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THE WISTARBURG GLASSWORKS OF COLONIAL NEW
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THE WISTARBURG GLASSWORKS OF COLONIAL NEW JERSEY

BY

Arlene Mary Palmer

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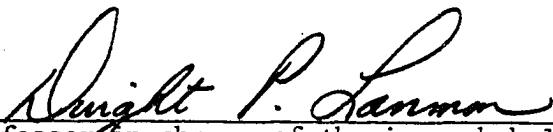
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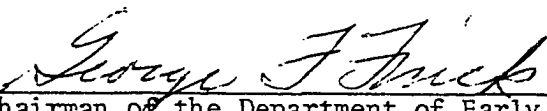
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
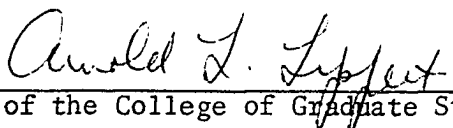
THE WISTARBURG GLASSWORKS OF COLONIAL NEW JERSEY

BY

Arlene Mary Palmer

Approved: 
Professor in charge of thesis on behalf of the Advisory
Committee

Approved: 
Chairman of the Department of Early American Culture

 Approved: 
Dean of the College of Graduate Studies

Caspar Wistar (1696-1752) enjoys a distinctive position in the development of American craft industries, for he was the first to succeed in the commercial manufacture of glass. Caspar and his son Richard (1727-81), who continued the glassmaking business after his father's death, did not contribute to the design or technology of glass; nonetheless, they are important for their vision and success in asserting the role of glass manufacturing in America. Born in the Palatine region of Germany, Wistar emigrated in 1717 to Philadelphia where he learned the trade of brass buttonmaking. By 1738, when he commenced plans for his Wistarburg glassworks, he was very well-established both economically and socially.

Although he had no reason to expect a glass business would thrive in the colonies, Wistar opened a factory in 1739 under the supervision of four German glassblowers whom he had persuaded to immigrate for that purpose. These first workers were not mere employees but were partners with Wistar in the business. Built on Alloways Creek in Salem County, New Jersey, the glassworks operated--incredibly--for forty years.

Through Benjamin Franklin's description of Wistarburg as well as through other documents, many details of the glasshouse facilities, raw materials, and products are known. While no absolutely documented

examples of Wistar glass exist, there are a number of objects which are very probably of Wistar manufacture. Fragments gathered from the factory site have also expanded knowledge about the enterprise. Its chief products throughout the entire period of operation were bottles of all sizes and shapes and window glass blown by the cylinder method. Some tablewares fashioned in the Germanic waldglas style and scientific glassware were also made there. Through the agency of Benjamin Franklin Wistarburg glassmen provided scientifically-minded men of all colonies with tubes and globes for their electrical experiments. The Wistars imported high quality English crown window glass and hollow wares in an effort to attract upper class clientele to their Philadelphia shop. For their own products as well as imported goods, the Wistars enjoyed markets in Pennsylvania and New Jersey, though evidence of Wistar glass in other provinces was found.

The circumstances which surround the closing of Wistarburg during the Revolution are not clear. There seems to have been labor problems--at least two workers left to join the rival establishment of Henry William Stiegel--and the complicated economic situation of the 1760's and 70's would have affected Richard Wistar as both an importer and a manufacturer. By the beginning of 1778 the workers had left Wistarburg; glassmaking ceased, never to begin there again.

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INTRODUCTION

CASPAR WISTAR

German-born Caspar Wistar (1696-1752) enjoys a distinctive position in the development of American craft industries, for he was the first to succeed in the commercial manufacture of glass. Though he received but scant attention before the twentieth century, by 1920 his importance was recognized, and antiquarians began to collect information about his New Jersey glassworks.¹ Attempts were then made to relate actual glass to Wistar's factory, called Wistarburg, which had operated from 1739 until the Revolution. Because the attributions which followed were not always prudent, a veritable Wistar mania swept the nation's auction houses and antique shops during the 1920's: every imaginable sort of blown glass was assigned to Wistarburg. Yet with all the commotion about Wistar, no serious study was forthcoming. Scholars' persistent neglect of America's first successful glass manufactory may admittedly be explained by the dearth of documented pieces of glass. Museum curators have had to label "Wistarburg-type" any green glass objects which are rather crudely blown into eighteenth-century forms, which display a vaguely Germanic style of applied ornament,

and which sport a South Jersey history. Beyond this broad classification of the glass and the sketchiest of factory histories, no one has ventured.

Virtually no material of consequence has been added to the Wistar literature over the years. Historians of American glass manufacture continue to stress the immigrant's importance as a "first" and as the founder of the South Jersey style of glass but have relied upon hackneyed biographical data. The objects of glass assumed to be his are dismissed as quaint but historic variants of the German waldglas tradition. Within the usual chronological framework, writers are only too happy to move from Wistar to the "more colorful"--and more tangible--Henry William Stiegel and discuss his efforts to provide the colonies with fine quality table glass.

Wistar need no longer remain an enigmatic character of colonial glassmaking: new documentary evidence has considerably illuminated many aspects of the immigrant's glass business. Fragments from the factory site and a number of possible Wistar objects have been chemically analyzed and when the testing is completed consistent chemical characteristics may result which will greatly aid the authentication of Wistarburg glass. The obscurity which shrouds the personal lives of Caspar Wistar and his son Richard (1727-81), who carried on the glass manufactory after Caspar died, has not, however, been entirely dispelled. In spite of the wealth and social position the Wistars were to attain in Philadelphia, they never aspired to

public notoriety so remain peripheral personalities in much of the manuscript material of the eighteenth century.

Some information about Caspar's life in Germany before he emigrated to Pennsylvania in 1717 can now be added to the standard accounts, information gathered from a fragmentary autobiography which has hitherto been ignored.² Wüsters--the spelling was changed only on these shores³--had resided in the Rhenish Palatinate since the beginning of the seventeenth century; their origins before that time have not been satisfactorily determined.⁴ Caspar Wistar, born in February, 1696, was the eldest son of Hans Caspar and Anna Catherina Wüster of Hilspach, a tiny village in the mountains near the Neckar River, not far from Heidelberg. Caspar, Senior, worked as a hunter (jäger) in the employ of the Elector of the Palatine who then lived in Heidelberg. Hilspach had no school but the young Caspar studied at home until he was fifteen years old. He then spent four years with a hunter in order to be trained in the hereditary profession of his family. But to the Wüsters' great sorrow, the twenty-one year old Caspar chose not to succeed his father as jäger for the the Elector. Instead, he decided to emigrate to the New World.

There had been an exodus from the Palatinate because of the nearly continuous wars which had ravaged the province since 1688; Caspar would have had little reason to believe the future of the area would be any less bloody. Possibly the youth was dismayed

by the prospect of the comfortable but limited income he would enjoy if he remained in Hilspach so determined to seek his fortune elsewhere. But by his own account, he was simply struck with wanderlust, taken with the idea of going to a new land. He must have heard the reports of Germans who had emigrated, since

those already in Pennsylvania sent back a glowing description of the ease with which land could be acquired, the productiveness of the soil, the abundance of food, the freedom from taxation and the equality of all men before the law to their natural rights and their religious creeds.⁵

So Caspar left the homeland--in the face of severe opposition from family and friends.

All tried to sway me from my . . . trip but they could do nothing. Thus with good intentions I began my trip in the year 1717 which . . . at the same time appeared to my parents, brothers, sisters, and close friends to be a great mistake.⁶

He traveled the two hours to Heidelberg, and, after several delays and a final attempt by his mother to persuade him to stay, he caught the boat to Rotterdam, the point of departure for trans-Atlantic voyages.

When he landed in Philadelphia in September, 1717, the German youth was healthy but poor. He later recalled having only nine pence and being four pence in debt--a humble beginning. But Caspar's life was to be a classic rags to riches tale, an early testimony to America as the land of opportunity. For during his thirty-five years in Penn's colony, Wistar amassed one of the largest fortunes of his day, leaving at his death an estate valued over £ 26,000.⁷

Caspar Wistar was just one of many thousands of Germans who quit the fatherland to begin life anew in the Quaker province. William Penn had offered sanctuary to the hapless people of the Palatine region in the late seventeenth century, but significant numbers did not emigrate until 1707. After that date there was a continuous flow of Palatines--but the name was indiscriminately applied to all Germans--and by 1717 their number was sizable enough to provoke official concern.⁸ Many immigrants unable to pay their passages came as indentured servants, but Caspar managed his fare and was bound to serve no one. Germans who were free did not often linger in Philadelphia but immediately moved westward to take up farming on lands the Penns readily granted them. Tradesmen, on the other hand, frequently joined the little Germantown community northwest of the city, which had been laid out in 1683 by Dutch and German Quakers.

Wistar evidently stayed in Philadelphia, for after several unsuccessful attempts to find employment, he was hired to unload cargo from the ship on which he had traveled. But already he had selected a trade, for it was during the time he worked at the docks that he learned how to make brass buttons. Caspar unfortunately did not record the name of his instructor; only a few button sellers advertised in the newspapers at that time and none were specified as manufacturers. This occupation turned out to be a happy choice for the youth, as there seemed to be considerable demand for the product.

Buttons were an essential part of eighteenth-century clothing, especially of men's coats and breeches. In that period gentlemen of means preferred silver, gold, shell, stone, or paste buttons: only after 1800 did buttons of brass come into vogue. Wistar, nevertheless, had not assessed his market inaccurately, for the vast majority of the population found brass ones quite suitable, particularly as they were a cheap variety of so necessary and notoriously transient an item. No doubt he intended to usurp the market enjoyed by foreign-made brass buttons by offering his at lower prices.

Attesting to the popularity of brass buttons are the advertisements for runaway servants which literally filled eighteenth-century Pennsylvania newspapers. Here the clothes of the fugitives are photographically detailed, and brass buttons are specified over and over again. The description of one of Wistar's own transgressors proves that the proprietors furnished their glasshouse personnel with buttons of their own manufacture: Adrian Brust, servant at the glasshouse, was wearing a "lightish coloured Upper Jacket, with Brass Buttons, this Country make," when he abandoned the glass business.⁹

The manufacture of brass buttons was not a complex procedure, according to contemporary descriptions.¹⁰ In essence, buttons were stamped out of sheet brass placed upon wooden molds. Wistar obtained his brass already in sheets from England but also bought old brass

in Philadelphia which he would have melted, cast into ingots, and flattened.¹¹ Round pieces were cut from the sheet with punches, then hammered with iron, convex punches upon concave molds to form the cap or plate of the button. A design could be stamped onto the plate, a thick strip of lead being placed between the engraved iron punch and the button. The lead contributed to the "taking off all the strokes of the engraving; the lead by reason of its softness, easily giving way to the parts that have relieve; and as easily insinuating itself into the traces or indentures."¹² The plate might then be filled with cement to strengthen it and to preserve the design. A flat disc of brass, onto which an eye of wire was affixed, was then soldered to the cap. Finally, the entire button was turned in a lathe to set and polish the rim.

Metal buttons found in archeological excavations provide evidence of other methods of fabrication. Stanley South, North Carolina State Archeologist, has composed a chart of the types of buttons unearthed at the site of a tailor's shop in Brunswick Town. Pictured in Ivor Noël Hume's Guide to the Artifacts of Colonial America (p. 91), the chart illustrates buttons of the 1726-76 period in Types 1-16. Type 9 is a hand-stamped, flat disc of brass onto which an eye was soldered, while Type 8 is a single disc of cast brass. The Wistars certainly hand-stamped buttons of either one or two parts, but they may have used the casting process as well.

Molds, punches, stamps, and a lathe of the sort buttonmakers needed are depicted on the left side of the engraved tobacco box made in London for Richard Wistar who had pursued his father's profession (Plate 1). The Wistars conceivably shaped some of their own tools, but Richard, at least, purchased a quantity of stamps, pliers, and punches from a local ironmonger, Stephen Paschall.¹³

The buttonmaking process as illustrated in Diderot's encyclopedia involves a number of people, particularly in the shaping of the molds. Caspar may well have inherited molds from his master or even ordered some from abroad, for although he did have a few apprentices he probably did most of the work himself. Buttonmaking, after all, he always considered his profession--not glassmaking which was merely an investment. In an effort to present Caspar as the hard-working immigrant, writers record the story that his right hand was partially paralyzed "from the constant shocks caused by hammering out buttons."¹⁴ Firmer proof of his assiduity can be found in the inventory of his estate where the tools and materials of his trade comprise an investment of well over £ 600.¹⁵ The business was profitable, for in 1721, only four years after his arrival as a near-penniless immigrant, Caspar was able to buy a lot and house on High Street, Philadelphia's main artery, that cost him £ 210.¹⁶



Plate 1.

Tobacco box, steel, made by Thomas Shaw of London for Richard Wistar, 1756. Collection of the late Vincent D. Andrus.

At least two apprentices learned the art of brass button-making from Caspar Wistar. One of these, Henry Witeman, had moved to New York City by 1750 and become that city's first brass button manufacturer.¹⁷ The other apprentice was Richard Wistar. By the time he was nineteen years old he may have taken over the business, for in 1746 he enlisted an apprentice of his own, Ludwig Falkenstein.¹⁸ Caspar's son continued to supply his customers with the brass buttons they wanted until the 1770's.

Wistar buttons achieved some degree of notoriety throughout the colonies as "Philadelphia brass buttons." An interesting document to this effect is Witeman's advertisement of 1760:

Henry Witeman. . . as usual Makes Philadelphia Buttons and Buckles . . . as cheap and as good as can be purchased in Philadelphia. As there are a great many of the counterfeit Sort sold in this City, for Philadelphia Buttons, which, upon Trial, has been found to break very soon, and the Purchasers thereof considerably imposed upon; he gives this Notice to the Publick, that he calls those of his Make, New-York Buttons. . . .¹⁹

Caspar's buttons were not only noted for their strength but were guaranteed to last seven years. Richard Wistar assured his clients in the 1760's that the buttons he fashioned were just like those his father had made and were similarly guaranteed.²⁰

There is more extant information concerning the button industry for the period of Richard's shop than there is for that of his father. The younger Wistar's letterbook proves that he

acquired sheet brass and wire from Sheffield through the Bristol merchants Freeman and Osland, from whom he also bought glass. The brass was ordered by thickness and pattern, the latter perhaps indicating that a design was already stamped on one face, or that the sheets were pre-cut to specific sizes or shapes. The following entry was included in an invoice of goods received from William Freeman in 1767: "No. 21 Pieces Latten Brass to Pattern 10. 11. 13. 14. Gage. . . No. 3 Rings. No. 6 and 1 No. 7 standard Brass Wire drawn to Pattern."²¹ As seen in his letters to other English merchants, Richard imported ready-made buttons of cloth-covered horn or mohair to satisfy his more fashionable patrons.

Although there were a number of dry goods merchants who carried imported buttons in their shops, the Wistars had no local competition in brass buttonmaking before William Ball, excluding, of course, the anonymous man who had first taught Caspar. It is not known exactly when Ball started producing buttons: in 1766 he advertised only London-made buttons, but in 1782 he listed "ring & other Button Stamps. Collars and Dies, Swages, Cutting and dap[p]ing Punches" among his tools to be sold.²² From the 1720's to 1770, at least, it seems the Wistars enjoyed a monopoly of the manufacture of brass buttons in Philadelphia.

While engaged in the button industry Caspar Wistar undertook another profitable activity, that of land speculation. He apparently capitalized upon the 1724 act passed by the Provincial Council

to enable him "to Trade and to buy and hold Lands in this Province."²³ The extent of his investments has not been ascertained, but there is one outstanding example of his acumen. The Penns had pursued the practice, disapproved by many observers, of selling to the colonists lands which had not been properly purchased from the Indians, and which were, in fact, still claimed by the savages. It was one of these contested tracts which Wistar acquired in 1730 for £7 sterling per 100 acres. Seven years later he sold the 2,000-acre parcel for £ 53 per 100 acres Pennsylvania currency. Allowing for the exchange differential between sterling and provincial currency, his profit was about 500%.²⁴ Some idea of the amount of real estate Wistar owned in Pennsylvania at various times between 1730 and his death can be gleaned from warrant records. Here he is cited as the owner of 2,061 acres in Bucks County, 439 in Lancaster County, and 327 in Philadelphia County for a total of 2,827 acres.²⁵ Additional holdings are mentioned in his will and, of course, there was the glassworks property in New Jersey.

Wistar may also have been interested in the iron industry, though evidence for it is very slight. Secondary sources quite often allude to his investments in Pennsylvania furnaces such as Pool Forge and Colebrookdale, but investigation of the available records of these and other works yielded no mention of Wistar as a shareholder.²⁶ There is, however, an indenture of 1727 which registers a tripartite agreement among William Branson, William

Monington, and Caspar Wistar where the property conveyed was the Abbetinkton iron furnace.²⁷

From a group of letters in the Wistar Papers in the collection of the Historical Society of Pennsylvania it is obvious that Caspar maintained strong business relations with his friends in Germany, particularly Georg Friedrich Holtzer in Neckargemünd and others in Krefeld and Manheim. The exact nature or extent of their business with Wistar are not yet clear. On several occasions, however, Caspar ordered miscellaneous items--textiles, German books, spectacles--to sell in either his Philadelphia or Alloway, New Jersey shop.

It is difficult to say whether Wistar's continued financial success derived from these activities was facilitated by his acceptance by Philadelphia's merchant elite, or whether this class was obliged to assimilate him because of his economic status. In the 1720's and 30's urban society was still fairly fluid, but a ruling class was definitely emerging. This group was not surprisingly "jealous of its none too secure position and sought by social, economic, and political exclusiveness to strengthen the barriers that divided it from those below."²⁸ These were a shrewd lot of merchants who regulated the provincial economy by exporting agricultural surplus and importing items the colony itself did not produce.

Few non-Quakers were admitted to the charmed circle and even fewer Germans. Caspar, however, had early furthered his chances of material success by converting to the Quaker faith in 1725. At the time, however, he was probably far from being economically motivated, for he had fallen in love with a Quakeress and Friends were forbidden to wed outside of their religion. On January 25, 1726, he married Catherine Jansen (or Johnson) of a prominent Germantown family.

At some as yet undetermined point in his life Caspar directed his thoughts towards glassmaking, so that by 1738 construction of the first American glasshouse of the eighteenth century was underway in Salem County, New Jersey. When Caspar died in 1752 the business continued to prosper under his son's proprietorship. Though he was plagued by competitors and labor unrest, Richard Wistar kept Wistarburg's fires going until the American Revolution no longer made the factory's operation feasible.

In selecting his enterprise Caspar Wistar could not have been encouraged by precedent, for earlier glassworks had a less than lustrous history. In fact, the routine fate of American glasshouses before the nineteenth century was financial disaster: Wistar's works alone would die a relatively natural death. The Wistars' singular success in the "chronicle of continuous failure"²⁹ which

was the story of colonial glassmaking is the problem explored in the following chapters.

NOTES TO INTRODUCTION

1. The earliest mention of the Wistar glassworks was found in Robert Gibbon Johnson, An Historical Account of the First Settlement of Salem in West Jersey by John Fenwick (Philadelphia: Orrin Rogers, 1839), p. 83. Deming Jarves omitted Wistar from his pioneer survey of the American glass industry, Reminiscences of Glass-Making (2d ed. enl.; New York: Hurd & Houghton, 1865). J. Leander Bishop included Wistarburg in his publication of the following year, A History of American Manufactures from 1600 to 1860, Vol. 1 (Philadelphia: Edward Young, 1866), 236. In 1885 R. M. Acton discussed the factory at length in "A Short History of the Glass Manufacture in Salem County, New Jersey," Pennsylvania Magazine of History and Biography, IX (1885), 343-46. The first extensive treatment of Wistar in the twentieth century was Frederick William Hunter's chapter on Wistarburg in his Stiegel Glass (1914; reprint ed., New York: Dover, 1950), pp. 157-70. The glassworks is often spelled "Wistarberg" but in the eighteenth-century "Wistarburgh" or "Wistarburg" was used.
2. The five-page autobiographical account is in German. Box 1, Wistar Papers, Historical Society of Pennsylvania, Philadelphia. The repository is hereafter cited as HSP.
3. As was so often the case with immigrants, the spelling of Caspar Wüster's name was the arbitrary choice of colonial authorities. When John Wüster, Caspar's brother, landed in Philadelphia Wüster was recorded as Wister, not Wistar as it had been for Caspar. Each man followed the official version when signing his name and descendants of each have retained the er-ar distinction. Eighteenth-century spelling was rarely consistent, however, and no less than eleven additional ways of designating Wistar were discovered: Waster, Weistar, Weister, Wester, Whister, Whyster, Wooster, Wouster, Wuister, Wuster, Wyster.
4. Observations on the European Derivation of the American Family of Wistars and Wisters (n.p., 1898).
5. Frank Reid Diffenderffer, The German Immigration into Pennsylvania through the Port of Philadelphia, 1700 to 1775, Part II: The Redemptioners (Lancaster, Pa.: By the author, 1900), p. 145.

6. Autobiographical account, Caspar Wistar, Wistar Papers.
7. "Inventory of the Goods and Chattels of Caspar Wistar," taken April 13, 1752, Wistar Papers. Hereafter this document is cited as Inventory of Caspar Wistar.
8. Governor William Keith reported to the Provincial Council, soon after his arrival in 1717, that "great numbers of foreigners from Germany, strangers to our Languages and Constitutions, . . . daily dispersed themselves immediately after Landing, without producing any Certificates, from whence they came or what they were. . . ." As quoted in Diffenderffer, p. 36.
9. Pennsylvania Gazette, April 26, 1770.
10. The following information on the manufacture of buttons is from Temple Henry Croker, Thomas Williams, and Samuel Clark The Complete Dictionary of Arts and Sciences (London: By the authors, 1764-66).
11. "Plate brass, wire and Borax as p. Neat & Neave," an English firm. Inventory of Caspar Wistar, p. 16. Philadelphians from whom Caspar bought old brass included John Smith, John Wyat, John Black, and William Bard. Receipt Book of Caspar Wistar, HSP.
12. Croker, Williams, and Clark.
13. Ledger B, pp. 29, 109, 185, Stephen Paschall Ledger Books, Paschall and Hollingsworth Account Books, HSP.
14. Richard Wistar Davids (comp.), The Wistar Family: A Genealogy of the Descendants of Caspar Wistar, Emigrant in 1717 (Philadelphia: n.p., 1896), supplement.
15. Among the items appraised in the Inventory of Caspar Wistar were the following: 264 1/4 lbs. cast brass; 246 lbs. brass pans for buttons; 2,850 lbs. brass in sheets for buttons; 94 lbs brass wire and Button shanks. Inventory, p. 16.
16. Deed, John Sturgis and wife to Jasper Wister, Deed Book F 3, pp. 422-24, Philadelphia City Hall. Copy in Box 1, Wistar Papers.
17. New York Gazette, September 17, 1750. In Inventory of Caspar Wistar, p. 16, after list of button making equipment, are listed four "servant lads" who may have been apprentices: Theodore and Martin Cline, John Cryder, John Eely.

18. Falkenstein voyaged in the ship Anne Galley from Rotterdam and was qualified for residency in Pennsylvania September 27, 1746. He was bound to Richard Wistar for eight years to be taught the trade of brass button making. Pennsylvania Magazine of History and Biography, 32 (1908), 368. For immigrant lists see William Henry Egle (ed.), Names of Foreigners who Took the Oath of Allegiance to the Province and State of Pennsylvania, 1727-75 ("Pennsylvania Archives," 2d ser., vol. 17; Harrisburg: Edwin K. Meyers, 1892). Also I. Daniel Rupp, A Collection of Thirty Thousand Names of German, Swiss, Dutch, French and other Immigrants in Pennsylvania from 1727 to 1776 (Philadelphia: Kohler, 1876).
19. New York Gazette, October 13, 1760.
20. Pennsylvanischer Staatsbote, September 30, 1765.
21. Invoice, William Freeman to Richard Wistar, March 10, 1767, Richard Wistar Letterbook, M 220, The Joseph Downs Manuscript and Microfilm Collection, The Henry Francis DuPont Winterthur Museum. Hereafter cited as Joseph Downs Collection.
22. Pennsylvania Journal, November 13, 1766; Pennsylvania Packet, May 2, 1782.
23. Minutes of the Provincial Council of Pennsylvania ("Colonial Records of Pennsylvania," vol. 3; Philadelphia: Joseph Stevens & Co., 1852), 235.
24. Francis Jennings, "The Scandalous Indian Policy of William Penn's Sons: Deeds and Documents of the Walking Purchase," Pennsylvania History, 37, (January, 1970), 22.
25. William Henry Egle (ed.), Warrantees of Land in the Several Counties of the State of Pennsylvania, 1730-1898 ("Pennsylvania Archives," 3d ser., vols. 24, 26; Harrisburg: William Stanley Ray, 1897-99).
26. There is no mention of Wistar in connection with the iron industry in Arthur Cecil Bining, Pennsylvania Iron Manufacture in the Eighteenth Century ("Publications of the Pennsylvania Historical Commission," Vol. IV; Harrisburg: Pennsylvania Historical Commission, 1938). Nor did Wistar invest in New Jersey furnaces: Charles S. Boyer, Early Forges and Furnaces in New Jersey (Philadelphia: University of Pennsylvania Press, 1931). The Historical Society of Pennsylvania, however, in its Guide to the Manuscript Collections (2d ed.; Philadelphia: Historical Society of Pennsylvania, 1949), states that Wistar

was an original investor in both the Pool Forge and the Colebrookdale Furnaces. An examination of the available record books of these companies yielded no mention of Wistar in that capacity.

27. Thomas A. Glenn, "An Old Pennsylvania Royal Coat of Arms," Pennsylvania Magazine of History and Biography, 24 (1900), 179.
28. Carl and Jessica Bridenbaugh, Rebels and Gentlemen, Philadelphia in the Age of Franklin (New York: Reynal & Hitchcock, 1942), p. 14.
29. Pearce Davis, The Development of the American Glass Industry ("Harvard Economic Studies," Vol. 86; Cambridge: Harvard University Press, 1949), p. 21.

CHAPTER I

THE BACKGROUND: GLASS AND GLASSMAKING IN EARLY PHILADELPHIA

The exact circumstances which induced Caspar Wistar to enter the glass manufacturing business will probably never be known. In the absence of an explanation from Caspar himself a story has been popularized over the years to account for his decision. Allegedly, the buttonmaker took a business trip to southern New Jersey and observed that the sand there was an excellent sort for making glass, it being quite similar to glass sand he had known in Germany.

