indeed, there is a reference to a ‘wind furnace’ in Vose, p.143.

We are now approaching industrialisation proper, rather than small, localised, enterprises. By the late seventeenth century the glass cone seems to have been developed to enhance the draught, and at the same time to provide a working area around the furnace itself. The sieges, or seats, where the pots sat seem to have been, more often than not, rectangular in British practice. This was an earlier deviation from the usually circular siege structures of the Continent, and writers there regarded this, together with the cone, as a peculiarly British form of glass house. Some were indeed house-shaped, with a fairly attenuated cone coming up through the roof. Although later (late 1880s) and larger, Pilkingtons’ No. 9 Tank House shown in Krupa and Heywood, 2002, p.2, Plate 3, gives some idea of the general outline of these early ‘houses’.

¹¹ Information kindly supplied by Dr Kate Harris, Curator Longleat Historic Collections. (Pers comm.)

¹² Vose, 1980. This derives from Neale, F, 1974:Thesis on the topography of medieval Bristol, University of London