Available studies of the German glass industry indicate that Wistar's home near Heidelberg was not in a major glass-producing region. The southwestern section of Germany was never noted for the manufacture of elegant glassware, or for much glassware of any sort; what little glass was blown there consisted of bottles and utilitarian articles in the waldglas style. Few forest glasshouses have been traced to the Palatine woods, though such small establishments often eluded documentation. The reason for the lack of a developed glass industry in the Palatinate could well have been an insufficient supply of raw materials: sand and wood. According to Wistar, the area around Hilspach was chiefly farmland.¹ Within a

fifty-mile radius of Heidelberg, however, were some glass factories: in southern Hesse and the Black Forest. The mobility of a teen-aged son of a hunter in early eighteenth-century Germany was probably not very great, so it is doubtful that Wistar was familiar with these works, their products, or the appearance of the necessary raw materials for making glass.

In any event, from the vantage point of the twentieth century, it is easy to declare that Wistar simply saw and filled a need in his society, and to applaud him for his vision. But the exigency of domestic glass in Philadelphia can be debated; recent investigation indicates that Wistar took quite a risk in the 1730's in assuming the city would be a ripe market for locally blown glass.

It is interesting that from the very founding of Philadelphia, as had been the case at Jamestown, glassmaking was considered an essential craft. Unlike the Virginia adventurers, however, the Quakers were well-prepared. In an effort to direct the establishment and operation of suitable industries for Penn's colony which would provide commodities for export as well as for local consumption, they organized the Free Society of Traders. Although this experiment in corporate business was eventually a failure, the original Quakers did succeed in erecting a number of factories, among them a glass-works. Joshua Tittery, a "broad glass maker, from New Castle upon Tine," had arrived in June, 1683, under contract to serve the Society in his trade for four years at the salary of £ 88 per year.²

Construction of a glasshouse for him was underway if not completed by August 16, 1683, as implied in a letter of that date from the proprietor William Penn to the Society.³ Tittery was still called a glassmaker in colonial records for 1688, but within ten years he had turned to the manufacture of pottery. Nothing is known about the operation or output of this first glass factory in Philadelphia, but it is likely that window or "broad" glass was its chief if not sole product.

A late seventeenth-century record pinpoints the location of Tittery's works in what was known as the Northern Liberties, an area along the Delaware River north of the city proper. According to Harold Gillingham, the glass factory advertised in the 1770's by John Hewson--later the Union Glass Works--not only occupied the same site as the seventeenth-century enterprise, but was, in fact, a later stage of that house. That is, Gillingham contends, without obvious evidence, that a glassworks in the Northern Liberties was in continuous operation from the time of the Free Society to the mid-nineteenth century.⁴ Admittedly, that the old glasshouse was physically standing in 1736 is proved by an advertisement in the American Weekly Mercury,⁵ but there is no evidence that glass was actually blown there after the late 1600's. Instead, there is every indication that no glassworks was in blast in the Philadelphia area when Wistar opened his factory in 1739; moreover, until 1763 when

Henry William Stiegel started his glasshouse in Lancaster County, Pennsylvania, Wistar was the only manufacturer of glassware in the Middle Colonies.

Philadelphians' immediate interest in glassmaking has a dual significance. In the first place, the Quakers, like the Virginia Company, may have hoped a colonial glasshouse with its unlimited fuel resources could assist English glassworks in supplying the home market. Secondly, Tittery's works implies a local desire for inexpensive and readily available glassware. Objects of glass are hardly considered prime necessities of a pioneer settlement, yet glass window panes, at least, were thought essential for Quakers' houses.

Some extremely crude dwellings in the town--certainly the caves along the river banks--demanded no such luxuries. Although a few of these shelters were occupied well into the eighteenth century, most settlers acquired more substantial housing within a few years of their arrival. By 1684, or two years after its founding, Philadelphia boasted 357 dwellings which in all likelihood resembled London rowhouses of the post-1666 fire period.⁶ In buildings of this type, casement rather than sliding sash windows were the rule. Such structures as the Slate Roof House, constructed c. 1687, and the Court House of 1707 certainly had casement windows with small diamond-shaped panes of glass. The Letitia House dating

between 1703 and 1715, on the other hand, had sliding sash windows with square panes. The fashion for larger, square panes of glass, supposedly introduced by Governor John Penn, quickly caught on and prompted the following verse:

Happy the man, in such treasure,
Whose greatest panes afford him pleasure;
Stoics (who need not fear the devil)
Maintain that pain is not an evil;
They boast a negative at best,
But he with panes is really blest.⁷

Window glass, of course, was not the only commodity of glass that colonists might have wanted; bottles, drinking vessels, and other containers were presumably in demand as well. Yet available documentation--newspaper advertisements and estate inventories--does not prove that glass of any kind was a major trade item in early Philadelphia.

In the 1720's only three advertisements for glass appear in the town's two newspapers, the American Weekly Mercury and the Pennsylvania Gazette. Caleb Jacobs simply noted "glass-ware" for sale, while Ralph Sandiford specified the sizes of his bottles.⁸ Although twenty-one other Philadelphians were dealing in glass before 1740, in nearly all cases, glass constituted but a minor portion of their stock. The dealer in glass was a general merchant: the products advertised along with glass ran the gamut from corner cupboards to prunes.

Window glass was the chief glass product for sale. Other wares, though rarely listed, included bottles, cruets, and drinking glasses. "Fine glass ink founts and viols [phials]" were sold by the printer of the Mercury, Andrew Bradford.⁹ Some fine quality glass was also available for in 1731 merchants Teague and Hillier offered both single and double flint glasses for sale, "single" and "double" denoting the relative quality of the flint (lead) glass.¹⁰ When recorded, the quantities of glass imported were meager considering the city had a population of 8,500 in 1730 and functioned as a trading center for much of the Middle Atlantic region. On the whole, the importation of glass before 1740 seems to have been an infrequent and haphazard affair.

An examination of Philadelphia County inventories for six random years between 1715 and 1740 was equally unsatisfactory in clarifying the role of glass in the pre-Wistar period. While glass was not a frequent entry in the records it could neither be associated with any particular income or occupational group. A Philadelphia brass founder, for example, whose estate was appraised in 1730 for £136, displayed fourteen shillings' worth of glassware on the mantelpieces of his house, yet a tin plate worker's estate valued at £332 in the same year ostensibly included no articles of glass.¹¹ As a source of information concerning the various forms of glass owned in Penn's town the inventories are as frustrating as newspaper advertisements with their listings of "bottles" and "sundry glassware."

Nonetheless, several precise descriptions were discovered which prove that glass mugs, canisters, drinking glasses, bowls, and salts were enjoyed in some Philadelphia households before 1740.

What must be remembered is that what little glass the colonial gentry did possess had been imported from London or Bristol. The English glass industry was highly developed by 1740; fine quality crown window glass and durable, brilliant lead glass tablewares were rapidly becoming the most prized glass goods of all Europe. For the upper classes which evolved as the colonies grew wealthier, London was ever the mecca of fashion and taste: only the excellence of English craftsmanship would suit their needs and social status. This prejudice of well-to-do colonists for British goods of all materials would prevail until the pre-Revolutionary economic strictures sparked a "buy American" attitude.

The relatively insignificant role of glass objects in the early eighteenth century is not surprising in spite of the settlement's initial corporate enthusiasm for glass, since Philadelphia, like other colonial centers, was still very much in a formative stage. Only in the late 1730's was the population large and prosperous enough to support any kind of luxury trade or to promote domestic manufacturing on a wide scale. As William Fishbourn observed in 1739, Philadelphia

was ye admiration of all people, who saw or heard of its flourishing Condition, in Lands, Improvements in building, houses, and shipping, Manufactures of many kinds, Encrease in plenty, Commerce and Trade and great numbers of Inhabitants.¹²

Drastically overshadowed in 1730 by Boston and New York in statistics of port activity, Philadelphia became the busiest harbor in the American colonies by 1760.¹³ And, just as the Quaker city was the economic center of the colonies, the achievements there in literature, science, and the arts were unparalleled in the second half of the century. The rise of the Pennsylvania capital was furthered by a body of enterprising merchants, largely Quaker, who "by the careful pyramiding of their interests and astutely arranged intermarriages consolidated their riches and position and gradually coalesced into a distinct upper class."¹⁴ Naturally, an emerging social class such as this created new demands for variety, quality, and quantity of consumer goods.

It was during this phase of Philadelphia's triumphant expansion that Caspar Wistar, already a member of the merchant elite, chose to build his glassworks. Glassmaking was, for all practical purposes, a novel business. Wistarburg was not only the first glass factory in the vicinity of Philadelphia since the late seventeenth century, but it also predated all other eighteenth-century glasshouses erected in other colonies. That the New Jersey works stimulated glass production elsewhere will be demonstrated.

Throughout history, governments have often sought to encourage the manufacture of glass. In the seventeenth-century Netherlands the authorities offered incredible incentives to would-be glass manufacturers: free building sites, free fuel, tax exemptions, and free dwellings for workmen, to name but a few.¹⁵ American factories would enjoy no such advantages; instead, an official *laissez faire* attitude contributed to the financial failure which was to be the fate of many glasshouses.

Although Philadelphia's seventeenth-century adventure in glassmaking was sponsored by the Quaker leadership, there is no evidence that Caspar Wistar ever received similar official promotion or financial assistance. This is understandable since a colonial glassworks directly countered the economic interests of the mother country. At the core of English colonial policy was the notion that home manufactures should reign supreme in supplying overseas possessions. Indeed, an inherent purpose of colonies was the expansion of the home market. Throughout the eighteenth century this idea was reaffirmed by various offices in charge of American affairs. In 1705, for example, the Board of Trade disallowed a Pennsylvania act for encouraging shoemaking in the province, claiming, "It cannot be expected that encouragement should be given by law to the making of any manufactures made in England. . . it being against the advantage of England."¹⁶ The Commissioners had been notified

when the glass factory commenced operation, but they did nothing to suppress it--or Wistar's buttonmaking business. Their laxity cannot be cited as an example of salutary neglect: the Board no doubt assumed Wistarburg would fail in short order as had all previous glassmaking attempts.

Wistar could scarcely have drawn inspiration from the feeble history of glass production in Pennsylvania, and he may not have even known about the seventeenth-century failures in Jamestown, Salem (Massachusetts), and New York City. He had no assurance whatsoever that people would purchase any glass, let alone his products which could not equal those of English glass-houses. No word of encouragement was forthcoming from official sources; instead, there was a real chance of royal opposition and eventual suppression. Furthermore, the manufacture of glass entailed no paltry investment: it required skilled labor that was nonexistent in America and a sizable plant, since glassmaking on a small scale was not worth the effort. In spite of this gloomy state of affairs, which Wistar may or may not have been fully aware of, the German immigrant's plans were activated in 1738 as he began to acquire land and experienced personnel for his glassworks.

NOTES TO CHAPTER I

1. Autobiographical Account, Caspar Wistar, Wistar Papers.
2. Harold E. Gillingham, "Pottery, China, and Glass Making in Philadelphia," Pennsylvania Magazine of History and Biography, 54 (1930), 123.
3. Ibid., 98.
4. Ibid., 122.
5. American Weekly Mercury, March 23-39, 1736.
6. Hugh Morrison, Early American Architecture (New York: Oxford University Press, 1952), pp. 513-14.
7. As quoted in John F. Watson, Annals of Philadelphia, and Pennsylvania, 1 (Philadelphia: J. B. Lippincott, 1870), 217.
8. Jacobs, American Weekly Mercury, February 26-March 7, 1722/3; Sandiford, Pennsylvania Gazette, August 14, 1729.
9. American Weekly Mercury, August 22-29, 1734.
10. Ibid., August 12-19, 1731.
11. Inventory of the estate of Austin Paris, founder, No. 146, Philadelphia County Wills and Inventories, M 996, Joseph Downs Collection. Inventory of the estate of William Stapler, tin plate worker, No. 168, *ibid.*
12. As quoted in Arthur L. Jensen, The Maritime Commerce of Colonial Philadelphia (Madison, Wis.: State Historical Society of Wisconsin, 1963), p. 4.
13. Ibid., pp. 5, 292.
14. Bridenbaugh, p. 180.

15. Robert H. McNulty, "Common Beverage Bottles: Their Production, Use, and Forms in Seventeenth-and Eighteenth-Century Netherlands," Part 1, Journal of Glass Studies, 13 (1971), 94.
16. As quoted in Louis M. Hacker, The Course of American Economic Growth and Development ("The Wiley Series in American Economic History"; New York: John Wiley & Sons, 1970), p. 28.

CHAPTER II

THE FACTORY

Wistar must have found the wooded expanses and navigable creeks of Salem County as attractive as the legendary sand discussed in the previous chapter. Throughout history the greatest expense of glasshouses has not been the cost of raw materials or freight of finished products, but rather the cost of fuel--the cutting, hauling, and drying of wood for the furnaces. As intense heat was required continuously during the operating period, seven or eight months of the year, a tremendous amount of wood was consumed. Trees have thus determined the locations of glass manufactories, while sand supplies and marketing conveniences were highly important but secondary considerations. Caspar Wistar selected some well-wooded land along Alloways Creek, eight miles from Salem, New Jersey, and purchased thirty-nine acres from Clement Hall in January, 1738; he accumulated 2,000 additional acres by the following spring. The factory buildings were constructed on a tract he bought from Amos Hilton which lies along the modern Commissioners' Pike, one mile east of Alloway.¹ The map pictured in Plate 2 shows the exact location of Wistar's glassworks; the Wistarburg community was apparently thought large or important enough to be included in contemporary maps.



Plate 2

Thomas Jefferys, *The American Atlas* (London: R. Sayer & J. Bennett, 1775) plate 13. Courtesy of The Henry Francis du Pont Winterthur Museum.

It was not at all unusual for a Philadelphian to establish business connections with this section of New Jersey; Philadelphia, after all, was only thirty-five miles away by water. By the 1720's a number of Philadelphians owned land in Salem County as evidenced by newspaper advertisements. Wistar very possibly got his idea for a Jersey location from one of his acquaintances, such as Edward Pleadwell, who had already invested in real estate there.² Another inducement may have been the Quaker-ness of Salem County, since Quakers traditionally maintain commercial relations among themselves.

A group of English Quakers conducted by John Fenwick organized the town of Salem in 1675. Seven years later, while Philadelphia was just being laid out, Salem was named a port of entry. In spite of this auspicious beginning, Salem failed to burgeon into a major center as Penn's city did. The port was not inactive, however, as cargoes of deerskins, cedar shingles, wheat, and beef were regularly exported in the eighteenth century. Official control was negligible with the result that Salem became a notorious smugglers' haven.³

Numerous villages followed the settlement of Salem; in 1738, when Wistarburg was under construction, the county had 5,884 inhabitants and gained a thousand more by 1745.⁴ Salem was not a popular place to live because it was reputedly one of the unhealthiest

regions on the continent.. Swamps abounded in this low, flat country; the Swedish traveler Peter Kalm reported in 1749 that Salem "is very easily distinguished about this time [May] by the disagreeable stench which arises from the swamps."⁵

This unpleasant feature did not deter Wistar, though, of course, he did not have to live in the county. On July 31, 1740, the Lords Commissioners for Trade and Plantations were informed that "there has lately been Erected a Glass work within Eight miles of that Port [Salem] by one Casper Wester [sic] a Palatine, and is brought to perfection so as to make Glass."⁶ Four glassblowers had sailed from Rotterdam on the Two Sisters and landed in Philadelphia in September, 1738.⁷ These men, Simeon Griesmeyer, Wilhelm Wentzel, Martin Halter, and Caspar Halter,⁸ were German, not Dutch as is often claimed: Rotterdam was simply the point of departure for most central Europeans voyaging to the New World. Wistar paid their passages; he must have persuaded them either directly or through friends still in Germany to emigrate and operate his glassworks--the exact circumstances are unknown.

Little is known about the Germans' backgrounds, but glassblowers would probably not have ventured off to America to build a works on their own initiative, with their own capital. Indeed, enterprisers frequently had great difficulty in finding foreign glassmakers who would come to America under any conditions.⁹ Perhaps it was to insure that his men would not only come but stay that

Caspar named them partners, rather than mere employees of the factory, and formed with them the United Glass Company. Documents relating to the company are quoted in Appendix 2; the record book which details the financial interactions of the principals fortunately survives.¹⁰ Frederick Tolles mentions but does not specify Quaker merchants in Philadelphia who invested in Wistar's firm, but as yet, no evidence of any owners other than the Wistars and the German workers has come to light.¹¹ It is possible, however, that Wistar received financial assistance from friends in Germany.¹²

Caspar Wistar brought little if any knowledge of glassmaking to this project; that he at least had had no glassblowing experience is implied in the partnership agreement where the Germans promise to teach the mysteries of their art to no one except Caspar and Richard Wistar.¹³ This was a legal technicality so Wistar could retain his monopoly on domestically produced glass, if only in the Philadelphia area: it is unlikely that either of the Wistars ever blew any glass except for his occasional amusement. Assuming then, that Caspar had no first-hand acquaintance with glasshouses--and his background in Germany confirms this--actual construction of the Alloway plant must have been directed by the blowers. This would explain the year's delay between the arrival of the workers and the commencement of the factory's operations. Further evidence of the Germans' role in setting up the facilities is suggested by Caspar's notation in the ledger of "the furnaces bought of them by me" (Appendix 2.).

The chief source of data about the facilities at Wistarburg is a marvelously detailed description recorded in 1747 by Benjamin Franklin. He was in an excellent position to examine the glassworks, for at the time he was actually supervising the production of glass objects for his electrical experiments--a matter discussed at length in Chapter VI. The historian could scarcely wish for more thorough documentation than that which Franklin provides, because his purpose was to present all the information a person planning to sponsor a glassworks would need to know.

In December, 1746, the eminent Philadelphian received a letter from Thomas Darling, a New Haven merchant. Although the first letter of the series does not survive, it is obvious from Franklin's reply that Darling intended to construct a glass manufactory in Connecticut. Having heard--somehow--of Wistar's success, Darling asked his friend to ascertain all pertinent details. What he wanted to learn is outlined in the manuscript notes Franklin made in preparing his answer:

1. How many men imployed in the whole?
2. How maney men imediately about the Glass blowing?
3. How maney feet of Glass Do they make a Day?
4. How Do they Sell it per foot in their Philedalphia?
5. What are the Stone they make their furnace of and
6. Where Do they Git them?
7. Where are the pots made that Contain the metal?
8. Who makes them?
9. Can they be bought amonst you and what a peace?
10. How Large the furnace and where Does it Stand?

11. How Do you think workmen are to be hired i.e. glass mongers: are they to be had by the Day and how much their money per Day: if they be or are they to be hired in as partners?
12. [How] Maney pots shall I need per Annum [and] how Long will they Last?
13. How maney men Shall I Have Need to Send for to England?
14. How Soon may the furnice be got a going?
15. What Do you think their furnice Clears per annum?
16. Where Does their furnice Stand? in what town? how far from Philedalphia?
17. Whether there be any thing Special to Seperate the Glass from the Sedements?
18. Why Dont the Iron Grates between the first and Second Chambers melt when the fire is So Extream? Cramer upon Metals.
19. What the Reason workmen may not be had with you?
20. When will their Furnace begin to work this Spring: because &c.
21. What is the Contrivance of their Kiln?
22. Do they in England Use potashes in m[aking] Glass?
23. What part of Sand and ashes is Converted into Glass?¹⁴

Darling's questions undoubtedly paralleled those of another novice, Wistar himself, when he first conceived the idea of such an undertaking. From Franklin's responses to Darling of February 10, 1746/7, and March 27, 1747, a rather complete picture of Wistarburg can be drawn. As it turned out, Franklin's assistance was for naught because the Connecticut factory never materialized.

Regarding a suitable location for a glassworks Franklin advised his friend to procure at least 1,000 acres of well-wooded land situated on or near a navigable body of water. In stressing the latter feature Franklin must have echoed Caspar Wistar's reasoning in choosing the Alloway site, and wrote, "By Means of the

navigable Water, [you can] carry your Glass to Market cheaper and with less Risque of Breakage."¹⁵ In Europe markets were severely restricted geographically if water transportation was unavailable, for overland travel, aside from being costly to begin with, invariably entailed considerable breakage. Eighteenth-century Parisian glaziers, for example, "constantly complained that about one out of every four windowpane disks [crowns] from Normandy was broken."¹⁶

But the major requirement for a glasshouse was a vast, well-wooded tract, for both Wistarburg and the factory Darling envisioned utilized wood-burning furnances. English and some Continental glassworks had converted to coal fuel because of a wood shortage. Even though the American colonies were well forested, Franklin urged careful planning in acquiring wood fuel. He implied that Wistar was prudent in this respect by cutting approximately a thirtieth part of his woods yearly and replanting immediately so as to insure a continuous supply. "Our Glasshouse," wrote Franklin,

consumes Twenty-four Hundred Cords of Wood per Annum tho' it works but Seven Months in the Year. (But the Wood is only of 3 Foot Length, which lessens the Quantity One Fourth.) It is split small and dried well in a Kiln before 'tis thrown into the Furnace. The Cutting, Hauling, Splitting and Drying of this Wood, employs a great many Hands, and is the principal Charge. . . .¹⁷

Some idea of the extent of Wistar's establishment can be deduced from comparison with a South Jersey factory operating in 1820. According to the census record of that year, Cumberland County's Eagle Glassworks consumed 1,200 cords of wood, or half of Wistar's amount, for a cost of \$3,300--43% of the total payment for raw materials. Using that quantity of wood the Eagle factory, which employed twenty-four men and ten boys, produced 3,000 boxes of window glass.¹⁸

Darling is reminded that wood, in spite of its expense, "furnishes at the same Time [a] great Part of the Ashes that are wanted"¹⁹--that is, the potash (unpurified wood ashes) needed as an alkali in the batch. Additional quantities of that substance at Wistarburg were furnished by what is called the "Potash Company" throughout the account book of Wistar's business. For the common or green glass which Wistar made in quantity, and Darling hoped to make, Franklin knew that sand and potash were the major ingredients; lime was needed to stabilize the batch, but it could have been introduced inadvertently with the potash. Unpurified wood ashes could not be used in the manufacture of fine table glass: it was only suitable for the coarser kinds of glass and was a characteristic element of the German waldglas from which Wistar's wares were descended.

There is no apparent truth to the statement that Wistar produced America's first lead glass. Aside from the fact that Wistar never intimated his wares were finest quality table glass, very little lead glass was blown in Germany, so would have probably been outside the blowers' experiences, if, indeed, all the Wistarburg glassmakers came directly from Germany. Most of Wistar's glass required no coloring or decoloring agents, for the common glass which formed the bulk of Wistarburg's output was green, a color produced by iron impurities present in the sand. Wistar did make some colorless glass, according to the ledger book, for which manganese oxide would have been imported.

Considerable detail is offered by Franklin concerning the furnace construction at the Alloway works. Writing to Darling in March, 1747, he noted that

the Furnace is about 12 foot long, 8 wide, 6 high, has no Grate, the Fire being made on its Floor. . . . On each Side in the Furnace is a Bench or Bank of the same Materials with the Furnace, on which the Pots of Metal stand, 3 or 4 of a Side.²⁰

From this description it is evident that Wistarburg's furnace was of a design typical of northern European glasshouses: the glassblowers had copied those they had known in Germany. One-level furnaces of this rectangular plan were reported by the German monk Theophilus in the Middle Ages, and were distinct from furnaces of the southern European glass factories which featured a three-level arrangement.²¹

Two-thirds of the furnace length was probably separated from the remainder by a wall. The larger chamber contained the main melting furnace, while the other third formed the auxiliary oven, the calcar, for fritting or initially combining the raw materials. Along the entire bottom of the primary furnace was a longitudinal trench where the fuel was burned. The secondary oven did not have its own firebox but derived its heat by means of a linnet hole connecting it to the main chamber. The pots which held the batch were placed on platforms along either side of the fire trough. Next to each pot was a hole in the exterior wall enabling the blowers to gather their glass from the pots. The ceiling of each furnace was arched so the heat would be reflected and increase the temperature.

In the time of Theophilus the annealing oven where the finished glass objects were gradually cooled was a structure separate from the principal furnace. The one at the Wistar manufactory may or may not have been attached to the melting and fritting furnaces. By the eighteenth century, the leer, a tunnel-like structure through which the glassware was slowly moved away from the heat of the melting furnace, was quite common in glasshouses. Franklin neglected to mention either the calcar or the annealing furnace in his answers to Darling. Richard Wistar is unfortunately ambiguous on the subject in his 1780 list of the factory's facilities; saying only that the glassworks "contains two Furnaces, with all the necessary Ovens for

cooling the Glass, drying wood, &c." It is unclear whether "two Furnaces" refers to one melting furnace and one calcar, or to two units which combined both.

The furnace was really the key to successful glassmaking.

As G. R. Porter claimed in 1832,

The whole operations of the glass-house depend upon the stability of its furnaces. In their original structure the prudent manufacturer will, therefore, not hesitate to avail himself of the assistance of the ablest builders and to employ materials which are best qualified by their density and infusibility for resisting the action of violent and continuous heat.²³

Even when great pains were taken the expected longevity of a furnace was between seven and twenty-seven months. What determined the life of a furnace was the preparation of the clays used to build it. A very fine white clay, argil, was combined with pulverized bits of old clay bricks. English workmen traditionally pounded the materials with their bare feet to achieve the desired mixture. It generally took twenty days to build and dry a furnace before it could be put to use; the time and labor involved prompted glassmakers to take the initial trouble to construct as sturdy a furnace as possible. At Wistarburg furnaces were "renewed" before every period of operation or blast; that is, they were rebuilt or repaired every September, since the fires burned from October to May. As Franklin told Darling, the furnace there was made of bricks of white clay. "The old Bricks are Pounded fine and mix'd with fresh Clay to make the new."²⁴

Many glasshouse proprietors were beset with furnace problems and Wistar was no exception. In 1752 Jonathan Belcher, governor of the New Jersey province, passed on information about Wistarburg to hopeful New England glass manufacturers much as Franklin had. To Colonel John Alford of Boston Belcher wrote that he had been well acquainted with Caspar Wistar some five years earlier. At that time the German had complained "that the Clay for the Furnace Bottoms was but poor and often gave way to their great damage."²⁵ This is interesting, for it was just at that period, 1747, when Franklin reported to Darling that Wistar was no longer compelled to buy his clay from England because suitable clay had been found in the colonies.²⁶ The difficulties with this domestic clay is perhaps explained by the workers' unfamiliarity with its particular properties. It is probably to this domestic clay that Belcher refers in his reply to Messrs. Belcher and Foye of New England, who consulted the Governor in their plans to organize a glass manufactory. Belcher wrote, "I will take all the prudent steps I can. . . to get a Sample of the Clay." This would seem to suggest that the clay deposits were in New Jersey. In any case, Belcher urged his friends to procure Stourbridge clay from England, if possible, even though "exportation is prohibited upon a great penalty." The Governor added that he himself had managed to acquire some illicitly for his copper furnaces.²⁷

Good clay was similarly vital for the pots or crucibles in which the batch was melted. If not properly fashioned, pots would burst in the furnace and halt production. Again, the most durable pots were made from a combination of fragments of old pots and new clays. The nineteenth-century English flint glass manufacturer, Apsley Pellatt, advocated the use of four-fifths measure of new Stourbridge clay to one-fifth measure of old clay bits.²⁸ Shards could not be crushed too finely, however, for a somewhat porous body was necessary so humidity could diffuse through the pot's sides and lessen the chances of its splitting during drying and heating. After being mixed and saturated with water the clays were kneaded by the workmen with their bare feet.

When of the right consistency, the clay mass was rolled into small pieces, sausage-size, advises Pellatt. These were placed together to form a four-inch thick bottom for the crucible, which was beaten with a wooden mallet. Rolls were piled up to form the sides; air bubbles were assiduously eliminated. The finished pots, usually between two and three feet in height and diameter, were kept warm to dry for at least four to six months, though there is some disagreement among authors as to the exact length of drying time.²⁹ Immediately before use in the furnace they had to be carefully raised to furnace temperature. To do this the pots were positioned in the coolest end of the leer and gradually moved towards the heat. If made well, one of Pellatt's pots lasted an average of three months.

Although the pot-making process Pellatt outlined was intended for lead glass factories, it was essentially the same method Wistar would have followed in forming pots for his potash glass. The crucibles did not need to be as thick as those which contained lead glass, nor did they have to be covered. In England lead glass was melted in covered or hooded pots to protect the colorless substance from the discoloring coal smoke.

Pot-making was an important aspect of glassmaking and was frequently done by the glassworkers themselves: it was not entrusted to the hands of less skilled employees. Whether or not this was the case at Wistarburg is not clear, for Franklin simply remarked that their pots were "made by the Workmen."³⁰ By 1780 part of the operation was automated, for there was a rolling mill and a stamping mill "for the preparing of clay for making of pots."³¹

In Franklin's estimation a glasshouse like Wistar's, with its furnaces, raw materials, and sundry equipment, could be set up with a capital investment of about £1,000. Glassmaking tools would be but a trifling portion of the expense, they "being only a few Iron Rods made hollow, with wooden Handles, Sheers, &c."³² As illustrated in Plate 1, the few tools required by a glassmaker were of simple design. The basic needs of each blower were a blowpipe, pontil, and pucellas, with perhaps additional shaping, cutting, and decorating devices. Since there were many ironworks in both Pennsylvania and

New Jersey by 1740, it is most likely that Wistar ordered his iron equipment from local firms. Proof of this can be found in the sales ledgers of Stephen Paschall.³³ Between 1753 and 1772 Richard Wistar purchased twelve "glass shovels," fourteen "glass ladles," and one "sturrer," all of which were presumably fashioned at Paschall's Philadelphia iron furnace. These particular implements in several sizes were employed in mixing the batch in the calcar and in transferring cylinders of window glass to and from the flattening oven; examples of such shovels and ladles can be seen in Diderot's encyclopedia.³⁴ Franklin did not mislead Darling by dismissing their cost, for in twenty years Wistar spent only £ 26 on these tools, paying one shilling per pound of iron. There are no known records which document the Wistars' other investments in tools. Even if Richard Wistar bought as many blowpipes, pontils, and pucellas as he did shovels and ladles, his expenditure for tools could still be described as trifling.

As for the rest of Darling's questions, Franklin recommended that he obtain the answers himself when he visited the New Jersey factory in the spring of 1747. No record could be found of the New Haven man's reactions to or reception by the Wistar enterprise, if indeed he did examine it as planned. Wistar may not have been overly informative; understandably, he was not always cooperative with would-be competitors. Belcher warned his friends:

You put me upon a Hard Task to procure you any Tolerable Information as to the Carrying on of those [Wistar glass] Works here in which the Managers are very close and Secret however I will take all the prudent steps I can to make you an Answer. . . .³⁵

And to Alford the Governor wrote,

I have begun to make Inquiry about the Glass Works in this Province wch are 130 miles from this Town & as I know no proper person near them capable of getting the Information you desire I have hardly a lean hope of rendring you any Service in that matter in which the Undertakers are very close & Secret. . . . I really think there can be no good & honest Intelligence gain'd from those Undertakers. . . .³⁶

The Wistars' silence was only to be expected, since manufacturers, especially successful ones, were not wont to divulge trade secrets and jeopardize their good fortune. In 1769 when many merchants decided to capitalize on the Anglo-American situation and invest in domestic manufactures, Wistar's aid was again solicited, and again, the question concerned the clay. Thomas Clifford, Philadelphia merchant, inquired the source of Wistarburg's clay. The glass manufacturer refused to tell him because he learned that Clifford asked on behalf of potential--rival--manufacturers in Boston. Clifford explained his rebuff, claiming Wistar was "apprehensive it may hurt his Business and thinks it not a reasonable request of me to ask and refuses either to tell me where I can get it myself or sell me a hogshead of it."³⁷ This incident demonstrates how crucial good clay was for successful glassmaking.

There were other facilities at Wistarburg which Franklin omitted in his survey. In the 1780 newspaper advertisement, when Richard Wistar placed the business on the market, "flatting ovens, in separate Houses" are mentioned. These were essential items for the production of window glass by the cylinder method which was probably practiced by the German workmen from the very start of the factory. In these furnaces the slit cylinders of glass were flattened into sheets. By the same token, there had to be accommodations for cutting the sheets into smaller pieces appropriate for window panes. Accordingly, Wistar noted a "House fitted with tables for the cutting of Glass."³⁸ Glaziers' diamonds were required to slit the blown cylinders and to cut window panes. Only sporadically mentioned in the account book, diamonds were the subject of a 1772 letter from Wistar to an unspecified overseas agent:

Please also to send me an Acct. what Glasiours Diamonds such as are used for the Cutting of Glass may be had for both sett & unsett That is the naked spark or Diamond without being inclosed in an iron ferroll such I call u[n]sett. those inclos'd in an Iron ferrel I call sett & are fitt for immediate use. I shall want about one Dozen provided the Price is not above what they come at from Holland.³⁹

Wistar had to assume a financial responsibility to provide for his workmen. Although Wistarburg at no time operated on the scale that John Frederick Amelung's glassworks of 1785 did, where 342 people were involved, Wistar in effect created a small town. His glassblowers and indentured servants had families, and all but

the very few natives of Salem County who were concerned in the business needed shelter, clothing, and food. Ten dwelling houses were built for workers--nothing of these remains today. Much of the food the workers consumed was probably provided by the glass-works farm or by neighboring farms. No doubt the sheep, swine, and cattle mentioned in Richard's will supplied much of the meat for the employees.⁴⁰

Wistar's workers were in close proximity to both Alloway and Salem where clothing and other supplies could readily be had, but Wistar recognized an opportunity to expand his business and act as a retail merchant at Wistarburg. Thus the advertisement includes a reference to "a convenient Store-house, where a well assorted retail Shop has been kept above 30 years; is as good a stand for the sale of goods as any in the county."⁴¹ In his correspondence Richard calls this his "country store." Many Philadelphia merchants set up these "branch" general stores in the countryside surrounding the city; by 1763 such establishments reached the Ohio territory.⁴² Some idea of the types of goods with which Wistar stocked his store is gleaned from the letterbook of the 1760's. Here items are ordered from English manufacturers specifically for the country store--Wistar, it must be remembered, also managed a shop on Market Street in Philadelphia, and merchandise for the clientele was scrupulously differentiated.⁴³ Wistar's English suppliers included Robert and

Nathan Hyde of Manchester, Samuel Elam of Leeds, and William Freeman of Bristol. These firms, largely Quaker and quite ensconced in Philadelphia trade circles, sold Wistar cotton goods, silks, ribbons, and metalwares.

Another structure in the Wistarburg complex was the mansion of which no trace remains. It was apparently rather large and had a bakehouse and washhouse.⁴⁴ It is doubtful that the dwelling was occupied by any of the managers of the works, such as Benjamin Thompson, although the Wistars themselves, especially in Caspar's day, seem to have spent little time in New Jersey. On several occasions Richard Wistar's address is given as Wistarburg, and some information about the furnishings of the house is available.

The handful of written sources consulted for the preceding discussion of the physical facilities of the Wistar establishment are the only documents that have been discovered which offer such data. No illustrations of the works are yet known; further information about Wistarburg must await archeological investigation.

NOTES TO CHAPTER II

1. The details of Wistar's land purchases are cited from secondary sources, as the original deeds are in the manuscript collection of the New Jersey Historical Society, an institution which was closed to the public during the period this thesis was researched.
2. American Weekly Mercury, February 9-16, 1728.
3. Larry R. Gerlach, "Customs and Contentions: John Hatton of Salem and Cohansey, 1764-1776," New Jersey History, 89 (Summer, 1971), 69-92.
4. William A. Whitehead (ed.), Administrations of Governor Lewis Morris, President John Hamilton, and President John Reading, 1738-47 ("Documents Relating to the Colonial History of the State of New Jersey, New Jersey Archives," 1st ser., vol. 6; Newark: Daily Advertiser, 1885), 242, 244.
5. Peter Kalm, Travels in North America, rev. and ed. Adolph B. Benson, 1 (New York: Wilson Erickson, Inc., 1937), 294.
6. Cha[rles] Carkesse to Thomas Hill, Secretary to the Lords Commissioners for Trade and Plantations, July 31, 1740, New Jersey Archives, 1st. ser., vol. 6, 98.
7. Pennsylvania Archives, 2d ser., vol. 17, 155-58.
8. The names of these glassmen were spelled in a variety of ways in the contemporary records. Simeon Griesmeyer, Briesmeyer, Craysmeyer; Wilhelm Wentsil, Wentzell; Caspar and Martin Halter, Holder, Halder. The spellings used throughout this these are those found in the Account Book, Glass Company, 1743-67, Box 2, Wistar Papers.
9. Messrs. Tower and Leacock, founders of the Philadelphia Glassworks, wrote Benjamin Franklin in London requesting his aid in acquiring glassblowers. Franklin replied, August 22, 1772:

I received yours and should readily have afforded the Assistance in my Power you desire. to Mr. Crafts, in sending Hands to you for the Glasshouse, if he could have found any willing to go on reasonable Terms. It is always a Difficulty here to meet with Good Workmen & sober that are willing to go abroad. I heartily wish you Success in your laudable Undertaking to supply your Country with so useful a Manufacture. . . .

BF 85.56, Franklin Papers, American Philosophical Society, Philadelphia.

10. Account Book, Glass Company, 1743-67, Box 2, Wistar Papers.
11. Frederick B. Tolles, Meeting House and Counting House: The Quaker Merchants of Colonial Philadelphia, 1682-1763. (Chapel Hill, N. C.: University of North Carolina Press, 1948), p. 88.
12. Georg Friedrich Holtzer to Caspar Wistar, February 23, 1740, Box 1, Wistar Papers. Translated from the German:
For this glasscutting I congratulate you from the bottom of our hearts and wish good profits, if enough glassmakers could rise out of these bad times. . . .
Wistar perhaps sent Holtzer some glass from the first batch he made. Wistar had considerable financial dealings with Holtzer throughout the 1730's so it is possible that he at least borrowed money from him to start the factory.
13. According to Hunter, p. 159, the terms of the contract of December 7, 1738, between Caspar Wistar and the four Germans were as follows: Wistar was to pay their passages from Rotterdam; they were to teach the art of glassmaking to the Wistars and to no one else; Wistar was to provide land, fuel, servants, food and materials for a glasshouse in New Jersey; Wistar was to advance money for their expenses and to give them one-third of the net profits. The original document has not been located. It was first mentioned by R. M. Acton in 1885 and has been cited in secondary sources ever since.
14. Leonard W. Labaree (ed.), The Papers of Benjamin Franklin, 3, (New Haven: Yale, 1961), 112-13. Hereafter cited as Labaree.
15. February 10, 1746/7, *ibid.*, 110.
16. Warren C. Scoville, Capitalism and French Glassmaking 1640-1789 ("University of California Economic Publications," vol. 15; Berkeley: University of California, 1950), p. 97.

17. February 10, 1746/7, Labaree, 3, 109.
18. United States Census of Manufactures for New Jersey, 1820, M 1600, Joseph Downs Collection.
19. February 10, 1746/47, Labaree, 3, 109.
20. March 27, 1747, *ibid.*, 114-15.
21. This manuscript essay upon various arts of the eleventh century by Theophilus is entitled "De Diversis Artibus seu Diversarum Artium Schemata" and is discussed in a variety of works on glass.
22. Pennsylvania Journal, October 11, 1780.
23. G. R. Porter, A Treatise on the Origin, Progressive Improvement, and Present State of the Manufacture of Porcelain and Glass (Philadelphia: Carey & Lea, 1832), p. 126.
24. March 27, 1747, Labaree, 3, 114. Fragments of white clay bricks have been found at the Wistarburg site.
25. August 24, 1752, New Jersey Archives, 8, 110. Alford was a prominent Charlestown citizen; his interest in glass manufacture has eluded documentation.
26. February 10, 1746/7, Labaree, 3, 110.
27. August 19, 1752, New Jersey Archives, 8, 108-09. Foye was Belcher's nephew.
28. Much of the following technical information is from Apsley Pellatt, Curiosities of Glass Making (1849; reprint ed., Newport England: The Ceramic Book Co., 1968).
29. Pellatt, p. 15, claims that three months' drying time is sufficient but that four to six months is preferred. Porter, p. 130, on the other hand, advocates a full year.
30. March 27, 1747, Labaree, 3, 114.
31. Pennsylvania Journal, October 11, 1780.
32. February 10, 1746/47, Labaree, III, 110.
33. Ledger B, pp. 29, 109, 185, Stephen Paschall Ledger Books, Paschall and Hollingsworth Account Books.

34. Diderot, vol. 10, p. 17.
35. To Messrs. Belcher and Foye, August 19, 1752, New Jersey Archives, 8, 108-09.
36. August 24, 1752, *ibid.*, 109-10.
37. Thomas Clifford to Samuel Pope, August 1, 1769, Thomas Clifford Letterbook, 1767-73, HSP. As quoted in Charles S. Olton, "Philadelphia Artisans and the American Revolution," (unpublished Doctoral dissertation, University of California, 1966), pp. 37-8. Olton did not realize the role of clay in glass manufacture so called Richard Wistar a potter.
38. Pennsylvania Journal, October 11, 1780.
39. October 9, 1772, Richard Wistar Letterbook.
40. Will of Richard Wistar, 1780, No. 1374 H, Gloucester County Wills and Inventories, New Jersey State Archives, Trenton.
41. Pennsylvania Journal, October 11, 1780.
42. Bridenbaugh, p. 8.
43. For his country store Wistar ordered goods from Freeman and Osland of "Neither the Very best Sorts Nor yet the most Inferiour Kind," November 27, 1759; he complained about some cloth recently sent from Robert and Nathan Hyde of Manchester saying, "The figures were too Large and therefore Unsaleable," September 29, 1770; to Mildred and Roberts he wrote in December 4, 1766, "I shall Want Anually a Quantity. . . for the Supplying a Country Store (for which Reason I have been perhaps more than Commonly Particular in Colours." All these letters are in Richard Wistar Letterbook.
44. Pennsylvania Journal, October 11, 1780.

CHAPTER III

LABOR AND MANAGEMENT

The labor force of American glasshouses is one facet of the industry which has been consistently avoided in the literature. Yet it is the glassmakers with their special skills and training who directly determine the character of the products and, quite often, the success of the factory. Studies of early glassblowers as individual craftsmen, as a vital group in the country's labor pool, or as purveyors of particular styles are nonexistent, in spite of the rather interesting fact that the same names frequently reappear in the records of various glassworks. One obvious reason for the scholarly disregard of individual glassmakers is the frustrating absence of written documentation: rarely are there letters or diaries by men of this occupation. Another important and perhaps more cogent reason is the difficulty of associating specific glass objects with any maker; it is difficult enough to delineate a factory's style, let alone one man's work within a factory.

The primary sources--church records, newspapers, wills, inventories, immigrant lists--which were searched for information about Wistarburg employees yielded but little data. It is nevertheless intuitively apparent that Wistar workmen, in a variety of ways, are

crucial to an understanding of America's glass business, from its beginning through the nineteenth century. By sustaining the Wistars' success, by joining rival establishments, or by starting up their own glassworks these men contributed to the general expansion of glassmaking in the late eighteenth century, and in particular, laid the foundation for the network of glasshouses which marks southern New Jersey to this day. Finally, the Wistarburg blowers were largely responsible for the dissemination of Germanic techniques and styles which characterize much early American glass.

The German workers Caspar Wistar initially engaged were "qualified" in Philadelphia on September 9, 1738.¹ Because of official concern about the hordes of immigrants, new arrivals had to qualify for residency by swearing allegiance to the English monarch and adherence to English law. According to Benjamin Franklin, Wistar had at first only two blowers who, in turn, instructed four others, so that by 1747 there were six glassblowers.² Since all four of the first artisans seem to have been experienced glassmen, Franklin probably confused his facts and meant that only two others were subsequently trained. At any rate, only and all of the original four glassmakers were made partners in the business, forming with Wistar what was called the United Glass Company. More is known about these men and their role in the manufactory than about any other Wistarburg employees.

The eldest of the group, thirty-five years old in 1738, was Johan Wilhelm Wentzel. His was perhaps the strongest link with the Germanic glass tradition, for Wentzels had been among the twenty-four major glassmaking families in Germany since the fifteenth century. Wentzels practiced their craft in Bohemia, Hesse, Mecklenburg, and Schleswig-Holstein; their seeming ubiquity is not, however, a unique phenomenon.³ Glassblowers have always been a mobile group, and in Germany, the tradition of the wandering journeyman was especially vigorous. This in part explains the workers' willingness to leave Germany and make glass in America. Further encouragement was the depressed state of the German glassmaking industry in the 1730's, with many houses collapsing in the face of Bohemian imports.⁴

Traveling with Wentzel on the Two Sisters was his wife, Anna Maria; by the time he made his will in 1761 they had had six sons, some of whom may have followed their father in his trade. Wentzel joined the Emmanuel Lutheran Church at Friesburg, only a few miles from the factory, for his name occurs in the records there. At his death in 1761 Wentzel owned an estate worth £ 321. Unfortunately no clue as to his glassblowing creations can be culled from his inventory, as the only mention of glass is less than revealing: "Sundrys of wooden ware Iron Glass China delf pewter."⁵ To Wentzel, however, belongs the distinction of being the only blower whose wares are specified in the ledger book as of both green and

white (colorless) glass.⁶ This reference constitutes the only proof that colorless glassware was manufactured at Wistarburg. Previously, it has been assumed that the products of the Alloway factory were solely of highly colored bottle and window glass. There is one other--unfortunately ambiguous--mention of white glass in the "Extract from the Diary," Appendix 2, which may or may not refer to its manufacture at the Wistar works.

Nothing is known of Simeon Griesmeyer's history in the Old World. Only twenty years old when he landed in Pennsylvania, he lived but a short life in his adopted land, dying in 1748. The other two blowers were Halders (or Halters), Caspar and Martin. Caspar was not as successful in his profession as Wentzel, possessing property only worth £33 at his death in 1761. It has not been determined whether or not he was related to Martin, though it seems rather likely. In the Friesburg Church records for 1752, Martin Halter is singled out as "Master at the Glassworks," which may mean he held a position above that of his colleagues.⁸ Although there was no inventory taken when he died in 1767, Halter's will includes specific bequests amounting to £175.⁹ More about the finances of the above men will be discussed in the analysis of the company's accounts.

A Salem County man who was probably associated with Wistarburg from the beginning was Benjamin Thompson. The Wistars did spend some time in New Jersey, but they did not personally

supervise the daily operation of the works. For this they relied upon a plant manager: Thompson is believed to have been the first. Jacob Houseman has been cited as his successor, but confirmation is prohibited by the confusing plethora of Jacobs with similar surnames--Haus, Hauser, Hausman, House, Housman.

In addition to the original workmen, thirty other men are definitely known to have labored at Wistarburg in some capacity, while a number of others may also have been employed (Appendix 3). It is uncertain how many were actual glassblowers, for a glassworks required many who were not directly involved in making glass. In European establishments there were usually several master blowers or gaffers, each of whom was aided by less skilled assistants and gatherers; at Alloway, considering the simple wares produced, each blower may only have had a boy to help him. Someone had to supervise the woodcutting, hauling, and stoking of all the various ovens, see that the proper temperatures were maintained, and check the physical condition of the furnaces. A number of woodcutters and haulers might be hired on a daily or weekly basis to assure the correct amount of fuel. Moreover, when furnaces had to be repaired or rebuilt masons were on hand to do the job. People were also needed to wash and sift the ingredients of the glass batch, while glasscutters were employed to reduce the finished sheets to the desired pane sizes. Other laborers around a glassworks might include packers and carpenters. Of course, not all of these

positions were full-time; masons, for example, might be called upon only for emergency furnace repairs. Philip Jacobs, an indentured stone mason at Wistarburg, was probably put to some other task such as stoking when not required to perform his own trade.

It is thus rather difficult to ascertain the exact number of employees Wistar had or would have needed. In French glasshouses which most closely followed German practices and produced common glass, there were anywhere from fifteen to thirty workers.¹⁰ A standard labor force of South Jersey glassworks in 1820 was twelve men and four boys. Most manufacturers indicated in the census of that year, however, that this was a smaller group than usual because of the then-current economic depression.

The Wistars occasional method for obtaining personnel to handle odd jobs was to hire local men to be paid by the day or week. From the ledger such men as Engel, Heinrich, Peter, and Hans appear to be in this labor category. The far more usual practice was to acquire indentured servants--a cheaper but often more troublesome solution. Because of the inhumanities of the ocean crossings, many Quakers shunned servant labor.¹¹ That Wistar relied so heavily upon it is unusual and especially incongruous in light of his writing of the immigrants' sufferings.¹² Of course, Wistar was forced to depend on foreign glassblowers simply because none were to be had in the wilderness that was America. But in Caspar's receipt book are several entries proving that he paid the ocean passages of

unskilled immigrants in return for their services for a specific number of years. These servants were nearly all German; some are called Dutch, but it is difficult to say whether this appellation really meant Netherlandish or was merely the classification commonly and incorrectly ascribed to many Germans. Writers have claimed that Catholicism took root in Salem County when French and Belgian glassworkers came to Wistarburg. Although men of those nationalities were traced to the county in this period, none could be definitely tied to the operation at Alloway. As was suggested above, some men have been proved to be glassworkers by the records of the Friesburg church. It does not follow, however, that all Germans associated with that church were employees at Wistarburg. Germans had settled on farms in Salem County even before Wistar himself landed in Philadelphia, and though some contend that the Lutheran church was founded by Wistar workmen, references to the congregation date from 1726.¹³ Furthermore, of the prominent churchgoers who are consistently named in secondary sources as Wistarburg glassblowers--Dilshoever, Trullender, Tobal, Mackassen, Sowder, Fries--none can yet be connected to the glasshouse.

Several of the Wistars' servant workers deserve special attention. Chief among these is Christian Nassel or Asel. His qualification listing could not be located; he is first called a glassmaker in the 1752 record of his son's burial at Friesburg,¹⁴ but he had lived in the area from at least 1750 when he signed the

church articles. What is most important about Nassel is that he quit Wistarburg and in 1763 appears as one of the first three glassblowers at Henry William Stiegel's new factory in Lancaster County. In the archives of that company Nassel is designated an "Expert Glassblower."¹⁵ Had Nassel been a glassblower in Germany or was he trained at Wistarburg? The answer is unfortunately unknown, but the implications for the accepted dichotomy of Wistar and Stiegel styles are quite clear. He is obviously a key figure in colonial glassmaking. During his first years with Stiegel he probably blew bottles and window glass, much as he had in New Jersey, for the products of Stiegel's first glasshouse were primarily bottles and window panes. Nassel moved to the Baron's second factory at Manheim where the manufacture of fine quality table glass, which is Stiegel's claim to fame today, was begun. It is tempting, but imprudent, to associate Nassel with this line of finer wares, even though he was still considered an expert gaffer at Manheim.

In launching his project Stiegel did need to attract glassmen--what easier source of labor than the nearby Wistar manufactory? Although Nassel remained with Stiegel until the latter's failure in 1774, it must be stressed that the Baron, so far as is known, was only able to lure one other Wistar worker away from Alloway. That Nassel did capitulate offers an early example of the mobility of glass craftsmen; that more Wistar blowers did not abandon Wistarburg perhaps speaks well of the Wistars. One

point, of course, is that Stiegel did not propose a partnership, but then, there is no evidence that Nassel was ever a partner of Wistar's. The Wistars did have considerable trouble with runaway servants, as newspaper advertisements show, but these for the most part were not glassmakers by trade, but were those who held miscellaneous posts around the factory.

Another Wistar-linked name occurs in Stiegel's records, that of Christian Gratinger. A "Cratinger" is mentioned in Wistar's ledger from 1750 but his role is not clear. Two Manheim glassblowers with the surname Halder may have been related to Martin or Caspar of that name at Alloway. Further investigation may reveal many Wistar-Stiegel connections. Interestingly enough, Caspar's nephew, Daniel Wister, became a third owner of the Baron's ironworks, the Elizabeth Furnace, when he took over the share of Alexander Stedman in 1766.¹⁶

Other workers who deserve emphasis are the Stangers or Stengers. Johan Adam Stanger, Senior, and his six sons were members of an illustrious glassmaking family, Stangers having made glass in Lotharingia since the sixteenth century.¹⁷ Prior to their emigration to America in 1768 the family may have owned and operated a glassworks in Dornhagen, Germany.¹⁸ In any case, they were the only trained glassmen definitely at Wistarburg besides Wentzel, Griesmeyer, and the Halters. Although Wistar undoubtedly brought them

over to fill the gap left by the death of his master gaffer, Martin Halter, in 1767, and to hold responsible positions in the factory, some of the Stangers were bound as indentured servants. Jacob Stanger, for example, was sought as a runaway servant in 1770.¹⁹ Another member of the family did not enjoy Wistarburg: in 1774 Solomon Stenger appears in the list of Stiegel's glassworkers at Manheim. After the collapse of the Wistars' works, the Stengers opened their own glasshouse in nearby Glassboro. Theirs was the only other glass factory to operate in New Jersey in the eighteenth century, but its existence complicates the problem of identifying Wistar-made glass.

The frequency of runaways from Alloway--five in the late 1760's and early 1770's--is perhaps symptomatic of serious problems at the factory, problems which may have precipitated the closing of the works. Labor troubles are alluded to but never fully explained in two letters from Sarah Wyatt Wistar to her husband Richard "at the Glasshouse." They date somewhere between 1768 and 1771.

Thou writes the Glassmakers are troublesome about agreeing
Indeed I have often been thoughtfull Whether the Cares &
troubles attending Carrying that business on has not been
a hurt & hindrance to the more Important business thou
ought to be employed in & about. . . .

And then she wrote:

it seems to me neither body & mind Can escape unhurt by
 such tryals & exercises as those my Dear [T]hou may see
 far farther than I for [I] am a poor Short sighted Mortal
 I know but it looks to me as though it would be thy
 Interest every way to get Shet [Shed] of the Glasshouse
 for some hundreds damage thou hast sustained by Servants
 & sometimes when I see thee fretted & hear thee express
 thyself I am afraid thou sustains a works & greater Loss
 by far than they are & poor Creatures I am often very
 thoughtful on their account. . . .²¹

The workers may have been distressed about wages, conditions,
 or almost anything; it sounds as though they expressed their discontent
 in a rather violent manner. Mrs. Wistar may have been referring to
 the Stengers' agitations. At any rate, it is somewhat surprising
 that the Wistars had not encountered serious problems before this,
 as glassmakers were notoriously dissident.²²

Caspar Wistar's novel organization of a partnership with his
 master glassmen, referred to above, is not yet fully understood.
 Unfortunately, the ledger book does not present a complete picture
 of the financial situations of the factory, but only records Wistar's
 accounts with each of the original gaffer-partners from 1743, four
 years after the works opened, to 1767, several years before it
 closed. Information about the glass products, raw materials, sales,
 or other employees appears only if pertinent to the reckoning of
 the partnership profits. There were books devoted to these other
 aspects of the manufactory's operation but none have survived. The
 accounts of the ledger in the collection of the Historical Society

of Pennsylvania are puzzling at best. Moreover, the mixture of middle German, high German, Pennsylvania German, and English in which the book is written does not facilitate comprehension of the economics.

The partnership agreement was strictly a company within the company. On the credit side each master received a portion of the total value of the glass which presumably he himself had made. From 1743 through May, 1751, Wentzel and Caspar Halder were credited with one-third the total amounts of their respective glass. Martin Halter and Simeon Griesmeyer, however, together formed a third of the company, so each of them got one-sixth of the sum of their efforts. After Caspar Wistar's death Wentzel and Martin Halter were the only original partners still alive. Each of them received a one-fourth portion, while Richard Wistar enjoyed a half-partnership. From the time of Wentzel's death to his own in 1767, Martin Halter was a half owner, splitting both profits and expenses with Wistar.

From these credit statements the total production of at least these gaffers can be calculated (Appendix 4, Table 1). Indications are, however, that these quantities cannot be understood as the total output of the entire establishment. There were other glassblowers, such as Christian Nassel, who worked in this period and were not partners--Franklin, it will be recalled, claimed there were six glassblowers in 1747 (above, 2n). The extras may have only assisted the principals, but in the 1760's Halter could scarcely

have been the only master blower. Moreover, the amount of glass to his credit in those years was comparable to that which all four were earlier alleged to have blown. That the amount in Table 1 may represent less than what was actually made is suggested by Franklin's comment that the six Wistarburg glassmakers could fashion £ 20 worth of glass in one day.²³ Were this the case, the totals for seven-month blast periods should be in the vicinity of £3,500.

Each gaffer shared the costs of his "particular" company with Caspar Wistar in the same proportion as he shared the profits. The expenses of each one's arrangement with Wistar varies according to the level of their production (Table 2). But after the deaths of Caspar Wistar, Caspar Halder, and Griesmeyer, the "particular" company was organized quite differently. Now Wentzel and Martin Halter were in a company together and together bore its entire costs.

In the operation of the larger company, in the 1740's, each worker paid the same amount, one-twelfth of the whole expense. After 1751-52 Wentzel and Halter were each responsible for a quarter part of the "whole" company's costs. Martin Halter became a full half-owner with Richard Wistar after Wentzel died in 1761. The expenses of the "whole" company for each year are summarized in Table 3.

In addition to the companies' liabilities, miscellaneous charges appear against the workers; these serve chiefly to inhibit

an understanding of what the whole and particular companies' expenses actually covered. In no regular pattern whatsoever are included agents' pay, the manager's pay, woodcutting, glasscutting, freight and storage costs, the potash account, and Wistar's 10% commission on the value of each blower's production.

In the record book John Stockard is called the "factorem" of the United Glass Company. From the entries in the ledger it is evident that he was not the bookkeeper as has been claimed,²⁴ but rather a factor or agent for the firm. His duties are never defined; he was probably a sort of general business manager, responsible for the disposal of the finished wares. He did not actually operate the Philadelphia outlet, for there are references to the invoices of David Matzinger of the glass shipped to him at Philadelphia, with an account of the breakage in transit. Moreover, the urban shop seems to have been the domain of the Wistars themselves. Included in each yearly debit column for the 1740's is a sizable payment to Stockard: £296, for example, for July, 1743 to July, 1744--a sum greater than that credited to the four glassblowers for the glass they had made in the same period.²⁵ After 1751, Stockard is not mentioned in the book and no name replaces his as factor.

Substantial conclusions can hardly be drawn from the above, but a few observations may be made. In the early years of the

manufactory a glassblower's contributions could vary significantly, fluctuations which may correlate to the possible physical problems of furnaces and pots cited in Chapter II. The glassworks apparently did rather well in the late 1740's, a phenomenon neatly explained--perhaps--by the extensive demand for electrical equipment (see Chapter VI). Other external factors cannot be as readily summoned to elucidate the remaining data.

NOTES TO CHAPTER III

1. Pennsylvania Archives , 2d ser., XVII, 156-57.
2. Letter, Benjamin Franklin to Thomas Darling, March 27, 1747, Labaree, 3, 114.
3. Axel von Saldern, German Enameled Glass: The Edwin J. Beinecke Collection and Related Pieces (Corning, N. Y.: Corning Museum of Glass, 1965), pp. 166, 213, 226.
4. Ibid., p. 166.
5. Inventory of the estate of Wilhelm Wentzel, 1097 Q, Salem County Wills and Inventories, New Jersey State Archives.
6. Account Book, Glass Company, p. 10.
7. Inventory of the estate of Caspar Halder, 1134 Q, Salem County Wills and Inventories.
8. Peter Brunnholtz et al., "Church Book for the Evangelical Lutheran Congregation in Salem County," trans. Herman G. L. Drews, Friesburg Emmanuel Lutheran Church Rectory, Friesburg, New Jersey, p. 94.
9. Will of Martin Halter, B 13, P. 266, Salem County Wills and Inventories.
10. Scoville, p. 72.
11. Tolles, p. 88.
12. In 1732 Wistar wrote, "Last year a ship was twenty-four weeks at sea, and of the 150 Passengers on board thereof, more than 100 died of hunger and privation, and the survivors were imprisoned and compelled to pay the entire passage-money for themselves and the deceased." As quoted in Diffenderffer, p. 262.

14. Ibid., p. 94.
15. Hunter, p. 235.
16. Ibid., p. 55.
17. Saldern, p. 226.
18. Adeline Pepper, The Glass Gaffers of New Jersey (New York: Charles Scribner, 1971), p. 31.
19. Pennsylvania Chronicle, April 18, 1770.
20. Hunter, p. 238.
21. Box 1, Folder 2, Wistar Papers.
22. See, for example, the discussion of striking workers in Norman glass factories in 1711, Scoville, p. 80.
23. To Darling, March 27, 1747, Labaree, 3, 114.
24. Pepper, p. 21.
25. Account Book, Glass Company, pp. 9-16.

CHAPTER IV

CUSTOMERS, COMPETITORS, AND THE CLOSING OF THE FACTORY

Although the two major outlets for Wistarburg commodities were the Wistar-owned stores in Philadelphia and Alloway, finished bottles, window panes, and other items reached a far wider market. The store at Wistarburg, for example, had many patrons besides the local Jersey residents. Glassblowing has always been a popular spectator industry, and colonial Americans were not immune to the fascination of the craft. Wistar's factory, being the only one of its kind in the area for many years, and having a foreign flavor about it, was probably high on the list of sights to see in and around the Quaker city. Even after Stiegel's more ambitious works commenced operation, Wistarburg remained an attraction, for on November 14, 1771, the following notice was placed in the Pennsylvania Gazette:

Notice is hereby given that on the second Tuesday of this instant November, the Subscribers Stage Waggon will set out from the house of Jacob Paullin in Pilesgrove, not far from the Glass-House, and drive from thence, through Woods-Town to William Cooper's Ferry and return to the said Jacob Paullin's the Thursday following, and continue weekly to drive on the aforesaid Days: Price for Passengers or Lumber per hundredweight, carried the whole Distance, three shillings and nine pence. . . . William Shute and Jacob Paullin *Any Passengers from Philadelphia, or elsewhere, that are desirous to go to the Glass-house, or anywhere in that Neighborhood, the Subscribers promise to convey them.

Obviously there was some demand for Shute and Paullin's stage wagon tourist service. Visitors to the glassworks would have wanted a souvenir of their excursion and purchased something at the warehouse, while those who frequently needed large supplies of glass may have found a greater selection of goods at the factory outlet than at the Market Street store.

From the Wistars merchants in outlying regions ordered glass wholesale to sell in their own shops. Their accounts and correspondence with the glasshouse proprietors indicate that they demanded window glass almost exclusively. Michael Fordine, Jacob Karn, and Philip Gotfrock, Pennsylvania German shopkeepers, placed orders for window glass in the 1750's, while Theophilus Hartman of Lancaster bought £51 4s 9d worth of window glass of varying sizes and quality between November 1761, and December, 1764.¹ A number of other Lancaster County men have been identified from the extensive list of debtors to Caspar Wistar's estate; further research may show this list to be an index to Wistar customers.² Another country shopkeeper who relied on Wistar products--or glass that Wistar imported--was William Green of Maxatawny, Philadelphia County. From his 1777 letter to Richard Wistar it is evident that he too purchased window glass.³

It is only reasonable to assume that brewers and chemists, of whom there were many in the Philadelphia area, obtained from Wistar the bottles, jars, phials, and retorts which were vital to

their businesses. Few expense account books of men in these occupations have survived, however, so the matter must remain speculative. Caspar Wistar's appearance among the creditors of Timothy Matlack may indicate that that Philadelphia brewer, for one, utilized Wistar bottles.⁴

Private individuals as well would have required household bottles, and a person no less than James Logan was perfectly content with locally-blown glass. In 1747 he wrote Wistar from Stenton:

As I drink nothing but Malt Liquors, of any kind of Beer, and scarce any of my family do the same, if thou wilt be pleased to furnish me w[i]th half a gross of Pint Bottles I will willingly pay ye as much as any others do for full quarts the first time thy furnace begins to work again, and thou wilt very much oblige herein. . . .⁵

Other prominent Philadelphians patronized Wistarburg as will be seen in Chapter VI.

Two miscellaneous customers of Wistar's urban shop, buying either the English or American glass which was sold there, were the Pennsylvania Hospital and Isaac Zane. Among the records of the Hospital's construction was a 1757 bill with Wistar for sixty panes of 8 by 10 glass. The Treasurer's Cash Book and Ledger contains further transactions with Wistar for the following year, but the type of glass is not specified.⁶ Most certainly the Hospital purchased English crown glass from Wistar, not his New Jersey product. Caspar Wistar was one of the original donors of the institution--this perhaps explains the Hospital's patronage.⁷ Isaac Zane, distinguished Quaker merchant, bought unrecorded kinds of glass objects in 1767 from the

Wistar store.⁸ These records of glass purchases from the Wistars were found by chance, for, on the whole, a search of the accounts of logical Wistar clients was fruitless.

Surprisingly, Wistar glass did enjoy a market beyond Pennsylvania and New Jersey. In his will of 1752, in which he bequeathes the glass business to his son Richard, Caspar Wistar stipulates that his other son, Caspar, receive a portion of the glass manufactured every year. The items Richard was to give his brother are detailed in kind and quantity: 400 feet of 8 by 10 window panes, 200 feet of 7 by 9, 100 feet of 9 by 11, three dozen half-gallon case bottles, six dozen pocket bottles, and three dozen gallon bottles.⁹ It may well be this share which Caspar, Junior, advertised for sale in New York City in 1769:

American Window Glass. Any quantity of American Window Glass of different sizes, to be sold at a lower Rate than can be imported from Europe. Enquire of Caspar Wistar, at his still-house near the Ship-Yards; where any Person may be supplied with York Distilled Rum.¹⁰

Caspar obviously needed bottles for his own distilling business.

Additional, earlier documentation of Wistar glass available in New York City is presented in Chapter VI. Because the Alloway factory was the only domestic source of glass objects used in conducting electrical experiments, and enjoyed the direct supervision of the "Father of Electricity" in the production of such items, Wistar glass was sent all over the colonies. Thanks to Franklin,

scientists from Boston to Jamaica procured Wistar-made tubes and globes.

Colonial Americans were evidently eager to purchase domestically manufactured glassware, for had they withheld their support, Wistarburg could hardly have operated for nearly forty years. The success of Wistar's enterprise must have encouraged other businessmen to seek profits in both glass manufacture and importation. After mid-century the demand for glass was considerably greater and more diversified than it had been when the factory opened in 1739. By 1760 some 18,000 people lived in Philadelphia alone, while thousands more settled in the surrounding counties. More colonists, particularly in the sophisticated urban climate, wanted and could now afford fine table glass, and English glassware of every imaginable sort was on hand in quantity to satisfy them. While glass had been of incidental concern to most importers in the early decades of the century, many now offered glass on a regular basis. Indeed, for some, glass became their major interest.

Newspaper advertisements reflect the popularity of glass and provide evidence of the variety of forms which were available. Crown window glass continued to be a key import, while table glass had risen in demand. Obviously, in many households, glass was replacing wooden ware, horn, and pewter on the dining table. In 1772 Rebecca Kearny advertised "best London double flint, half-pint and quart decanters, carrafts and water cups; jelly and syllabub

glasses, wine and ale glasses, tumblers, &c."¹¹ Her "&c." may have included the proof bottles, vinegar cruets, fountains, candlesticks, lamps, and "cut, worm and common" wine glasses which Alexander Bartram sold.¹² Or perhaps the "rich cut" glassware in still other forms offered by Joseph Stansbury, a merchant who counted John Cadwalader among his customers: sugar dishes, essence bottles, salad bowls, hyacinth glasses, plain and labelled goblets, butter tubs, lemonade cups, and painted, flowered, and plain mugs.¹³

Richard Wistar had not only a great amount of imported glass to contend with, but also products of rival manufactories in America. His first competitor was Henry William Stiegel who commenced glass production in Lancaster County in 1763. It is rather amazing that the Wistars were allowed to enjoy the twenty-four year monopoly they did. As early as 1752 Governor Belcher had expressed his surprise that none had yet jumped on the Wistar bandwagon, since their "work has already turned out to great Profit."¹⁴ Wistarburg certainly had some bearing on Stiegel's decision to set up a glass-house. Since Wistarburg did not seem to number fine table wares among its commercial products, Stiegel may have been inspired to fill the void and provide domestic alternatives to English goods. Stiegel by no means limited his production to table wares, however, and by blowing a great deal of window, bottle, and chemical glass he encroached upon the Wistar market, especially in the Pennsylvania German counties where Wistar had many regular customers. That Stiegel did divert some

who would have patronized Wistar is seen in David Rittenhouse's turning to Manheim for his scientific equipment rather than to Wistarburg, which was a long-established source for the needs of Philadelphia's electrical scientists.¹⁵ Finally, Stiegel attracted a few of Wistar's glassmen to his business but he probably had hoped to persuade more to join his labor force.

Because of their coincidence in time and place, comparisons between Wistar and Stiegel have been irresistible to students of glass. It is invariably noted that Wistar was dull and stodgy next to the flamboyant and extravagant Stiegel. The trivial analysis does not usually end there but is carried to worthless completion in equating their personalities with their products--even though neither one of them personally made glass. Stiegel's glass is, if anything, more difficult to identify than Wistar's. Only when the mass of fancifully-attributed Stiegel-type glassware is rationally pared down, and further material gathered on the problem of mutual Stiegel-Wistar labor, can intelligent comparisons be drawn between these two giants of eighteenth-century American glassmaking.

By January, 1773, another glasshouse had been erected in the area and was "ready to receive and execute orders for white or green glass."¹⁶ This was the Philadelphia Glassworks built in the Kensington section of the city. The intention of the initiators of this project was to make quality glass for Philadelphians who did not wish to support the industries and policies of England. At least one of the

founders, Robert Towers, was well acquainted with Richard Wistar, so was probably influenced to some degree by the Wistars' continued success.¹⁷ Unfortunately, little information about the Kensington factory is available, but from newspaper advertisements it is clear that a wide range of goods was blown there. Like Wistarburg's, the fires at Kensington were extinguished during the Revolution.¹⁸

Wistar's American rivals were not limited to those in his immediate vicinity. Alexander Bartram's notice of a "quantity of American and English Glass" to be sold implies that other colonial glassworks, possibly in New England, sought markets in Pennsylvania.¹⁹

In spite of increasing competition Wistar prospered--his extensive land purchases in New Jersey, Pennsylvania, and Virginia in the 1760's and early 1770's attest to that.²⁰ Nevertheless, the end was near. Wistarburg's demise did not result from pressures of imported and other domestic glass, but rather, from a combination of internal and other external factors. The labor problems alluded to in the previous chapter alone sounded serious enough to check the factory's progress. Even more detrimental were the tense Anglo-American situation of the 1770's and the approach of war. All things considered, it is remarkable that the Wistar glassworks lasted as long as it did, for many glass manufactories have folded in far happier circumstances.

The late 1760's were troubled times for colonial businessmen, particularly those involved in overseas trade. In an effort to secure additional revenue, Parliament levied various taxes which the colonists found inimical to their commercial and industrial habits. Vocal opposition was the uniform response throughout America, but tangible plans of action were as varied as the colonies themselves. Philadelphia's mercantile population was, on the whole, more conservative than that of other centers and moved somewhat hesitantly towards revolution. Richard Wistar's activities in the city's pre-war period are difficult to trace and even harder to assess.

As the policies of the mother country in the 1760's began to force high-priced English-made goods on the colonial market, many importing merchants eyed the prospects of local manufactures. Some founded new industries, others invested in safer, already existing businesses. No doubt encouraged by his profits in glass-making, Wistar bought in 1764 a £250 share in a linen factory.²¹ One of the provisions of the Sugar Act was the suspension of the duty rebate on Continental and Asian linens; before that time, the duties placed on these high-quality, inexpensive goods coming into England were refunded when the linens were re-exported to America. The rebate had been discontinued in an effort to stimulate English linen manufacture, and the result for the American consumer was low-quality, expensive English linen. Thus the Pennsylvania group hoped to produce

a fine-quality, cheaper linen of their own. As with many such undertakings, the high cost of labor eventually doomed the linen factory.²²

As noted earlier, the existence of a glassworks in His Majesty's colonies was tolerated though not approved. Wistar was well aware of the official position, remarking in 1760 that he knew "it was Not for the Honour of England to Suffer Manufactories in the Colonies."²³ Of course, several glasshouses were operating in America at the time and more began production in the 1760's and 1770's with no official interference whatsoever. Nevertheless, the government could conceivably take a firm stand, and Benjamin Franklin, for one, thought it was possible.

In London in 1768, keeping close tabs on Anglo-American relations, Franklin wrote his son William, then Governor of New Jersey. Explaining Parliament's request for an account of the manufactures of the colonies, Franklin pointedly instructed William to minimize the importance of all industries under his jurisdiction. Here Franklin particularly mentioned the glasshouse he himself had frequented twenty years before during the peak of his electrical experimentation. After citing other Governors' reports already submitted, Franklin said, . . .

They are all very much in the same strain, that there are no manufactures of any consequence; Pennsylvania has tried a linen manufactory but it is dropped, it [linen] being imported cheaper there is a glass-house in Lancaster County,

but it makes only a little coarse wear [sic] for the country neighbours. . . . All speak of the dearness of labour that makes manufactures impracticable. . . . These accounts are very satisfactory here, and induce the parliament to despise & take no notice of the Boston resolutions. I wish you would send your account before the meeting of next parliament. You have only to report a glass-house for coarse window glass and bottles, and some domestic manufactures of linen & woollen for family use; that do not half clothe the inhabitants, all the finer goods coming from England. . . I believe you will be puzzled to find any other, though I see great puffs in the papers.²⁴

The younger Franklin's official statement shows he followed his instructions:

A Glass House was erected about Twenty years ago in Salem County, which makes Bottles and a very coarse Green Glass for Windows, used only in some of the houses of the poorest Sort of People. The Profits made by this Work have not hitherto been sufficient it seems to induce any Persons to set up more of the like kind in this Colony; but since the late Act of Parliament laying a Duty on Glass exported to the Colonies, there has been a Talk of erecting others, but I cannot learn that any are yet begun. It seems probable that notwithstanding the Duty, Fine Glass can still be imported into America cheaper than it can be made there.²⁵

Wistar's account book unfortunately does not record the financial state of the business after 1767, so the truth of Governor Franklin's remarks cannot be determined. Given the motivation of his report, however, his view of the negligible profits of glassmaking was probably a deliberate understatement, if he bothered to check with Wistar at all. Though the business had been declining for several years (Appendix 4, Table 1), Wistarburg had been a most lucrative undertaking, pushing its

proprietors into the very highest echelons of Philadelphia gentry. From Richard Wistar's land investments and from other outward displays of his wealth--he was one of eighty-four Philadelphians who owned carriages²⁶--it seems unlikely he was in serious financial difficulty in 1768.

Wistar's position before the Revolution can only be described as an ironic one. On the one hand, the Townshend duties upon glass encouraged colonists to support local glasshouses, and Wistar was quick to remind Philadelphians of the proper patriotic behavior:

Made at the subscriber's glass works, . . . window glass Lamp glasses . . . most sorts of bottles. . . receivers and retorts. . . also electerising globes and tubes, &c. As the above-mentioned glass is of American manufacture, it is consequently clear of the duties the Americans so justly complain of; and at present it seems peculiarly the interest of America to encourage her own manufactures, more especially those upon which duties have been imposed for the sole purpose of raising a revenue. . . .²⁷

On the other hand, Wistar imported a great deal of English glass because otherwise he would--by his own account--lose fully half of his customers.²⁸ Similarly, English metalware and textiles formed a sizable part of his shop's inventory. Thus the same law which promoted his industrial concern stifled his import business, which was a significant portion of his income. Wistar apparently attempted to burn the candle at both ends, as it were, by accelerating production of his American glass--a number of new workmen arrived in 1768--and, at the same time, by continuing to import English glass.²⁹

Wistar's situation was by no means unique, for in the years following the Seven Years' War many artisans had become part-time importing merchants and merchants had entered manufacturing concerns. Thus there were many whose conflicting interests precluded a clear-cut position on the Anglo-American problem.³⁰

Wistar's continued reliance upon English glass cannot be interpreted as unpatriotic conduct, for few Quaker merchants were eager to institute non-importation articles immediately after the Towshend duties were passed. They did so, but only in February, 1769, almost a year after Boston merchants had taken action. Ironically, empty bottles brought over as ballast were among the items excepted from the boycott.³¹ There had not been such hesitation in Philadelphia four years before in the wake of the Stamp Act, as the non-importation agreement was signed only seven months after Parliament passed the measure. Wistar concurred in neither agreement, even though a number of his relatives and friends did sign the articles.³² In 1769, when the possibility of serious discord with England loomed even greater, Philadelphia's Quakers were anxious to re-establish friendly relations with the mother country, but only under conditions acceptable to them and their economic interests. Wistar verbalized the prevalent atmosphere in the city at the end of March, 1769, in his letter to an unnamed English correspondent:

our People here are Come into an Agreement of not Importing any more Goods till Greivous [sic] Acts Imposing Taxes on us as wee apprehend Unconstitutionally [sic] and Oppression [I]t will be Pleasing to me & many More to See the antient Harmony Restored between Great Britain & the Collonys which will be to the Lasting advantage of us both.³³

But as economic coercion was superseded by opposition of a more violent kind, methods which had no place in Quaker thinking, many Friends withdrew from the Revolutionary movement.

Inevitably this type of action was regarded by the warmer "patriots" as support for the British. And there were just enough examples of wealthy Quakers whose sympathies (albeit passive) lay with the "wrong" side to bring down the charge of "Toryism" on all Quakers.³⁴

The stigma of Toryism has not escaped Richard Wistar because of the narrative of his descendant, Isaac Jones Wistar. The writings of this man have long been a standard source for incorrect information about the colonial members of his family, yet they continue to be quoted. According to his account, Richard Wistar was a prominent Tory who essentially paid for his views with his life. Sometime in 1780 his house in Philadelphia was supposedly attacked by a mob and Wistar was severely wounded in the melee. His life was saved by a passing regiment of British soldiers. Taken to Rahway, New Jersey, he later died of his injuries.³⁵ The single certain fact of this report is that Richard did spend his last days in Rahway. It is not known exactly how he got there so the above is often used as a convenient explanation.

True to his Quaker faith, Richard took no part in the war and remained at his shop in English-occupied Philadelphia. Considering his very active role in the radical pacifist Quaker organization of the French and Indian War years, the Friendly Association for Regaining and Preserving Peace with the Indians by Pacific Measures, it is hardly surprising that he did not participate in the Revolution.³⁶ Yet firm adherence to Quaker doctrine would have permitted nothing but an absolutely neutral position, so he cannot be automatically named a Tory informant. Had he really been tagged a dangerous loyalist he certainly would have shared the fate of Henry Drinker, the Pembertons, and other leading Friends. Congress feared these rich Quakers would pass on vital information to the enemy so had them arrested and held in Virginia.³⁷ Wistar was imprisoned at one point, May 25, 1779, along with Levi Hollingsworth. Elizabeth Drinker who recorded the event did not know for what reasons,³⁸ but his arrest may have been in connection with the inflation problem. Shopkeepers who violated the price regulations were to be punished.³⁹ At this time the British under Cornwallis had evacuated the city and patriot leaders were once again in control. From Mrs. Drinker's diary it is obvious that the period was a confused and troubled one, marked by mob rule and many arrests.

There are several lists of Philadelphia's loyalists because of the practice of confiscating the property of Tory sympathizers.

In none of these is Wistar mentioned nor does he appear in the rosters of New Jersey loyalists. Wistar's true feelings on the war cannot be ascertained, though it seems likely his pacifist inclinations dominated his views. He certainly had friends in both camps, while many of his relatives firmly supported the American cause. His son, Richard, was disowned by the Friends, in part for owning a war vessel.⁴⁰ The example of Benjamin and William Franklin, however, proves that father and son were not necessarily of the same mind.

At least Richard Wistar no longer had the glasshouse to add to whatever the trials of his final years. Evidence to date suggests that the Wistarburg factory closed sometime between 1776 and the end of 1777. In June of 1775 Bartholomew Wistar, Richard's son, sent word from London that he would happily return to America to share his father's "difficulties," a possible allusion to labor problems at the plant.⁴¹ A better indication that glass was still blown in 1775 is the newspaper advertisement of November for a runaway servant from the glasshouse.⁴² After 1775 Wistar ceases to appear in the court records of Salem County, a significant omission since up to that time he had been a frequent and regular plaintiff in financial cases.⁴³ The glassworks may still have been functioning August 8, 1776, for on that date Richard Footman placed an advertisement in the Pennsylvania Packet for his servant girl, who was supposed to have run off with a Conrad Konigsfold

"to Mr. Wistar's Glass-House."⁴³ The firm terminus ante quem, however, for Wistar glass is January 16, 1778. On that day Joseph Nickson, caretaker of the Wistarburg properties, penned a letter to his employer in the occupied city. In reporting conditions in Jersey Nickson clearly says that Godfrey [?] having left, "at present my self and [Jacob?] houseman is all."⁴⁴

Interestingly enough, the glasshouse was still considered an attraction and asset to Salem County even after it had closed. The newspapers of the late 1770's are replete with advertisements of land for sale. When Salem County properties are described, their physical location with regard to the glasshouse is inevitably given. But Wistarburg is not mentioned so much as a landmark, but rather as an economic attraction, an incentive for purchase.⁴⁵ Perhaps it was assumed the factory would function once again and provide opportunities for labor or a market for goods.

Although the glassworks was no longer operating, Nickson had been faithfully selling the remaining stock of glassware and reported to Wistar the "window glass I sould [sic] at 2/6 8 [by] 10 and 2/3 7 by 9."⁴⁶ Richard Wistar, too, had continued to sell glass, left-over Wistarburg wares and English goods, at his Philadelphia store, for Mrs. Drinker bought a vinegar bottle from him in April, 1778.⁴⁷ His customer pool had dwindled, probably restricted to those in the city proper. A country merchant who ordered glass from Wistar notified him that he had

not sent for the window glass since he had been forced to close his shop, as had so many others.⁴⁸ The year of British rule was a hard one in Philadelphia; provisions were scarce and trading was at a low level. In these last years of the decade Wistar decided to dispose of some of his real estate undoubtedly in an effort to retard financial decline.⁴⁹

Had Wistarburg not let its fires go out by the beginning of 1778 it would have within a few months, for suddenly the Revolution was a very real thing in Salem County. The English actually occupied the town of Salem and from there conducted foraging expeditions into the countryside. In their raids they encountered considerable opposition from the patriots, especially in the townships of Upper and Lower Alloways Creek. Three skirmishes were fought very near the glassworks: that at Quinton's Bridge, Thompson's Bridge (Alloway), and Hancock's Bridge. In fact, in March, 1778, the patriotic militia moved their headquarters to the glassworks, though this name could have referred to the town of Alloway as well as to the factory itself. Several letters are headed "Glassworks" and one account cites the "glass-house camp" of the Americans.⁵⁰ Writers often attribute the manufactory's closing to the workers' desertion to these continental troops. But other than Jacob Houseman and sundry Wentzels, no known glassblowers have been located in the army rosters.

In the fall of 1780 Wistar put the glass factory with its 1,500 acres, structures, and equipment on the market, but there

were no buyers in that war-beset year. Making his will shortly thereafter, Wistar empowered the executors of his estate, his sons Bartholomew, Richard, and John, to devise "or if they shall think proper to sell alienate and dispose of All that my Glasshouse and Manufactory of Glass."⁵¹ It has been proposed that John Wistar attempted to inaugurate production again after the Revolution, but no evidence of this could be found. Instead, indications are that Wistarburg never again functioned as a glass-works. The lot was eventually divided among the executors,⁵² the buildings demolished or left to decay.

NOTES TO CHAPTER IV

1. Box 1, Wistar Papers; Account No. 38, Theophilus Hartman Account Book, Lancaster County Historical Society, Lancaster, Pennsylvania.
2. Inventory of Caspar Wistar, pp. 6-11.
3. January 25, 1777, Lukens Collection, HSP.
4. Agreement among the creditors of Timothy Matlack, September 23, 1751, Box 7 B, Society Collection, HSP.
5. July 17, 1747, Alverthorp Letterbook H, p. 204, Logan Papers, HSP.
6. October 17, 1747, Miscellaneous Bills and Receipts, Buildings and Grounds, Pennsylvania Hospital Archives, Pennsylvania Hospital; Samuel Rhoads to Hugh Roberts on Account, 1758, Treasurer's Cash Book and Ledger, Vol. 1, p. 4, *ibid.*
7. Tolles, p. 228.
8. March 8, 1769, Isaac Zane Receipts, Coates - Reynell Papers, HSP.
9. Will of Caspar Wistar, No. 310, Philadelphia County Wills and Inventories, M 1019, Joseph Downs Collection.
10. New York Journal or General Advertiser, September 28, 1769.
11. Pennsylvania Packet, August 3, 1772.
12. *Ibid.*, April 13, 1771.
13. *Ibid.*, October 5, 1772; Pennsylvania Ledger, April 20, 1776; Pennsylvania Evening Post, July 11, 1776. Evidence of Cadwalader's account was found in Joseph Stansbury Accounts, Coates - Reynell Papers.
14. Jonathan Belcher to Messrs. Belcher and Foye, August 19, 1752, New Jersey Archives, 1st ser., Vol. 8, 108.

15. "I have seen a little curiosity with which you would be pleased; I mean the glass described by Dr. Franklin, wherein water may be kept in a boiling state by the heat of the hand alone and that for hours together. [pulse glasses] The first time I shall be in Lancaster where I hope to be next June, I expect to prevail on you to accompany me to the Glass House where we may have some of them made as well as some other things I want." David Rittenhouse to Mr. Barton, February 4, 1770, as quoted in Hunter, p. 68.
16. Pennsylvania Journal, January 27, 1773.
17. Robert Towers was a founding member of the Union Library Company, as was Richard Wistar in 1746. Towers also served as a witness to the will of Wistar.
18. Pennsylvania Packet, May 27, 1777.
19. Pennsylvania Packet, April 13, 1771.
20. Deeds, D 315, 325, 326, 333, 334, 365, 376, Salem County Historical Society, Salem, New Jersey. Additional indentures of lands sold to Richard Wistar can be found in Case 14, Box 17, Wistar Papers, Gratz Collection, HSP.
21. See Labaree, 11, 314-15. The stock certificate issued to Wistar is dated October 11, 1764, and is now in the collection of the John Carter Brown Library.
22. Olton, pp. 117-119.
23. To Daniel Taylor, Bristol, October 21, 1760, Richard Wistar Letterbook.
24. March 13, 1768, Labaree, 15, 77.
25. June 14, 1768, as quoted in Malcolm Vaughan, "New Light on Wistarburg Glass," International Studio, 84 (July, 1926), 48.
26. Robert F. Oaks, "Big Wheels in Philadelphia: Du Simitiere's List of Carriage Owners," Pennsylvania Magazine of History and Biography, 95 (July, 1971), 351-62.
27. Pennsylvania Chronicle, July 31, 1769.

28. Richard Wistar to Daniel Taylor and Brothers, Bristol, May 12, 1760, Richard Wistar Letterbook.
29. For a record of Wistar's orders for English glass, see his Letterbook. This facet of the Philadelphian's business is discussed at length in Chapter V.
30. For a discussion of the merchants and artisans in pre-Revolutionary Philadelphia, see Olton.
31. Jensen, p. 160.
32. Facsimile of 1765 Non-Importation Agreement, Vol. 5, p. 412, Stauffer Collection, HSP; "An Alphabetical List of the Subscribers to the Non-Importation Agreement entered into the 6th Feby. and 10th March, 1769," Henry S. Drinker Papers, HSP.
33. March 30, 1769, Richard Wistar Letterbook.
34. Robert F. Oaks, "Philadelphians in Exile: The Problem of Loyalty during the American Revolution," Pennsylvania Magazine of History and Biography, 96 (July, 1972), 299.
35. Vol. 1, pp. 24-25, Isaac Jones Wistar Journals, HSP.
36. For Wistar's role in this group see Vol. 12, p. 50 Pemberton Papers, HSP; Case 17, Box 7 Gratz Collection.
37. Exiles in Virginia: With Observations on the Conduct of the Society of Friends during the Revolutionary War (Philadelphia: n.p., 1848).
38. Drinker, Elizabeth, Extracts from the Journal of Elizabeth Drinker, from 1759 to 1807, ed. Henry D. Biddle (Philadelphia, Lippincott, 1889), p. 116.
39. Pennsylvania Packet, May 27, 1779.
40. William Wade Hinshaw, Encyclopedia of American Quaker Genealogy, 2 (Ann Arbor: Edwards Brothers, 1938), 691. Wistar's disownment occurred in the Philadelphia Monthly Meeting of April 26, 1782.

41. M. Birkbeck to Richard Wistar, June 3, 1775, Lukens Collection.
42. Advertisement for John Godfrey Knester, Pennsylvania Packet, November 6, 1775.
43. Quarter Sessions, Minutes of the Court of Common Pleas, Salem County, 1738-80, 5 Vols., Salem County Courthouse.
44. Case 20, Box 13, Society Collection, HSP.
45. See, for example, Pennsylvania Packet, February 27, 1779; New Jersey Gazette, March 17, 1779.
46. Case 20, Box 13, Society Collection.
47. Drinker Diary, p. 91.
48. William Green to Richard Wistar, January 25, 1777, Lukens Collection.
49. See for example, Pennsylvania Packet, January 30, 1779, Wistar's advertisement for a 600-acre plantation in Manington township, New Jersey.
50. Frank H. Stewart, Salem County in the Revolution (1932; reprint ed., Salem: Salem County Historical Society, 1967), p. 75.
51. Will of Richard Wistar, p. 9.
52. "Draft Division of Lands at Glass House Tract," SM 123, Salem County Historical Society.

CHAPTER V

THE GLASS

The myth of Wistarburg glass began in the early twentieth century mainly because of the efforts of Frederick William Hunter. Remembered as the historian of Stiegel's glass establishment, Hunter tackled the problem of Wistar glass as well. He "excavated" the site of the works in 1913, and using his finds developed the polarization of Wistar and Stiegel styles which plagues curators to this day.¹ The notion of the disparity between the wares of these two factories as Hunter has outlined them may need serious revision, as it is now evident that at least two of Stiegel's glassblowers had first worked at the Alloway factory. Christian Nassel, as discussed in Chapter III, had thirteen years' experience with Wistar, while Solomon Stenger spent about five years there. Others may also have blown glass at both manufactories.

Hunter was apparently ignorant of the proliferation of glasshouses in New Jersey in the nineteenth century; to him we owe the unfortunate habit of some who attribute to Wistar, rather than to the safer category of "South Jersey-type," pieces of crude, blue-green, blown glass that boast a New Jersey history. Thus in

the catalog of the 1923 sale of Jacob Paxson Temple's collection of American glass, no less than fifty-four objects are called "Wistarburg," objects which in style, color, and form nearly cover the range of all American blown glass.² In 1926 George McKearin, the pioneer scholar of American glass, endeavored to stem the Wistar tide and put a halt to the Wistarburg catch-all classification. With a logic uncommon in the study of decorative arts at the time, he noted, "With the possible exception of Stiegel, not any word in the realm of American glass has been as loosely used and greatly abused as Wistarberg."³ Little heed was paid McKearin, however, as the fashion for Wistar continued unabated in the 1930's and 40's. The highlight of a 1932 auction, for example, was an "Unsurpassed Wistarburg Deep Claret Footed Pitcher" which sold for a record \$900.⁴ McKearin repeated his admonition in 1952, claiming, "I have never seen a piece of glass that I could be absolutely certain was Wistar."⁵ With few exceptions this remains the case today.

Until the factory's production ledger is discovered a handful of newspaper advertisements and scattered manuscript sources must provide the only contemporary descriptions of Wistarburg products.⁶ From these one can conclude, not surprisingly, that bottles and window panes were the glasshouse's staple wares. The record book of Wistar's United Glass Company generally credits the master blowers only with "glass" blown in each blast period.

On several occasions, however, bottle, green, window, or colorless glass are specified. The glassblowers do not appear to have limited themselves to any one form of glass. From October, 1748, to May, 1749, Martin Halter and Simeon Griesmeyer together made £ 191 18s 4d worth of bottles and £ 999 18s 1d worth of window panes.⁷ By the same token, Wilhelm Wentzel blew both green and colorless glass during the third year of operation.⁸ Bottles required less time to make from beginning to end than did window glass, since the latter entailed auxiliary processes of flattening the cylinders and cutting the sheets. Moreover, the quality of the batch for bottles of "black" glass did not need to be as fine as that for window panes, though sand and potash were the chief ingredients in both cases.

Wistarburg craftsmen made bottles in all sizes and shapes to accommodate almost any demand. Free-blown bottles were available in half-pint, pint, quart, half-gallon, and gallon capacities. Molded bottles with flat sides, called case bottles, were made in two- and three-quart sizes. A fragment of the bottom of one of these square-based containers was found at the site (Plate 3), and a "case bottle mold" is listed in the inventory of Caspar Wistar's estate.⁹ Other forms mentioned in that document and in newspaper advertisements are snuff, mustard, pocket, bosom, and half-gallon-round bottles. Perhaps octagonally-shaped bottles, objects which are frequently unearthed on colonial sites, can be attributed to Wistarburg as well, for Ivor Noël Hume considers

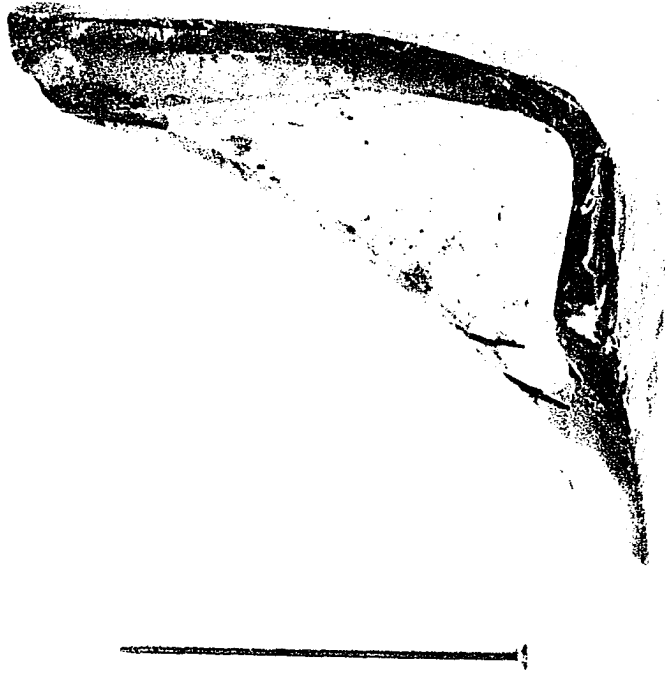


Plate 3. Case bottle, fragment of bottom. Wistarburg site. All fragments from the Wistarburg site are owned by The Henry Francis du Pont Winterthur Museum. A one-inch pin appears in all pictures of the fragments.

their extreme rarity in English contexts as possible evidence of American manufacture.¹⁰

In spite of documentary descriptions the identification of Wistar-made bottles is a nearly hopeless task. Vast quantities of bottles, both empty and full, were imported from England and Holland to the colonies throughout the eighteenth century. Almost all of the Dutch glasshouses manufactured bottles exclusively, while many English factories were similarly specialized. Only when one understands that a single Dutch glassworks produced 700,000 bottles in one year can the scope of the European bottle industry in the eighteenth century be appreciated.¹¹ But, of course, Dutch and English glasshouses supplied most of Europe in addition to overseas colonies..

Wistar could scarcely have hoped to deter foreign competitors, yet the demand for bottles was consistently great enough to assure him of a market. His production was by no means insignificant. Wentzel, Martin Halter, and Griesmeyer made a total of £ 294 2s 11d worth of bottles in one working period;¹² if these were all quart bottles of the sort Wistar sold in his store for four shillings per dozen, the Germans could have blown 1,470 dozen--17,640 bottles. When Caspar died the inventory taken of his Philadelphia store listed over 650 dozen bottles of all kinds, which may have included some imported bottles as well as those of his own manufacture. Still, given the high mortality rate of bottles and the disparity

between the sheer numbers of foreign and domestic bottles, one could summon the laws of probability and contend that few Wistar bottles could have survived the years. In any event, it is as yet virtually impossible to distinguish between European- and American-made bottles, since the composition and shapes are apparently the same.

The major use of bottles was to contain alcoholic beverages, and in our notoriously imbibing colonial society no household could have operated without a number of them. This assumption was corroborated by an examination of Pennsylvania inventories where bottles were found in nearly every estate. There may also have been a commercial market for bottles because the brewing industry was of considerable importance in the Philadelphia area. Beer had been made for both local consumption and for export since the beginning of the eighteenth century. By the time of the Revolution, Philadelphia and New York City were the established leaders of that industry.

Bottle factories are obvious corollaries of breweries; in Germany such glasshouses were frequently connected to specific breweries. Beer was often put into kegs at the factory rather than into bottles but at some point between brewery and dining table bottles may have been required. The 1732 advertisement of Samuel Carpenter records what was perhaps common Philadelphia procedure: "Those that send clean Bottles with good Corks, may

have the best Beer for 4s, the Dozen and Middling Beer for 2s the Dozen."¹³ In this instance the householder not the brewer supplied the containers. James Logan, quoted in the previous chapter, obviously followed this practice. Brewer William Pusey reminded his customers that the "highest price [was] given for empty Bottles."¹⁴ The brewery established by Timothy Matlack in 1746 and continued by Reuben Haines, Caspar Wistar's son-in-law, may have relied on Wistar bottles and not the customers' own supplies since the Wistars were among the creditors of the business.¹⁵ Beer imported from abroad was either already bottled or was ready for bottling by the importing merchant or the consumer.

Wine merchants may also have patronized Wistar's shop. The name of Caspar Wistar was frequently entered into the account books of his brother, John Wister, wine and liquor importer, for purchases of large amounts of spirits. There was no evidence, however, that John in turn bought bottles from Caspar.¹⁶ Glass bottles in colonial homes perhaps more often held wine than beer. Some wines were kept in kegs from which as many as 250 bottles could be filled, bottles which were either used directly at the table or used to fill glass decanters. Other wines were usually bottled, not kegged. By the later seventeenth century it had become customary to age certain wines, especially port, in bottles.¹⁷

A number of bottle mouths were found at the Wistarburg site and are illustrated in Plates 4 through 9. It is difficult to associate them with bottles of particular forms or functions, although the varying treatment of the string rims might suggest some correlation between the shape of the mouth and the contents of the bottle. String rims originally were essential features of liquor bottles which required stoppers of some sort: around the string rim was tied the wire or packthread which anchored the stopper.¹⁸ When it became customary to mature wines in glass bottles corks had to be driven flush so they were flooded when the bottles were stored upside-down or on their sides. Corks thus driven were difficult to remove--hence the corkscrew. From the time that device was invented in the late seventeenth century, string rims ceased to function as originally intended. They remained, but in a decorative role, although it may be argued that such rims facilitated the handling of bottles.

The colors of the Wistar bottle fragments are not uniform but range from pale green (Plate 3) to a grass green (Plate 7), and from a medium shade of olive (Plate 4) to the very dark, nearly black glass (Plate 5). Whole bottles with similar mouths and of colors comparable to those of the fragments do exist, notably at the Salem County Historical Society and The Corning Museum of Glass. They may not be assigned to Wistarburg solely on that basis, however, since Wistar's glassmen merely furnished conventional

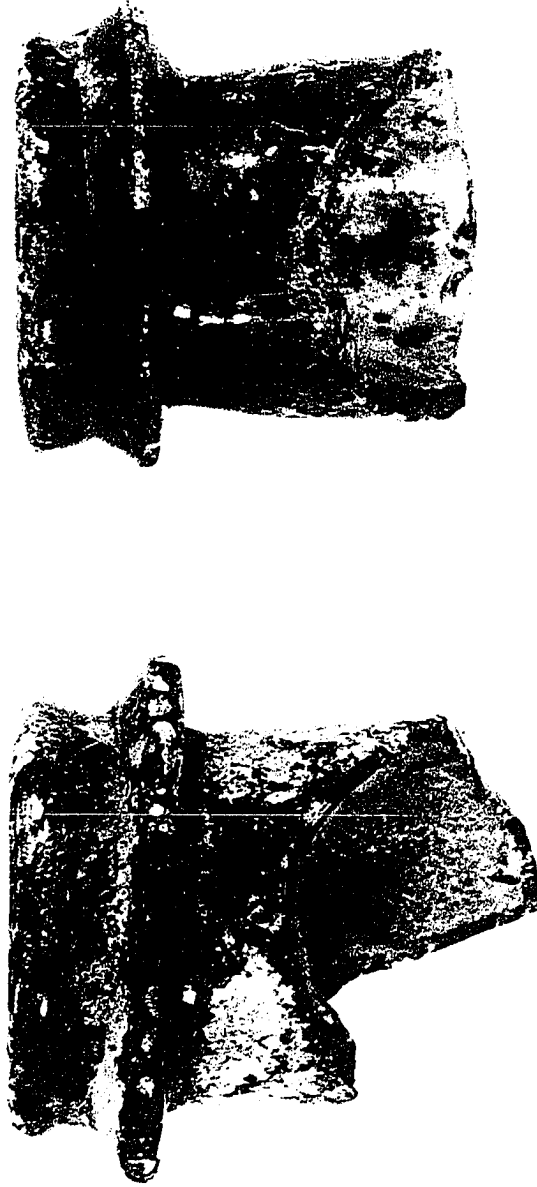


Plate 4. Bottle fragments, Wistarburg site.

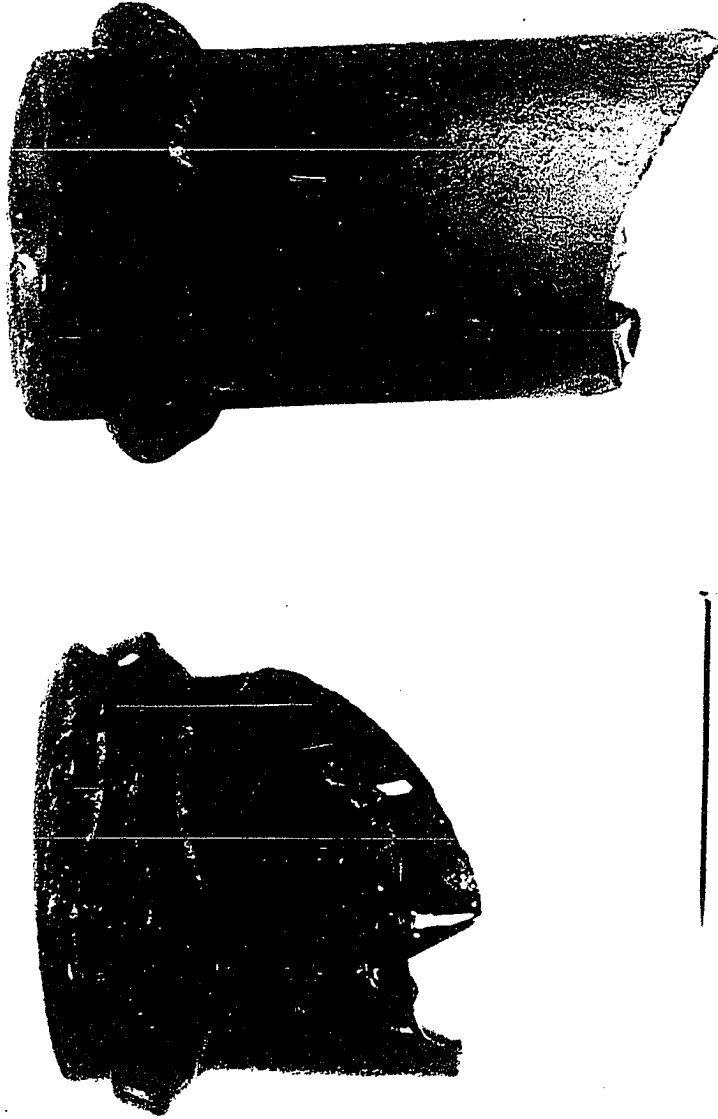


Plate 5. Bottle fragments, Wistarburg site.

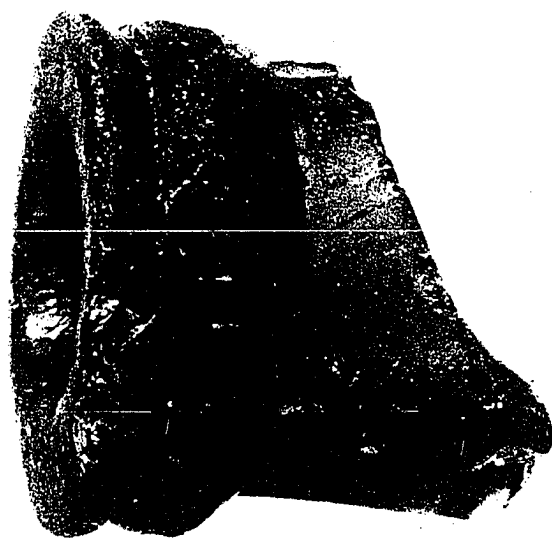


Plate 6. Bottle fragments, Wistarburg site.

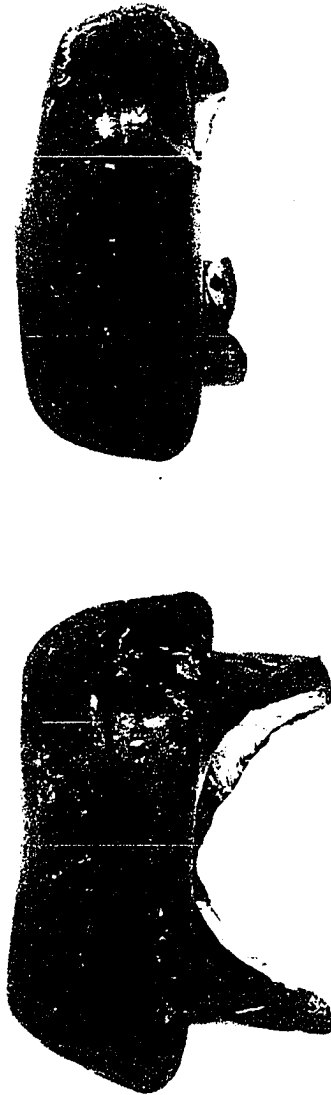


Plate 7. Bottle fragments, Wistarburg site.



Plate 8. Bottle fragments, Wistarburg site.



Plate 9. Bottle fragment, Wistarburg site.

shapes. The fragment on the right in Plate 8 was probably from a square-bodied bottle such as the mid-eighteenth-century French one pictured in Ivor Noël Hume's Guide to the Artifacts of Colonial America, page 70. The fragment shown in Plate 9 is obviously also from a high-shouldered bottle.

The case bottle in the collection of the Salem County Historical Society has a mouth unlike any of the fragments shown here; nevertheless, it may be of Wistar manufacture since it belonged to Captain William Smith of Salem County in the eighteenth century and Wistarburg did produce case bottles. Another surviving bottle usually considered a product of the glassworks bears the seal of William Savery, Philadelphia cabinetmaker, and is dated 1752 (Plate 10). It is otherwise an ordinary wine bottle. The attribution is based entirely on the belief that since Savery must have known Wistar he must have bought bottles from him. Savery did know Richard Wistar--they were both members of the Union Library Company¹⁹--but this can hardly constitute proof of Wistar manufacture. Although it is generally believed that winebottles with seals were not made in this country in the colonial period it is entirely possible. The Savery bottle, in any case, is a good example of the type of bottle Wistar's glassblowers could have made around mid-century.

Bottles or jars with wider mouths were designed in a variety of shapes and sizes. Pictured in Plate 11 is a possible Wistar

Plate 10

Wine bottle bearing seal of William Savery, 1752. Courtesy
of The Philadelphia Museum of Art (66.29.1).





Plate 11

Bottle, green glass, h. approx. 7".
Courtesy of Mr. Wade O. Ewen.

jar which has a long history in Alloway. It resembles German ones in its rounded, squat body.²⁰ Other jars could have been molded with four, six, seven, or eight sides, and had angular or gently sloping shoulders. The functions of these objects were similarly diverse. They often contained viscous oils, preserved fruits, or paints, but could just as easily have held something as unexpected as zoological specimens. Richard Wistar sent his friend Joseph Oxley in Norwich, England, "4 large bullfrogs in a tub and one in a Bottle with spirits," while the appraisers of Robert Hulme's estate were confronted with the problem of evaluating "20 Bottles with diff[eren]t animals preserved in spirits."²¹ Presumably the snuff and mustard bottles manufactured at Wistarburg, purchased by importers of those items, could also have been used to store spices, dyes, or other materials.

Druggists in the Philadelphia vicinity must have utilized Wistar's retorts in preparing their medicines and his bottles and phials to contain the resulting solutions and powders. Doctors at the Pennsylvania Hospital may have relied on Wistarburg receivers and phials for their experiments. According to the 1752 inventory retorts were the most expensive objects Wistar offered, selling for thirty shillings per dozen. Half-gallon case bottles were, by contrast, nine shillings per dozen, while pint decanters, probably imported, cost eleven shillings per dozen. The cost of

retorts must relate to the labor involved, for they were not easy forms to blow. According to Pellatt,

The Retort requires much skill in making the weight small in proportion to its size, and needs sharp swinging and extreme care that the bent part between the quill and the body of the neck should not get too contracted, it having at that point always a tendency to collapse while blowing. . . .²²

Although such scientific glassware had to be carefully blown and annealed, the glass itself did not need to be of a special quality. Some eighteenth-century chemical equipment in the Royal Scottish Museum, for example, was simply blown of dark green bottle glass.²³ No chemical glass objects are known which are thought to be of Wistar origin. Phineas Bond, William Shippen, and many others maintained apothecary shops in the city during the eighteenth century; unfortunately, few of their record books have survived so their use of Wistar glass for elixirs and balsams must remain conjectural.

An unusual light-green bottle of probable Wistar manufacture is pictured in Plate 12. Of the so-called "whimsy" category of glass, implying that the glass-blower made it for his own amusement rather than for sale, the animal-shaped object is nonetheless a functional drinking vessel. The direct product of a venerable Germanic tradition, the bottle differs only in degree of embellishment from a seventeenth-century Continental one in the Chrysler Museum at Norfolk.²⁴ The bottle in Plate 12 has been in the Haines family of Germantown, descendants of Caspar Wistar



Plate 12.

Animal bottle, green glass. Courtesy of Mrs. Mary T. Haines

through his daughter, Margaret Wistar Haines, since 1852 when it was given to Mary Haines by her cousin Sally Wistar.²⁵

The other principle effort of Wistarburg craftsmen besides bottle-making was the blowing of glass for windows. The presence of "flatting" ovens at the factory is proof that window glass was fashioned there by the cylinder method. In this process the gaffer blew and shaped a gather of glass into a long, hollow cylinder, about one foot in diameter. This was then slit lengthwise and flattened into a sheet in an oven for that purpose. When annealed the sheets were taken to the cutting house to be cut into panes with glaziers' diamonds. Window panes blown by this technique were less desirable than those of crown glass. In that process the gather was shaped into a flattened globe, the pontil attached to the flat side, and the blowpipe cracked off. By spinning the reheated glass "crown" on the rod, the hole left by the blowpipe was enlarged and eventually the disk flapped out into a circular sheet of four to four and one-half feet in diameter. When the pontil rod was removed a scar or "bull's eye" resulted in the center of the sheet. Although more even in thickness, panes blown by the cylinder method did not have the clarity and brilliance of crown glass panes because the sheets of glass lost their fire polish in the flattening process. It must be remembered that the term "crown glass" has been used as an appellation of quality even if the window glass so described was not actually manufactured by the crown method.

Though there is no proof that window glass was fashioned by the crown process at Wistarburg the possibility cannot be dismissed. While it became the standard technique of English glasshouses, crown glass was also made in certain areas of France and Germany. It is doubtful the Wistar workmen were trained to blow crown glass, but insufficient knowledge of them and their backgrounds precludes an unequivocal statement in this matter.

Several window panes in museum collections are traditionally attributed to Wistar. These are bull's eye panes achieved only in the manufacture of crown glass: at no point in the cylinder process was the pontil used in such a way as to form a scar or bull's eye. Since the panes were taken from early eighteenth-century South Jersey houses they have been labelled Wistarburg. Unless, however, documentary proof is found showing owners of these houses did purchase glass from Wistar, and the panes can be associated with that purchase, bull's eye window panes cannot yet be assigned to the Alloway factory. One such pane is in the collection of the Newark Museum. Taken from the Old Berry Homestead of 1747 in Pompton Plains., it is of a rather crude quality and quite green in color. Even if Wistar did make crown glass like this the upper classes of colonial society would probably not have bought it. For them, London or Bristol crown glass would only do. This unavoidable, unalterable fact of colonial consumption led the Wistars to import English crown glass.

The Wistars' investment in imported glass is a little-known facet of their business. A letterbook of Richard Wistar in the possession of a descendant contains copies of his letters to English merchants and glass manufacturers which offer clear evidence of his dependence on English sources. Although the bulk of the transactions concern drygoods, textiles, and hardwares for the country store, there are letters which suggest an interest in English glass of a scope hitherto unsuspected.

Wistar's letters are directed to commission merchants Freeman and Osland and to the Bristol glasshouse of the Taylor family. On January 7, 1759, Wister first wrote the merchants and inquired about the lowest possible prices for Bristol crown glass of various sizes: he expected he would want a "Large Quantity Yearly." Bristol goods were not new to his store, however, as his letter of the same day to Samuel Taylor suggests. In his complaints about defective shipments Wistar provides interesting insights into the freight problems which must have confronted all importers of glass.

I am Induced to Send thee an Order for a Small Quantity of Glass having been Assured. . . that thou Can & will Serve me as Well & on as Low terms as Any Person in Bristol Cann doo . . . I Desire that the Glass may be Good & Quite Squares having Observed in Many boxes, that there are many Lacking a Corner which is a Great Disadvantage to Sale & a Loss upon the Retailer and that the Glass be Strait & Well Packed which has Not been the Case with Great Quantities Lately Sent from Your Place. Many boxes haveing from 20 to 60 Panes brocken in them Owing as I apprehend to Crooked

Glass & Bad Package. [A]s I am a Dealer in Glass as well as a Glass Maker & the Only One in Pensilvania, Shall want a Great Quantity Yearly, in Order to Supplying my Customers, therefore if thou Serve me with Good Strait & Whole Glass and on as Low terms. . . [I] Shall Enlarge my Orders Next Time.

The order Wistar placed at this time was for thirty-five boxes, or 3,500 feet of window glass of two sizes. In spite of the Taylors' failure to send the glass promptly, the Philadelphian added fifty-two boxes of window glass to that order.

As it turned out, Wistar had a most unsatisfactory experience with the Taylor firm, for by May of 1760 he had yet to receive any of the glass he ordered--glass he had already paid for. Hoping still to deal with the company, Wistar perhaps exaggerated his expected market for Bristol wares:

I must again Request that if both My Orders for Glass be Not Shipt that they may by the first Vessell as the Disapoint[ment] is Very Great. & [I] Shall Not be able to Serve half My Customers. I would herewith have Sent You Another Order with the Bills Inclosed for Double the Quantity already Sent for if I had any Reason to Expect that You would have Ship'd me the Glass, however I desire You to Inform me Whether I may Rely on You[r] House for Glass or not, as I find my Demand & Trade to Encrease [I] Shall want about 3 hundred boxes Yearly. if Such a Correspondent be worth Your Notice.²⁶

If, by contrast, only half of his customers were content with locally-made window glass, perhaps this was not as important a product of Wistarburg as has been believed. The Taylors' seeming reluctance to do business with Wistar forced him to handle his needs for Bristol glass through other channels.

Explaining his disappointment to Freeman and Osland, Wistar asked if they could supply him with Taylor glass, for he still considered their products the finest in Bristol.²⁷

Glassblowing had been an industry of Bristol since 1651 and within a hundred years the city boasted fifteen manufactories.²⁸ From the early days of the eighteenth century Bristol glassmakers had enjoyed a reputation for their fine quality crown window glass and bottles, but other glass was also produced. The Taylor firm opened in 1752 under the supervision of Daniel Taylor; after Daniel's death in 1755 the business was operated by his sons Samuel and Daniel. The line of ownership then becomes rather complicated--a common occurrence in the history of most glasshouses. Until 1783, at least, the factory concentrated on making window glass and bottles. According to an advertisement of that year, the company still had a sizable overseas market--this in spite of the warning of an angry Wistar some twenty years before:

You May be Very much Pressed with Order from this Parts,
but I am of the Oppinion that will Not allways be the
Case as there are Severall Glasshouses, on this Continent
already & Severall More Going to be Errected, Which I hope
will Ease you of a Little of Your Great Hurry & Burden.²⁹

Data concerning the importation of glass in the time of Caspar's management of the glassworks is not as explicit as that from the later 1750's and 1760's. That Caspar did rely on imported wares, however, can be deduced from several records. Included in his inventory was "English Glass as p[er] Neat and

Neave."³⁰ Also listed in the store inventory was a number of glass items which were in all probability not made commercially at Alloway: salts, inkstands, tumblers, drinking glasses, and decanters. Later proof that English hollow wares were handled by the Wistars is found in Richard's letterbook. In a letter to Taylor in 1759, Richard wrote, "Inform me what House I may be Supply'd with Hollow Ware Such as Tumblers & Drinking Glass Dekaneters & of the Common Sort Not Double Flint &c. as I shall want a Quantity."³¹ Eight years later when placing an order for ceramics Wistar added that he wanted the prices of "Single Flint or Common Glasses that is Wine Glasses Pint tumblers 1/2 pint & Gill d° Vinegar Cruets Mustard Potts &c."³² Since he was so careful to specify common glass rather than the more highly prized--and priced--double flint (high quality lead glass), it is hardly likely that tablewares formed a significant portion of his own company's output. One cannot even assume that the lowlier forms such as jars and phials which appear in Wistar advertisements were made in New Jersey, for a crate of Bristol "violes" was sold to Catherine Wistar when she was apparently managing the store after Caspar's death.³³ In the matter of electrical glass, however, Wistar attributions may relatively safely be made.

The Wistarburg glassmen provided Philadelphia's nascent scientific community with many of the glass tubes and globes they needed in their electrical experiments. This hitherto unexplored

group of Wistar-made objects is extremely important, for, at the present time, the only two pieces of glass which are most likely the products of America's first successful glassworks are the electrical tubes shown in Plates 23 and 24. Owned by the Library Company of Philadelphia and the American Philosophical Society, these long, green glass tubes were used to generate static electricity and were the major implements of the earliest electrical experiments in the late 1740's and 1750's. Their documentation, through their association with Franklin and his descriptions of the Jersey-blown electrical glass, is the subject of the following chapter.

Most of the objects in museum and private collections which are attributed to Wistarburg are not examples of the main thrust of the manufactory's production, bottles, window glass, or electrical goods, but are the more interesting and more aesthetically pleasing "offhand" wares. This term refers to the notion that glassmakers, having completed their quota of bottles or window cylinders for the day, would have had time--and glass--to create a few things for their own use and enjoyment. Whimsy articles would qualify as end-of-day creations, but so would table glass of all kinds which the gaffer blew for family and friends. These offhand tablewares are distinguished as such by the nature of the glass itself; that is, a factory which featured table glass among its commercial products would not ordinarily employ bottle, window,

or common glass batch for such things. Thus sugar bowls, pitchers, candlesticks, dishes, tumblers, and the like which are formed from the tell-tale "black", green, amber, or aquamarine glass emanated from a glassworks which specialized in bottles or window panes.

Offhand pieces of glass afford an opportunity to assess the creative talents of individual but anonymous blowers, since the formation of bottles and window requires skill but little imagination. All of the South Jersey offhand hollow wares are executed within a Germanic framework as one would expect given the Teutonic backgrounds of many of the workers. In utilizing typical waldglas motifs of threading, crimping, prunts, animal finials, and eared handles, the glassblowers exploited the inherent, fluid nature of their material.

Candlesticks are rather rare forms in American glass of the eighteenth century. Two single and one pair of candlesticks exist which could well be examples of Wistarburg craftsmanship. The pair in The Corning Museum of Glass (Plate 13) are free-blown from light green glass. For decorative interest they rely solely on the three hollow, ball knops of the shaft, a feature which was to become typical of nineteenth-century candlesticks in the South Jersey style. The applied, domed feet have plain rims. These candlesticks were purchased in the 1930's from a Woodbury, New Jersey, family whose ancestors "had worked in the glass factory which was operated at Alloway in the eighteenth century."³⁴



Plate 13

Candlesticks, blue-green glass, h. 6 $\frac{3}{4}$ ".
Courtesy of The Corning Museum of Glass (50.4.1).

Far more unusual in shape is the small candlestick shown in Plate 14 which is among the best documented "probably Wistar" pieces of glass. Elizabeth Morris Canby (1813-92), the granddaughter of Rebecca Wistar Morris, Caspar's daughter, assembled and catalogued a collection of family-related objects. Among them, number twenty-one in her notebook written at mid-century, was this candlestick which she recorded as a product of her great-grandfather Caspar's glasshouse. From other entries it is obvious that she would have had no interest whatsoever in the candlestick had she not believed it firmly associated with her ancestor's enterprise. Her husband, incidentally, was also descended from the Wistars, through David Deshler, Caspar's brother-in-law. If the candlestick is indeed of Wistar manufacture it is a startling discovery. Not only is it of a blue tint, a color previously unsuspected in the Wistar spectrum, but also, with its knop and baluster shaft, it is of a form seldom encountered in South Jersey-type glassware. Moreover, a candlestick in the Winterthur collection (57.90.3) is nearly identical to the Canby one. Although it is taller and of a colorless, non-lead glass, it has the same unusual proportions of the socket, drip pan, knop, and baluster, while the chemical composition of the two objects was shown to be virtually identical (Appendix 5). The Winterthur one came from the collection of the McKearins who had proposed a Wistar or

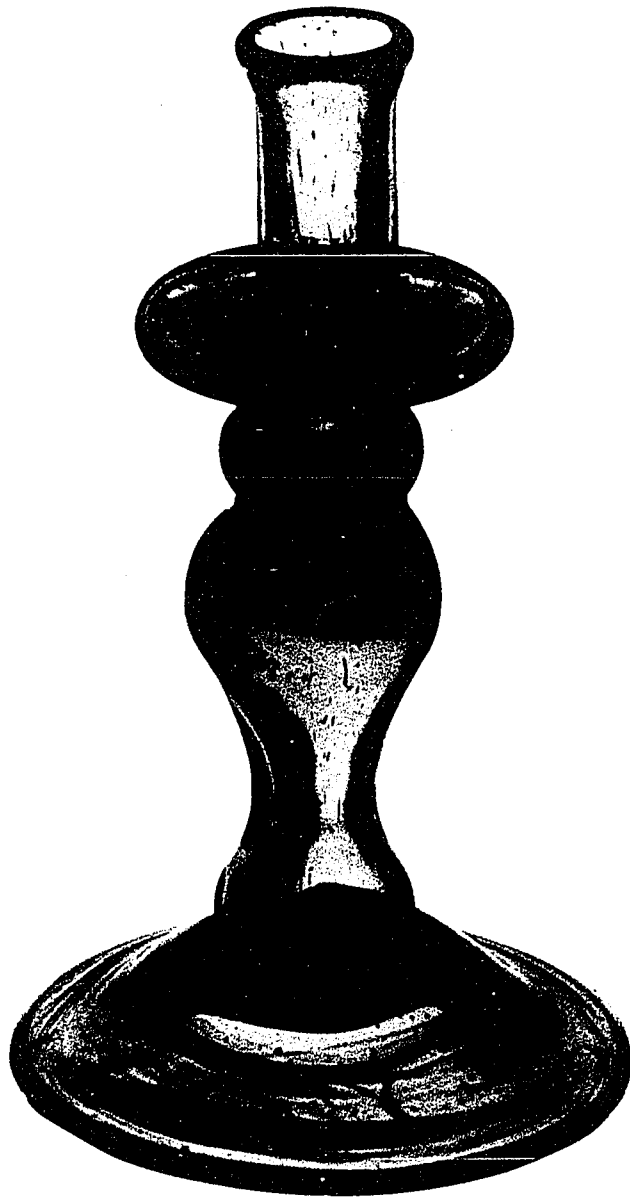


Plate 14

Candlestick, blue glass, h. 4 3/8".
Courtesy of Mr. and Mrs. Lewis Rumford II.

Stanger origin. There is something of a Spanish or Portuguese air about these candlesticks; perhaps a connection may eventually be established between them and the servant-workers at Wistarburg who had emigrated from Portugal.

The covered "sugar" bowl is a fairly common form of early American free-blown table glass and occurs in both the traditional South Jersey and Stiegel modes. They are difficult to assign to specific factories because of the wide range of colors and decorative detail. Two bowls with South Jersey histories are known which may be attributed to an early South Jersey, possibly Wistar's, glasshouse. To these several other bowls may be related on the basis of color, shape, or detail.

The sugar bowl illustrated in Plate 15 is owned by The Newark Museum. It is supposed to have belonged to Anne Morgan Hopkins of Gloucester County, New Jersey, in the eighteenth century and descended in her family. Green in color, the wide, U-shaped body has twenty vertical ribs and a swirled-rib pattern, probably achieved through use of a single one-piece dip mold. Each scroll handle of this bowl is embellished with three crimped extensions in typically Germanic fashion. The lid is of striking proportions, sitting very high above the bowl and having a squared top. Its finial is formed in three parts: a ball top in a bulbed shaft, a circular pad base, and a trailed band pincer into six wafer-like fins. Each fin has a waffle design on one side and a herringbone



Plate 15

Sugar bowl, green glass, h. 10 1/4".
Courtesy of The Newark Museum (66.212).

pattern on the other.

The other sugar bowl of South Jersey origin is in the collection of the Salem County Historical Society.³⁵ Like the Newark one it is vertically ribbed but has no secondary diagonal ribbing. The body is somewhat different and tapers sharply from the handles to the foot. However, the lid bears a strong resemblance to that in Plate 15 in both shape and relation to the bowl. A finial, identical in construction but varying in detail, ornaments the lid.

Closely related to the Newark example is a sugar bowl at Winterthur (Plate 16). Of a slightly darker green glass, this one has a similarly-shaped bowl with twenty vertical ribs. The lid is considerably flatter. The distinctive feature, however, the finial, has fins pincered in the same patterns as those of the Newark lid: an identical, if not the same, tool was used to shape both. These bowls may at least be attributed to a single factory with some assurance, if not to Wistarburg, or perhaps to the owner of that instrument who could have worked in more than one factory. Another object which is apparently akin to these on the basis of the finial treatment is a glass "teapot" or oil lamp filler which was sold in the Fish sale of 1940.³⁶ Its present whereabouts are unknown and from photographs the wafer details cannot be discerned.



Plate 16

Sugar bowl, green glass; h. 7 1/4".
Courtesy of The Henry Francis du Pont Winterthur Museum (59.30.2).

A more loosely related sugar bowl belongs to The Corning Museum (Plate 17). Its body is not ribbed at all but the handles are similar to those of the Newark piece. The lid of this item parallels that of the Winterthur example but the finial is of a different character.

A rather small, colorless sugar bowl at Winterthur (59.30) has a bowl quite similar in shape to the angular one of the Salem Historical Society. But like the Newark bowl, this one is vertically ribbed--with sixteen ribs--and is diagonally ribbed as well. Its foot is not round but square; the handles, common scrolls, are rather large for the body. The lid is high but rises more steeply to a swan finial. Parallels may be drawn between this bowl and another colorless one at Winterthur (59.3028). Its foot and finial are the same; the swan is fashioned in exactly the same manner but rests on an extra flattened pad. Unusual here are the bow-knot handles. Although the history of neither bowl is known they may perhaps be linked with Wistarburg on the basis of their chemical compositions which are markedly similar to those of the baluster candlesticks (Appendix 5). A number of other sugar bowls survive, such as those assigned to the New Geneva glassworks, which can be associated with these Winterthur ones because of the animal knobs, but they do not bear significant similarities to the South Jersey-historied bowls in question.



Plate 17

Sugar bowl, green glass, h. 6 1/8"
 Courtesy of The Corning Museum of Glass (50.4.2).

The problems of dealing with early American glass are amply evident in the preceding discussion. When one considers the diverse backgrounds of glassworkers and their individual creative abilities, perhaps the concern for similarity in such wares seems exaggerated. Even closely affiliated objects cannot be assumed to have been made at the same factory, for some of Wistar's workmen, as mentioned earlier, did migrate to other glasshouses. There is also the frustrating dilemma of deciding which similarities are important and which are not. Documents prove that Wistar glassblowers blew products of colorless glass, but the Newark and Salem bowls, if of Wistar make, are the only evidence that ribbed dip molds were part of Wistarburg's equipment: should the attribution of the bowls be hesitantly made because there is no documentary proof of pattern molding? No contemporary mention of glass sugar bowls at Wistarburg could be found; indeed, it is not certain such items were used to contain sugar in the eighteenth century since at least one German model is called a mulled wine glass.³⁷

That other hollow ware forms besides sugar bowls were blown at Wistarburg is implied by the two handle fragments (Plates 18, 19) which were acquired at the factory site. The one in Plate 18 is very dark green and quite heavy, with three ribs. Perhaps it was once part of a large pitcher or jug. The colorless, more delicate handle of Plate 19 may have adorned a smaller pitcher or mug. The



Plate 18

Handle fragment, Wistarburg site.

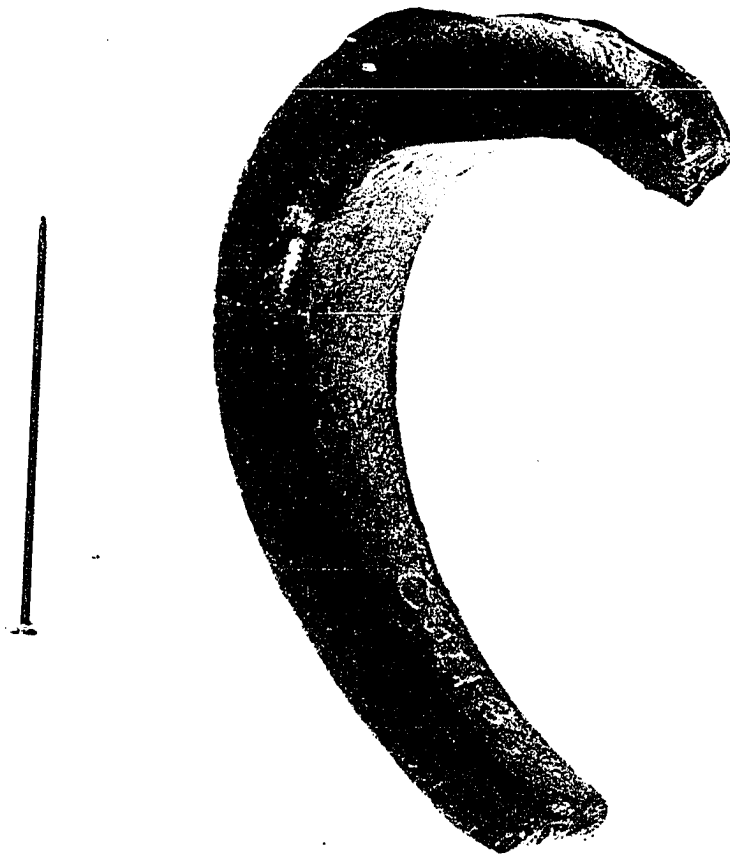


Plate 19

Handle fragment, Wistarburg site.

possibility that these were cullet (bits of broken glass) and not actually made at Alloway must be considered, as always with such fragments.

An important handled piece was excavated at the site of Benjamin Franklin's house in Philadelphia.³⁸ It is an olive green mug (Plate 20) of diminutive size and Germanic character with its threading from top to bottom and ribbed handle. The Wistar attribution stems from the fact that its archeological context was 1740-60, that it was probably not English, and that if it were American, Wistarburg was the only glasshouse operating in the area. Moreover, Franklin was well acquainted with the Wistars and purchased glass from them (Chapter VI). The mug could have been a gift to the Doctor from his enterprising neighbor. Of course, there is the chance it is Continental.

Many European parallels can be found for South Jersey offhand wares. Caution must therefore be executed in making attributions, since many objects assumed to be American may well be Continental. The extensive German import business in glass of the late eighteenth century as described by Dwight Lanmon did not happen overnight.³⁹ As Wistar's own correspondence reveals, Pennsylvania Germans maintained strong business connections with the homeland. The quantity of German wares blown in the vernacular vein and their probable exportation to the American colonies are subjects rarely considered in studies of eighteenth-century American

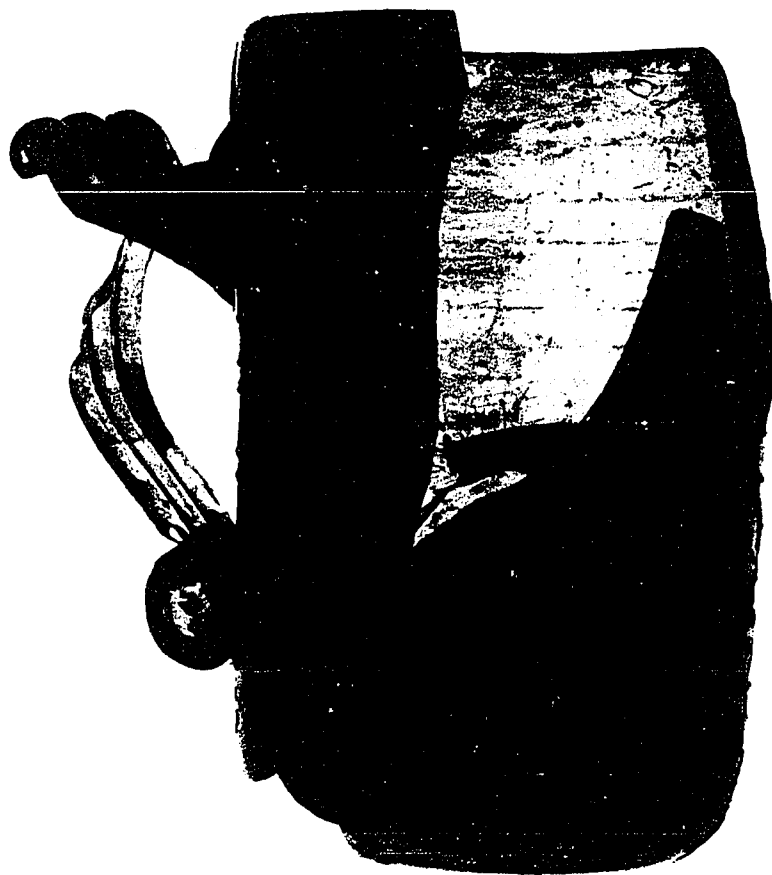


Plate 20

Mug, green glass. Courtesy of the Franklin Court Collection.

glass. This is an excusable oversight, however, for shamefully little attention has been paid post-medieval common glass of Europe: what work has been done is usually unavailable in English translation. The artistically more important enameled and engraved glass for which Germany and Bohemia are famous have monopolized the efforts of foreign scholars.

There is evidence at least that the Wistars themselves imported some glassware from Germany, evidence in the form of Continental objects which have descended in the Wistar family. Two wine glasses, one owned by Thomas Wistar of Philadelphia, and one in the Wistar Institute, Philadelphia, are typical eighteenth-century central European glasses.⁴⁰ They are decorated with engraved monograms of Caspar and Richard Wistar and elaborate hunting scenes, perhaps deliberate references to the Wüster hunters of Hilspach. Long assumed to be of South Jersey manufacture because of the family history, these glasses are now generally recognized as Continental products. It must be remembered that for the personal use of gentlemen of means, as Caspar and Richard pre-eminently were, few Wistarburg products would have been of acceptable quality.

Another Wistar family piece of glass of probable Germanic origin is a small tumbler owned by Mrs. Mary T. Haines (Plate 23). This non-lead, crizzled object is something of a puzzle, for the engraving on it, "Margareta Wisterin 1751," is not that of a

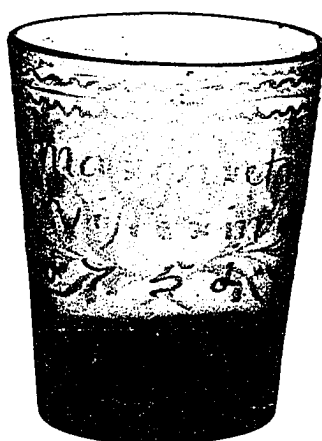


Plate 21

Tumbler, colorless.
 Engraved "Margareta Wisterin 1751." H. 3 9/16"
 Courtesy of Mrs. Mary T. Haines

highly skilled craftsman and seems hardly of the quality Wistar would have desired or troubled to import. Nevertheless, until firm evidence that Wistar produced engraved objects at his factory comes to light the tumbler cannot be called Wistarburg.

NOTES TO CHAPTER V

1. Pattern-molded, enameled, and engraved glass is attributed to Stiegel, while glassware with threading, lily-pads, colored loopings, or animal finials are classified as Wistar and South Jersey types.
2. "200 Years of Glasswork in America," Sale Catalogue, Jacob Paxson Temple Collection, American Art Galleries, November 15-17, 1923.
3. "Wistarberg and South Jersey Glass," Antiques, 10 (October, 1926), 275.
4. Pepper, p. 7.
5. "Some Notes on South Jersey Glass," Antiques, 62 (September, 1952), 209.
6. The chief sources are Caspar Wistar's Inventory, and the following advertisements: Pennsylvania Staatsbote, September 30, 1765; Pennsylvania Chronicle, July 31, 1769.
7. Account Book, Glass Company, p. 56.
8. Ibid., p. 9.
9. Inventory of Caspar Wistar, p. 12.
10. Ivor Noël Hume, "The Glass Wine Bottle in Colonial Virginia," Journal of Glass Studies, 3 (1961), 95.
11. The factory was at Amersfoort. McNulty, p. 96.
12. Account Book, Glass Company, pp. 51-58.
13. Pennsylvania Gazette, February 29-March 7, 1732.
14. Pennsylvania Journal, October 11, 1780.
15. Agreement among the creditors of Timothy Matlack, September 23, 1751, Society Collection.
16. Wister Papers, Joseph Downs Collection.

17. Andre L. Simon, Bottlescrew Days (Boston: Small, Maynard & Co., 1927), p. 236.
18. Corks were only common by the end of the sixteenth century; paper and wax were also used for stoppers. Helen McKearin, "Notes on Stopping, Bottling and Binning," Journal of Glass Studies, 13 (1971), 120-27.
19. Pennsylvania Magazine of History and Biography, 42 (1918), 195-96.
20. Walter Bremen, Die Alten Glasgemälde und Hohlgläser der Sammlung Bremen in Krefeld (Köln: Bohlan, verlag, 1964), No. 45 b.
21. Oxley to Wistar, July 16, 1773, Lukens Family Papers; Inventory of Robert Hulme, 1771, No. 123, Philadelphia County Wills and Inventories, M 1038.
22. Pellatt, p. 95.
23. Revel Oddy, "Some Chemical Apparatus Blown by Hand in the Late 18th to Early 19th Century," Annals du 5^e Congres International d'Etude Historique du Verre (Prague: n.p., 1970), p. 225.
24. Chrysler Museum Bulletin, 12 (September, 1962), Plate 5.
25. The history of the bottle is recorded on an old label kept inside.
26. Wistar to Taylor, May 12, 1760, Richard Wistar Letterbook.
27. May 12, 1760, *ibid.*
28. The following information on Bristol as a glassmaking center was gathered from Francis Buckley, "The Early Glasshouses of Bristol," Journal of the Society of Glass Technology, 9 (1925), 36-61.
29. June 21, 1760, Richard Wistar Letterbook.
30. Inventory of Caspar Wistar, p. 5.
31. November 8, 1759, Richard Wistar Letterbook.
32. To Freeman, May 12, 1767, *ibid.*
33. Receipt Book of Caspar Wistar.

34. George S. McKearin, "This Is How It Happened," Antiques, 58 (October, 1950), 291.
35. For illustration of the Salem County Historical Society sugar bowl, see Florence C. Maxwell, "Wistarberg, Yesterday and Today," Antiques, 60 (September, 1951), 192; George S. McKearin and Helen McKearin, American Glass (New York: Crown, 1946), Plate 28.
36. Sale Catalogue, Mrs. Frederick S. Fish Collection, Park-Bernet Catalogue No. 159, January 5-6, 1940, No. 368.
37. Bremen, No. 233.
38. The mug, V503 FC 518.167, was unearthed during the 1971 excavations of Franklin Court.
39. Dwight P. Lanmon, "Glass in Baltimore: The Trade in Hollow and Tablewares, 1780-1820" (unpublished Master's thesis, University of Delaware, 1968).
40. For an illustration of the glass with Richard Wistar's monogram, see Pepper, p. 24.

CHAPTER VI

WISTARBURG AND ELECTRICAL EXPERIMENTATION

It is now evident that the Wistars had an important and fascinating role in the development of colonial science, a role hitherto unexplored. Through their manufacture of electrical apparatus of glass they influenced the course of experimental "philosophy" in two ways. First, in providing equipment for the Philadelphia savants they to some degree made possible the scientific efforts which won the Americans international renown. Secondly, the availability and low cost of Wistarburg goods enabled more people to perform experiments--for research or amusement--than would have been possible had all materials had to be ordered from London.

The genius behind this facet of Wistar production was neither Caspar nor Richard, but their prominent neighbor, Benjamin Franklin. His papers, the principal source for this material, contain no mention of any initiative on the part of the owners or workers at the South Jersey factory: until documents are found which suggest otherwise, the whole matter of domestic scientific glassware must be considered an achievement of Franklin.

The exact nature and extent of Franklin's relation with the glassworks is frustratingly incomplete. That he was familiar with

the inner workings of the establishment at an early date is shown by his correspondence with Thomas Darling, discussed in Chapter II. These letters coincide with the beginning of Franklin's experimentation in electricity and his increasing need for Wistar's services.

It is not known precisely when and how Franklin first became interested in electrical theory; the obscurity stems from insufficient data as well as contradictions in his Autobiography. It seems logical to date his concern with the new science from at least April 26, 1744, when the following announcement appeared in the Pennsylvania Gazette:

A Greater Number of Gentlemen having subscribed to Dr. Spencer's first Course of EXPERIMENTAL PHILOSOPHY, than can be conveniently accommodated; at a Time: He begins his first Lecture of the second Course, on Thursday, the tenth Day of May, at five o'Clock: Subscriptions are taken in at the Post-Office, where a Catalogue of the Experiments may be had gratis.

Franklin, of course, was the Post Master at this time. In his Autobiography he recalls that he first heard a Dr. Spence in Boston in 1746, but the lectures referred to were actually given in 1743. so the Philadelphian's introduction to electricity must have occurred then.¹

Although Franklin may have purchased Spencer's equipment sometime in 1743 and undertaken experiments immediately,² this was not the situation which brought Wistarburg into the picture. It

was, instead, Peter Collinson's gift to the Library Company of a glass tube and directions for using it which caused scientific glass to be made locally. This tube may be the one on display in the Franklin Memorial Hall of the Franklin Institute. Franklin, as Secretary of the Library Company, acknowledged receipt of the tube in March, 1747, apparently some months after it actually arrived, for by the time of the letter he was already deep into the world of electrical phenomena.

I never was before engaged in any study that so totally engrossed my attention and my time as this has lately done; for what with making experiments when I can be alone, and repeating them to my Friends and Acquaintance[s], who, from the novelty of the thing, come continually in crowds [sic] to see them, I have, during some months past, had little leisure for anything else.³

This popular pressure upon Franklin to demonstrate the properties of electricity resulted in Wistar's involvement. Franklin wrote:

my House was continually full for some time, with people who came to see these new Wonders. To divide a little this Incumbrance among my Friends, I caused a Number of similar Tubes to be blown at our Glass-House. . . so that we had at length several Performers.⁴

Within a matter of months Wistar blowers had turned out a considerable quantity of glass tubes in response to the tremendous demand for them in Philadelphia. On May 25, 1747, Franklin reported to Collinson, "Electricity is so much in vogue, that above one hundred of them [tubes] have been sold within these four months past."⁵ By June, Wistar-made tubes could be found in New York.⁶

The glass tube was the most important instrument in electrical investigations of the 1740's. It could be readily "electrify'd" by rubbing--the Philadelphians used a piece of buckskin;⁷ thus charged, the tube could function in a variety of experiments, some of a spectacular nature. No doubt the colonists were eager to imitate the demonstrations of Dr. Spencer:

He took a Long Glass Tube & Rubbed it Vehemently with his hand, & then he held it pretty near several Pieces of Leaf brass or Gold, which put them into very brisk & Surprizing Motions. Some would leap toward the Tube, Sometimes adhere & fasten to it, settle on its Surface, and there remain Quiet: and sometimes be thrown off from it with a great force. And thus would they be alternately attracted and Repelled, for several times Successively. . . . A boy was suspended Horizontally & the Dr. rubbed a Glass Tube, a little distance from his feet w^{ch} made Sparks of fire fly from his face & hands. . . . 8

Many other simple experiments with the tube would certainly have been tried in the Friendly City, including those described and illustrated by J. T. Desaguliers, whose book was in Franklin's personal library (Plate 22).

Although a great many glass tubes were made at Wistarburg, few of the rather cumbersome items survive. Neither the example at the American Philosophical Society (Plate 23) nor at the Library Company (Plate 24) is absolutely documented, yet both conform to the contemporary descriptions of Wistar tubes. In addition, their green color and slightly crude quality match that of fragments found at the glasshouse site. They do not appear to be European, since Franklin states that London models were generally of a white--colorless--glass.⁹

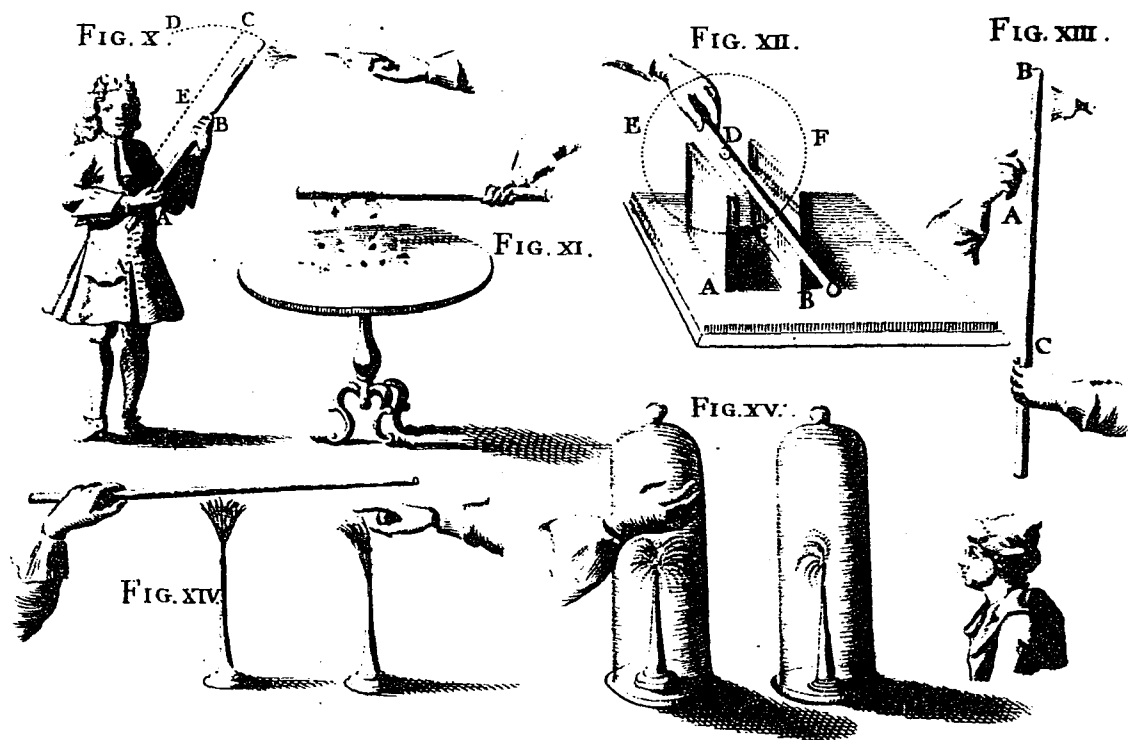


Plate 22. Taken from John Theophilus Desaguliers, A Course of Experimental Philosophy, Vol. 1 (2d ed. corr.; London: Innys, 1745), Plate 2. Courtesy of The American Philosophical Society.

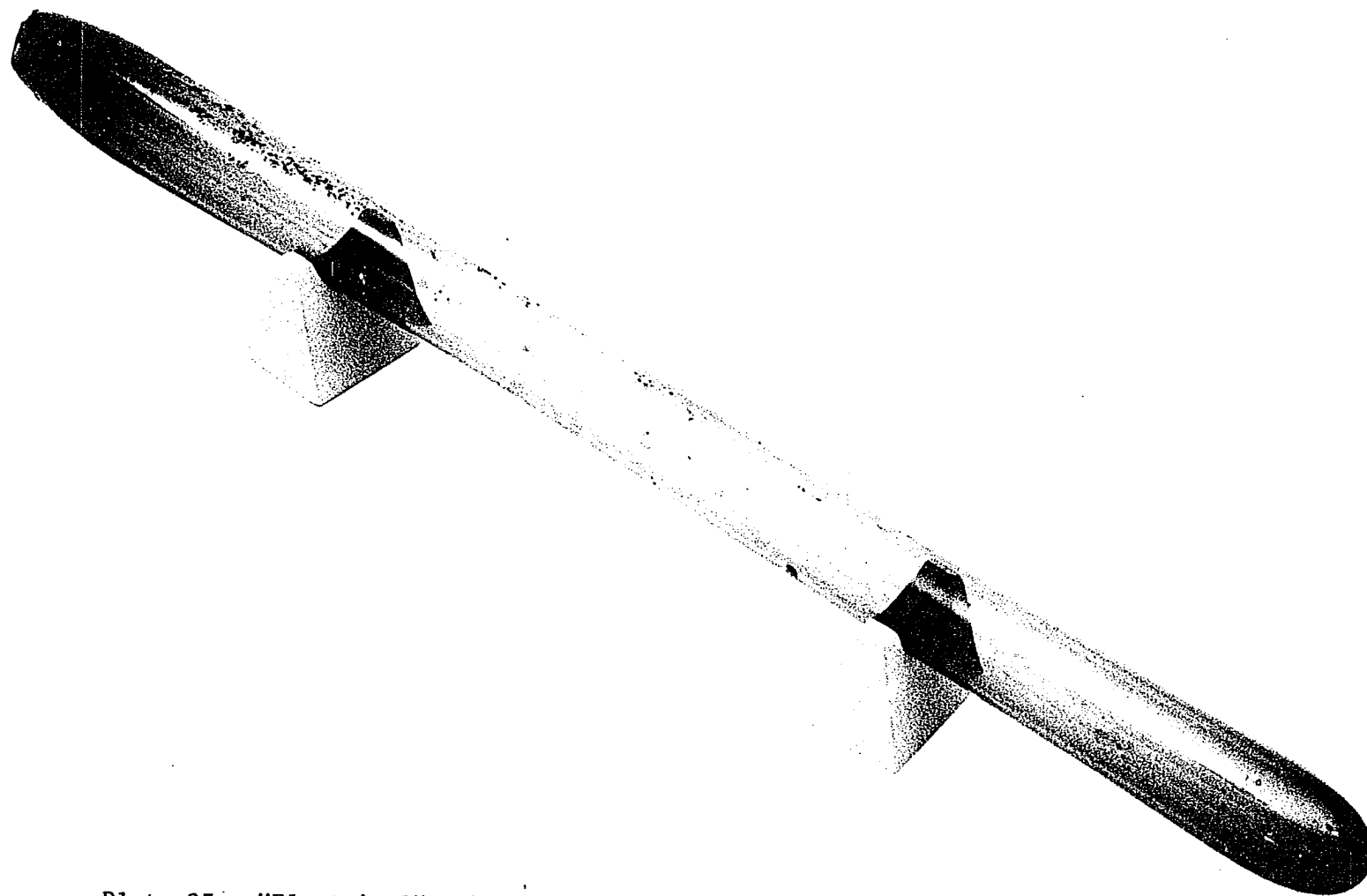


Plate 23. "Electrical" tube, green glass, length 23". Courtesy of The American Philosophical Society.

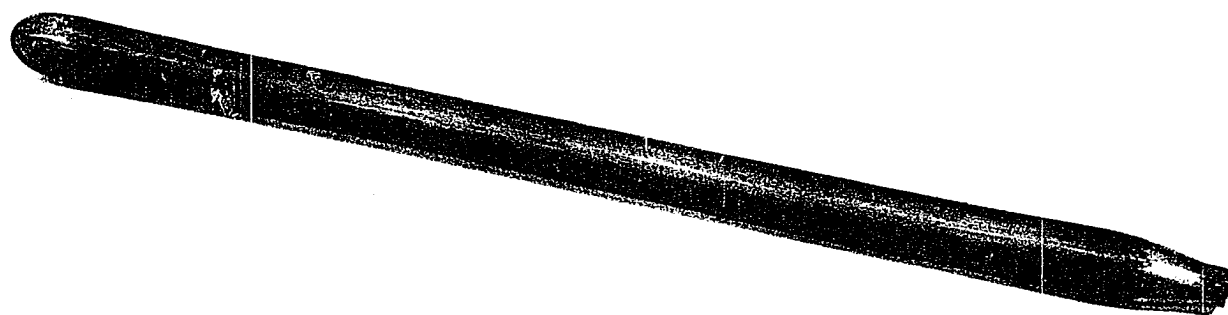


Plate 24. "Electrical" tube, green glass, length, $32 \frac{13}{16}$ ". Surface heavily scratched. Courtesy of The Library Company of Philadelphia.

The extant Philadelphia pieces may be the sort which were valued at two shillings each in the inventory of the Wistar store taken at Caspar's death in 1752. Smaller and cheaper tubing, fragments of which were discovered at Wistarburg (Plate 25), were also used in scientific apparatus. A remnant of a glass jar with a tube of this kind protruding from its lid may be seen in the collection of the Library Company.

Instruments more elaborate than glass tubes were quickly added to the Philadelphia laboratories. Sometime in 1747 the Library Company received a gift of a "compleat electrical apparatus" from the proprietor of the colony, Thomas Penn.¹⁰ Several types of electrical machines were in vogue which required spheres, cylinders, or plates of glass. Neither of the partial remains of electrical machines in the American Philosophical Society and the Library Company can be definitely associated with the Penn gift, but Franklin's machine now in the Franklin Institute, may be the one the proprietor sent.

Although these more complex machines were usually made abroad--the Penn one was fashioned by George Adams of London--there is evidence that some were fabricated by Philadelphia craftsmen. Cadwalader Colden of New York quickly learned of the new English apparatus at the Library Company and wanted one for the electrical enthusiasts of his city, claiming they "would purchase the like if they can be made at Philadelphia from what you Franklin have [had] sent to

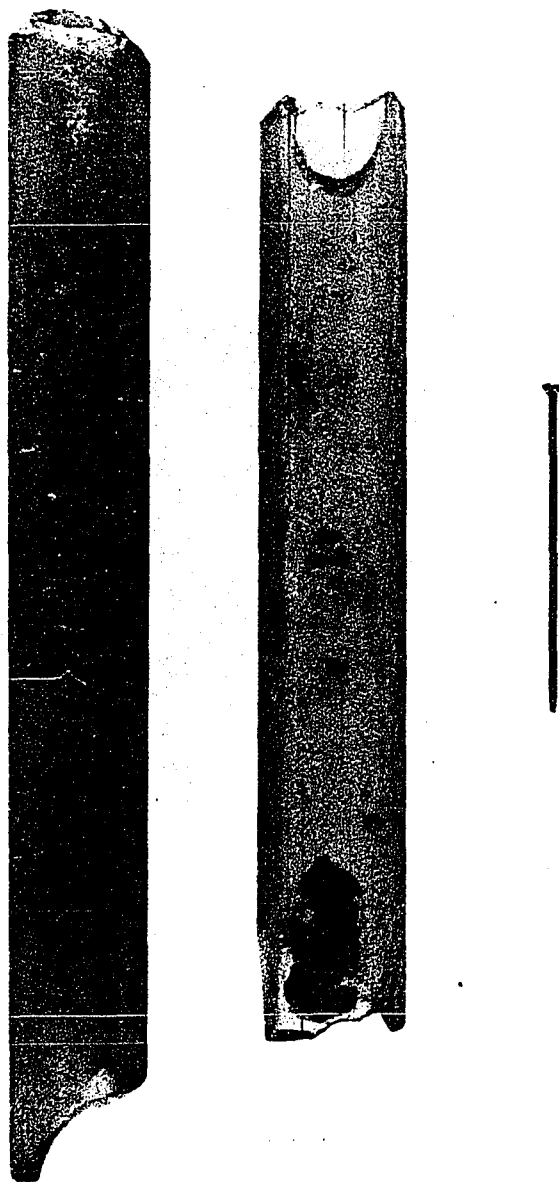


Plate 25. Glass tube fragments, Wistarburg site.

you. Please to let me know whether any of your Artists can do it and what may be the price."¹¹ Franklin's reply to Colden reveals his position as the director of the Quaker City's instrument-making efforts, and attests to the ability of the local craftsmen in such production.

I am satisfy'd we have Workmen here, who can make the Apparatus as well to the full as that from London; and they will do it reasonably. By the next Post I will send you their Computation of the Expence: If you shall conclude to have it done here, I will oversee the Work, and take Care that every Part be done to perfection, as far as the Nature of the Thing admits.¹²

A week later Franklin reported:

Our Workmen have undertaken the Electrical Apparatus, and I believe will do it extreamly [sic] well: It being a new Job they cannot say exactly what their Work will come to, but they will charge reasonably when done, and they find what Time it has taken. I suppose the whole will not exceed ten or twelve Pounds.¹³

Of course, instruments of this kind had wood and metal parts as well as glass ones; the Wistars would only have supplied the necessary glass. If, as I. Bernard Cohen believes, the Colden order was for a machine of the sort Philip Syng invented--or developed independently of European instrument-makers--it involved glass globes on iron axes with a handle attachment.¹⁴ In this case, Syng himself would probably have been responsible for the finished product.

Tubes and globes are the only electrical objects specifically mentioned in Wistar advertisements and the store inventory, but there is the possibility that other glass forms were made in New Jersey

for the scientists. In the records of Franklin, Ebenezer Kinnersley, and other electricians, many kinds of glassware are employed in experiments: strips and panes of glass, jars, bottles of all sizes and shapes, stoppers, and glass stands. Again, if Wistar did manufacture any of these, they would have followed European models, or Franklin's specifications. Only two references could be found which suggest that Wistarburg workers did blow electrical instruments other than globes and tubes. The fact that Franklin describes in great detail certain thin glass jars to Collinson, the man who supplied the Philadelphians with all of their English-made apparatus, implies that they were unfamiliar to Collinson and therefore of local design. Firmer proof of Wistar jars, however, is provided in the correspondence between Franklin and James Bowdoin. On April 12, 1753, Franklin notified his friend that he had shipped the glass jars he ordered-- and added a telling postscript: "The Glassmaker being from home, I cannot now get the Account."¹⁵

It cannot be ascertained whether or not the Wistars furnished the electricians with Leyden jars. The invention of Pieter van Musschenbroek and Ewald Georg von Kliest, both working independently in Europe around 1745, this item became a major component of electrical investigation and would certainly have been in demand in America. A battery of such jars is owned by the American Philosophical Society which has a clear Franklin history, but it is believed to be European.¹⁶

Certainly Wistar must have enjoyed a lively business in repairing and replacing broken parts of scientific apparatus.

Franklin's papers contain several examples of the sundry ways in which electrical glass was damaged. In the Autobiography Franklin, a militia colonel, remembers the first time he reviewed his regiment: "They accompanied me to my House, and would salute me with some Rounds fired before my Door, which shook down and broke several glasses of my electrical apparatus."¹⁷ A more usual hazard was the matter of transportation. Jonathan Belcher, eager to borrow Franklin's machine so as to have shock treatment for his palsy, finally received the thing only to discover the glass globe had been shattered "by the rough Conveyance of it (in a Waggon) from Burlington hither."¹⁸

One significant result of the Wistars' business with Franklin is that Wistarburg wares from an early date reached a market far beyond the Philadelphia-New Jersey area. Franklin was the leader of electrical science in the country; indeed, he became internationally famous for his discoveries. The point here is that he stimulated and directed the entire study of electricity in the American colonies. His circle of scientifically-minded friends was amazingly wide; he would write them of his latest ideas, ask their opinions, urge them to conduct experiments of their own, and comment upon their findings. Colden, Bowdoin, and all the rest were only too anxious to investigate electrical phenomena--they simply required the proper tools. Franklin's papers are replete with requests for apparatus and with confirmations

of shipment and receipt. Thus it was Franklin's role as promoter of scientific knowledge which put Wistarburg on the map, so to speak. New Jersey tubes and globes were sent to Boston, New York, New Haven, even to Jamaica. They accompanied Dr. Kinnersley on his lecture tours all over the colonies. Unfortunately, because the Wistar sales books have not been located, one can but speculate whether or not the glassworks benefitted substantially from this exposure.

The documents of Benjamin Franklin are valuable primarily for information about the forms of glass made by Wistar glassblowers and the demand and market for finished products. Only meager evidence is offered, however, concerning the nature of the glass itself. Franklin described American-made tubes and globes to Dr. John Lining of South Carolina, in 1755, almost ten years after production began:

The glass has a greenish cast, but is clear and hard, and, I think, better for electrical experiments than the white [colorless] glass of London, which is not so hard. There are certainly great differences in glass. A white [colorless] globe I had made here some years since would never, by any means, be excited.¹⁹

The inconsistency of glass composition and color which Franklin casually recorded summarizes the whole problem of the identification of colonial glass, and raises questions about the value of analytical methods of examination.

During the peak of this electrical output around mid-century, Wistarburg was not the only glass factory in the country. There was a works in New York City, while Franklin himself had a hand in the Braintree Works built outside of Boston in 1752.²⁰ Evidently these did not compete with the Wistar manufactory in the field of scientific glass, for in 1755, Franklin claimed, "The tubes and globes we use here [in Philadelphia], are chiefly made here."²¹ One glassworks which did include such glassware, though at a much later date, was Stiegel's establishment in Manheim, Pennsylvania. He had commenced glassmaking in 1763, but the evidence of scientific glass only dates from 1770.²²

Finally, it must be remembered that just as for other forms of glass, English apparatus was ever the chief competitor of domestic wares. Franklin never ceased to patronize London instrument-makers, as his correspondence with Collinson indicates. He even bought some English glass tubes in spite of his praise of local ones. After he took up residence in London in 1757, documentary proof of New Jersey manufacture decreases. Previous customers could obviously buy directly from Wistar without Franklin as middleman, but by this time apparatus more complicated than tubes and globes were the norm. Franklin, in London, continued to act as agent and supplied his American friends with the equipment they desired.²³

NOTES TO CHAPTER VI

1. Boston Evening Post, May 30, 1743. This Dr. Spence or Spencer is something of a mystery; he was perhaps Archibald Spencer. Franklin says he had come from Scotland, Benjamin Franklin, The Autobiography of Benjamin Franklin, ed. Leonard W. Labaree et al. (New Haven: Yale University Press, 1964), p. 240.
2. *Ibid.*, p. 196.
3. March 28, 1747, Labaree, 3, 118-19.
4. Autobiography, p. 241.
5. Labaree, 3, 134.
6. Franklin to Cadwalader Colden, June 5, 1747, *ibid.*, 142.
7. "We rub our Tubes with Buck Skin, and observe always to keep the same Side to the Tube, and never to sully the Tube by handling." Franklin to Collinson, May 25, 1747, *ibid.*, 134.
8. As quoted in Benjamin Franklin, Benjamin Franklin's Experiments, ed. I. Bernard Cohen (Cambridge, Harvard Press, 1941), pp. 51-2.
9. To John Lining, March 18, 1755, Labaree, 5, 521.
10. "Minutes of the Library Company," Vol. 1, p. 156, Library Company, Philadelphia; Library Company to Thomas Penn, Labaree, 3, 164-65.
11. August 3, 1747, Labaree, 3, 168.
12. August 6, 1747, *ibid.*
13. August 13, 1747, *ibid.*, 170.
14. Cohen, p. 60. For a description of the machine Syng fashioned see Franklin to Collinson, May 25, 1747, Labaree, 3, 134.
15. Labaree, 4, 462-63.

16. Robert P. Multhauf (comp.), A Catalogue of Instruments and Models in the Possession of the American Philosophical Society ("Memoirs of the American Philosophical Society," Vol. 53; Philadelphia: American Philosophical Society, 1961), p. 18.
17. P. 238.
18. Belcher to Franklin, December 18, 1751, Labaree, 4, 216.
19. March 18, 1755, *ibid.*, 5, 521.
20. John Franklin to Benjamin Franklin, November 26, 1753, *ibid.*, 5, 118-19.
21. To John Lining, March 18, 1755, *ibid.*, 512.
22. David Rittenhouse purchased glass tubing for barometers from Stiegel in 1770, Hunter, p. 68.
23. For example, Franklin to Thomas Hubbard, April 28, 1758, Labaree, 8, 52.

CONCLUSION

The Wistars did not contribute to the design or technology of glass, but they are nonetheless important for their vision and success in asserting the position of glass manufacturing on these shores. A metals craftsman untrained in the mysteries of glassmaking, Caspar Wistar considered the potential market for local glass in his society and decided to undertake its manufacture, even though others had tried and failed. The result of his ambitions was a good-sized establishment which sustained itself for nearly forty years. Wistar deserves recognition for having surmounted the *bête noir* of colonial manufacturers, the costs and scarcity of skilled labor--and glassblowers were among the most highly skilled artisans. Indeed, for his innovative partnership with his glassmen Wistar is a significant figure in the history of American labor practices.

The story of actual Wistar-made articles of glass is necessarily a conjectural and frustrating one. It is frequently impossible to document any piece of glass to a specific factory and this is especially true in the case of the Wistarburg glass-works. The circumstances of southern New Jersey minimize the value of family history as a clue of authenticity, for the styles

of the objects created at Wistar's glasshouse continued to be current in the many glasshouses operating in that area in the nineteenth century, and, in some instances, were transmitted by the very workmen who had blown glass at Alloway. Moreover, it has been shown here that Wistarburg products were sold outside of Pennsylvania and New Jersey, so a New York or Massachusetts family history of a piece of glass need no longer preclude a Wistar attribution. A South Jersey history is nevertheless considered sufficient and solely acceptable proof of Wistar origin by many owners of American glass.

Neither can identification of Wistar glass rest on simple visual inspection, for the forms, colors, ornamentation, and quality of most early American blown glassware are generally too homogeneous to permit attributions to individual glassworks. Such observations that a "special green color with bubbles in the glass helps to identify" Wistar glass are sheer nonsense but are all too persistent.¹ Only in those few instances where factory sites have been archeologically excavated or where known fragments have been successfully scientifically analyzed can guidelines--not absolute criteria--for attribution be suggested.

From written records it is obvious that Wistar's glass goods were varied in form and color, variations which, while they broaden the possibilities for Wistar pieces, do not necessarily expedite the authentication process. And, as additional information

is accumulated about English and Continental importations and colonial consumer habits, it may be that glass will be assigned to Wistarburg with even less assurance than it already is. Wistar's own position as the all-purpose dealer in glass, making and importing all kinds of wares of all prices so as to cater to the widest possible market, is a further complication, examined in detail for the first time in this thesis.²

The German immigrant's affiliation with Benjamin Franklin, the prominent figure of eighteenth-century Philadelphia, has here been exposed and explored in some depth. Through their connections a previously overlooked dimension of the Wistar business--electrical glassware--was revealed. This neglect was not the fault of glass enthusiasts alone but also that of historians of early science, for while the accomplishments of the electricians are celebrated, the efforts of colonial artisans in providing the required equipment has been ignored.

This thesis has been an attempt to illuminate the very dim origins of successful glassmaking in America. Knowledge of the Wistar enterprise has been only slightly amplified since Hunter's 1914 discussion in spite of numerous publications concerned with the colonial glass industry. Mythical in content, unscholarly in approach, the literature on Wistarburg is all too typical of published accounts of all aspects of American glass. This study of Wistar's glassworks is by no means complete but it is a first

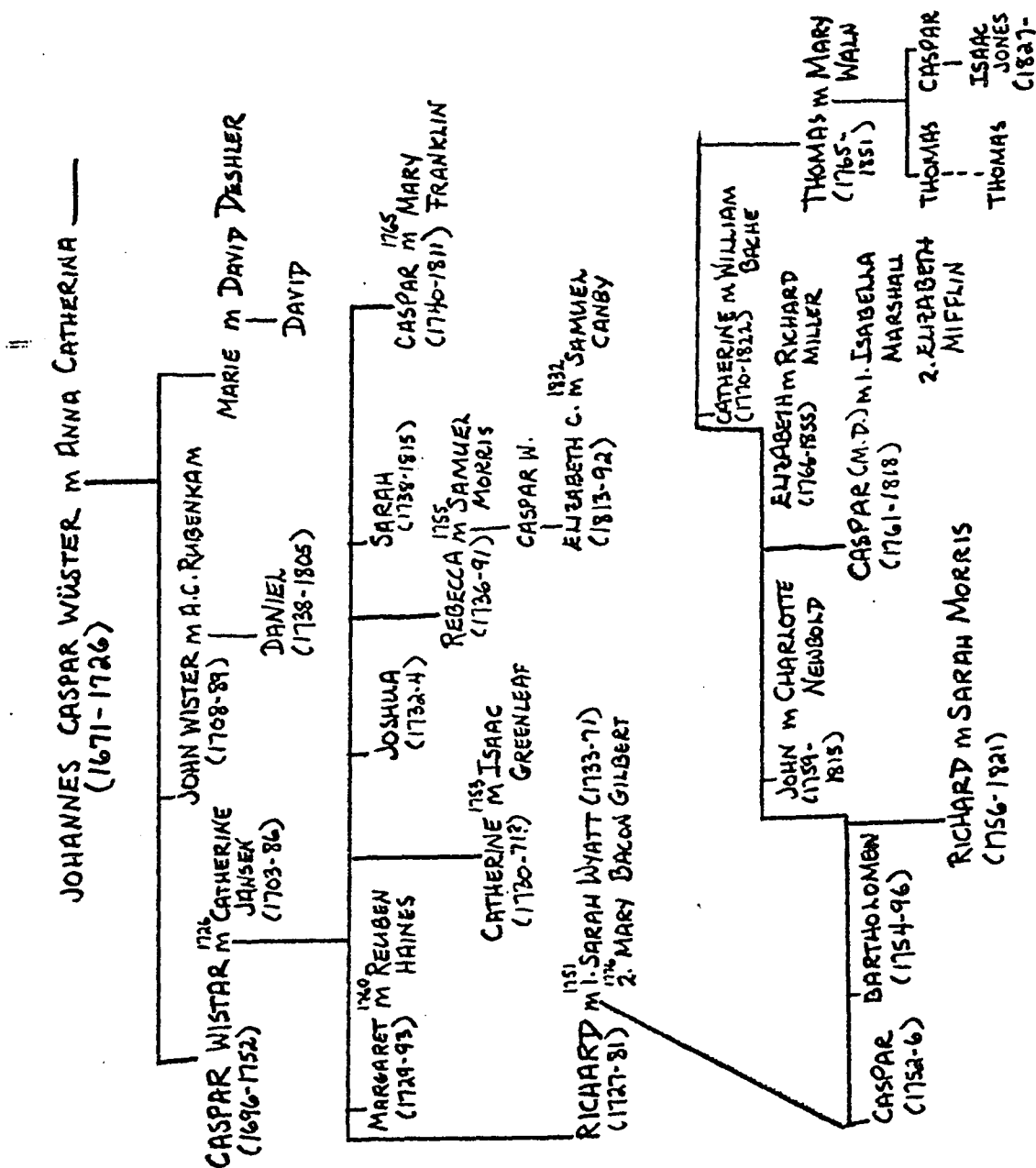
step: more facts about the factory and its physical and human resources remain to be discovered, more glass must be examined, and the entire body of data re-studied and re-evaluated. Few such investigations of individual glasshouses have yet been conducted even though the details of labor, products, and marketing are obviously crucial if a generalized understanding of the glass industry and its growth is to be achieved.

NOTES TO CONCLUSIONS

1. Irene Y. Hancock, In the Shade of the Old Oak (Salem, N.J.: Sunbeam Publishing Co., 1964), p. 18.
2. The extent of the Wistar import business was first publicized when the Winterthur Museum obtained a microfilm copy of the Richard Wistar Letterbook. Milo M. Naeve, "Richard Wistar: His Glasshouse and Country Store," Winterthur Newsletter, 5 (April, 1959), 1-4.

APPENDIX 1

A Partial Genealogy of the Wistar Family of Philadelphia



APPENDIX 2

Documents of the United Glass Company. Account Book, Glass Company, 1743-1767, F 124, Box 2, Wistar Papers, Historical Society of Pennsylvania. Translated from the original German.

Extract from the diary, October 12, 1741

This day I and the four glassmakers mutually made a covenant that I assume and take all glass and all debts, whatever they may be, from the beginning till now, and I further pay each one in money the sum of 85 pounds. Excepting, however, their own private bills and what they have had of me and the white glass, potash and other ashes. All other expenses I am to pay this day.

[Caspar Wistar]

In as much as there is so far no written evidence concerning the business and covenant of our Glass Works, and whereas the human memory is so weak that it cannot be depended upon, which leads to errors and misunderstandings, therefore, the United Glass Company has found it timely and expedient (to avoid misunderstanding) to commit to this book their dealings with one another, and to this end commenced this book in the year one thousand seven hundred and forty-three, 1743.

By John Stockard, Factor

Appendix 2 (Continued)

Declaration and Explanation

I, the undersigned Caspar Wister, do declare and affirm in regard to the four glassmakers, Hans Wilhelm Wentzel, Simeon Griessmayer, Caspar and Martin Halder that mine agreement has always been and is now, that at the expiration of this covenant, they shall receive and hold the Glass Works as their property, including the furnaces bought of them by me, and all property, tools, and other things bought by me, not stationary.

However, there shall be divided between me and them the two boilers in the potash house and all other iron tools bought by the whole company for the use of the company, provided such tools are not stationary. Of these the glassblowers shall have one share and myself two shares. In witness thereof I have hereunto set my name. 4 February 1744.

[signed] Caspar Wister

APPENDIX 3

Workers at Wistarburg

Positively identified as glassmakers:

Griesmeyer, Simeon (1718-48) Arr. Two Sisters, qual. Sept. 9, 1738.
Partner with Wistar.

Halder, Caspar (1712-61) Arr. Two Sisters, qual. Sept. 9, 1738.
Partner with Wistar.

Halter, Hans Martin (1714-67) Arr. Two Sisters, Qual Sept. 9, 1738.
Partner with Wister.

Halter, Peter (d. 1775) Possibly son of Martin, as mentioned
in latter's will. A Peter Halter arr.
Duke of Wirtemberg, qual Oct. 20,
1752.

Nassel, Christian In Alloway by 1750; joined Stiegel
1763.

Stanger family: Adam, Senior All arr. Betsey, qual Oct. 16, 1768.
Adam, Junior Not known if all were trained--Solomon
Christian was and others probably also.
Daniel
Jacob
Jacob
Solomon

Wentzel, Wilhelm (1703-61) Arr. Two Sisters, qual Sept. 9, 1738.
Partner with Wistar.

Known servants or employees of the Wistars, occupations unspecified:

Ambas, Peter Wistar paid his passage, Mar. 28, 1750.

Becker, Johan Jacob Arr. Edinburgh, qual. Sept. 15, 1749. Wistar
paid his passage Mar. 28, 1750.

Becktell, Jacob	Servant, bound to C. Wistar 4 years from Oct. 17, 1745.
Brust, Adrian	Arr. <u>London Pacquet</u> , from Lisbon, qual <u>Sept. 29, 1769</u> . Ran away from Wistar, ad. Apr. 26, 1770. Had been soldier in Portugal.
Drilring, Christian	Wistar paid his passage, Sept. 3, 1747.
Geisinger, Charles	A Carl Grissinger arr. <u>Palladium</u> , from Lisbon, qual. Oct. 16, 1766. Geisinger ran away from Wistar and M. Halter, ad. July 9, 1767. Had been soldier in Portugal. Age 40.
Hebener, Caspar	Had once been at glasshouse, according to notice, <u>Pennsylvanischer Staatsbote</u> , Apr. 7, 1772.
Kindiel, John	Servant, ran away from R. Wistar, ad. Apr. 19, 1770. Age 17.
Knepley, Peter	Servant, bound to C. Wistar 6 years, from Oct. 17, 1745.
Knobloch, George	Servant, bound to R. Wistar from Dec. 7, 1772.
Konigsfold, Conrad	At glasshouse, ad. Aug. 7, 1776.
Lambert, John Peter	Servant, bound to C. Wistar 12 years, from May 2, 1746.
Leger, Johan Thys	Wistar paid his passage, Mar. 28, 1750.
Reyffner, Anthony	Other Reyffners arr. <u>Two Brothers</u> , qual. Sept. 14, 1749. Wistar paid Anthony's passage Mar. 28, 1750.
Rider, John Michael	Servant, ran away from R. Wistar and M. Halter, ad. July 9, 1767. Had been soldier in Portugal. Age 25.
Zimmerman, Abraham	Arr. <u>Ann.</u> Sept. 27, 1746. Wistar paid his passage Oct. 4, 1746. Bound 5 years, from Oct. 4, 1746.

Zimmerman, Melchior	Arr. <u>Ann.</u> , qual. Sept. 27, 1746. Wistar paid his passage, bound 8 years, from Oct. 4, 1746.
Zimmerman, Melchior	? bound to C. Wistar 9 years, from Oct. 6, 1746.

Wistar servants or employees, occupations known; not glassblowers:

Friede, Christian	Glasscutter. Arr. <u>Brothers</u> , qual. Aug. 24, 1750. Called glasscutter in Account Book, Glass Company.
Jacobs, Philip	Stone mason. Servant, ran away, ad. Nov. 9, 1767.
Knester, John Godfrey	Carpenter. Arr. (Johan Gottfried Nestler) <u>Sally</u> , qual. Aug. 23, 1773. Ran away from Wistar, ad. Nov. 7, 1775.
Matzinger, David	Sales agent (?). Account Book, Glass Company.
Oelbers, Nicholas	Bookkeeper. 1768, Friesburg Church records.
Stockard, John	Factor, 1743-50. A Johan Valentine Stocker arr. <u>Winter Galley</u> , qual. Sept., 1738.
Thompson, Benjamin	Manager of Glasshouse. Salem Quaker, d. 1775.

Possible Wistar employees or servants:

Cratinger, <u> ?</u>	Account Book, Glass Company.
Houseman, Jacob	
Lambert, William	d. 1824
Shriner, Peter	Account Book, Glass Company. A Peter Schreiner arr. <u>Samuel and Elizabeth</u> , qual. Sept. 30, 1740. R. Wistar admr. of his estate.

Wentzells: Carl
Philip
Theodore
Wilhelm, junior

Ziegler, Theoderwald Arr. 1772

Zimmerman, Adam Arr. 1743

APPENDIX 4

Financial Tables, compiled from Account Book, Glass Company, 1743-67.

Table 1: Glass made by each gaffer (f-s-d)

Period	Wentzel	C. Halder	Halter & Griesmeyer	Total
1741-42	314-8-8-	220-1-10	629-7-10	1163-18-4
1742-43	365-8-2	204-11-5	637-7-1	1207- 6-8
1743-44	{green-105-5-3 clear-104-9-0	166- 8-1	439-10-0	816- 1-4
1744-45	349-12-8	264- 7-3	927- 5-6	1541- 5-5
1745-46	400-18-3	267- 5-9	953- 8-7	1621-12-7
1746-47	654-11-5	302-12-10	1288- 5-2	2245- 9-5
1747-48	546-16-8	301- 0-6	1155- 6-10	2003- 4-0
1748-49	{bottle-102-4-7 window-520-13-10	454-19-0	{bottle-191-18-4 window-999-18-1	2269-13-10
1749-50	-----	437- 7-10	-----	
1750-51	642- 4-9	435- 0-8	1235- 0-6	2312- 5-11
1751-52	Wentzel and M. Halter:			1606-13-10
1752-53				1807-16- 4
1753-54				2031-16- 4
1754-55				2072-17- 4
1755-56				1504-17- 2
1756-57				1703- 5- 5
1757-58				1245- 7- 7
1758-59				1398-14- 1
1759-60				1438-10- 5
1760-61				1350- 3- 3
1761-62	M. Halter			784-18- 7
1762-63				1385-16- 4
1763-64				1467-12- 6
1764-65				1627- 8- 8
1765-66				1775-18- 1
1766-67				581-11- 0

APPENDIX 4

Table 2: Expenses of the Particular Companies (£-s-d)

<u>Period</u>	Wistar and: <u>Wentzel</u>	<u>C. Halder</u>	<u>Halter & Griesmeyer</u>
1741-42 }			
1742-43 }	116- 1- 9	12- 9- 0	79-10- 0
1743-44	32-13-10	20-15- 5	66- 0- 3
1744-45	31-16- 0	16-13- 3	65-17- 0
1745-46	-----	29- 3- 6	69- 4- 0
1746-47	29-11- 8	11-11- 0	74- 5- 8
1747-48	43- 0- 3	16- 4- 3	75-19- 6
1748-49	73-15- 7	35- 4- 0	140- 4- 0
1749-50	-----	-----	-----
1750-51	53- 9- 6	21-17- 0	83- 0- 8

Wentzel and M. Halter in Company

1751-52 }	
1752-53 }	149-17- 6
1753-54	
1754-55	-----
1755-56 }	
1756-57 }	186-18- 6
1757-58 }	
1758-59 }	
1759-60 }	
1760-61 }	101- 8- 7

APPENDIX 4

Table 3: Expenses of the Whole Company

Each gaffer responsible for one-twelfth the amount	
1741-42 } 1742-43 } 1743-44 1744-45 1745-46 1746-47 1747-48 1748-49 1749-50 1750-51	 328- 5- 0 94- 4-10 211- 8- 9 138- 8- 0 131- 6- 4 135- 1-10 160- 2- 2 ----- 245- 1- 0
Wentzel, M. Halter, each one-fourth; R. Wister, one-half	
1751-52 } 1752-53 }	982- 5- 4
1753-54 } 1754-55 }	1167-12- 0
1755-56 } 1756-57 } 1757-58 } 1758-59 }	907- 0- 5
1759-60 } 1760-61 }	710- 1- 4
M. Halter, half; R. Wistar, half	
1761-62 } 1762-63 } 1763-64 } 1764-65 } 1765-66 } 1766-67 }	3861- 4- 2

APPENDIX 5

The Scientific Analysis of Wistarburg Glass

The scientific analysis of the composition of glass as an aid to identification and authentication is not a new idea. Glass collectors and curators have been conducting simple tests for years to determine if a piece was composed of lead glass. Until recently, however, it was only possible to detect the major chemical components as well as the trace elements of an object through destructive testing. That is, the object in question had to be defaced in order to obtain a sample. An apparatus recently added to the Analytical Laboratory of The Henry Francis du Pont Winterthur Museum has broadened the possibilities for analytical treatment of museum objects because it performs a non-destructive test: the valuable item can undergo chemical analysis with no damage whatsoever.

The device, a non-dispersive X-ray fluorescence spectrometer popularly known by the maker's name, Kevex, is based on the principle that each element when excited by an external X-ray source, re-emits an X-ray of unique wavelength which is characteristic of the particular element. Thus the object to be analyzed need only be induced to radiate X-rays; these can then

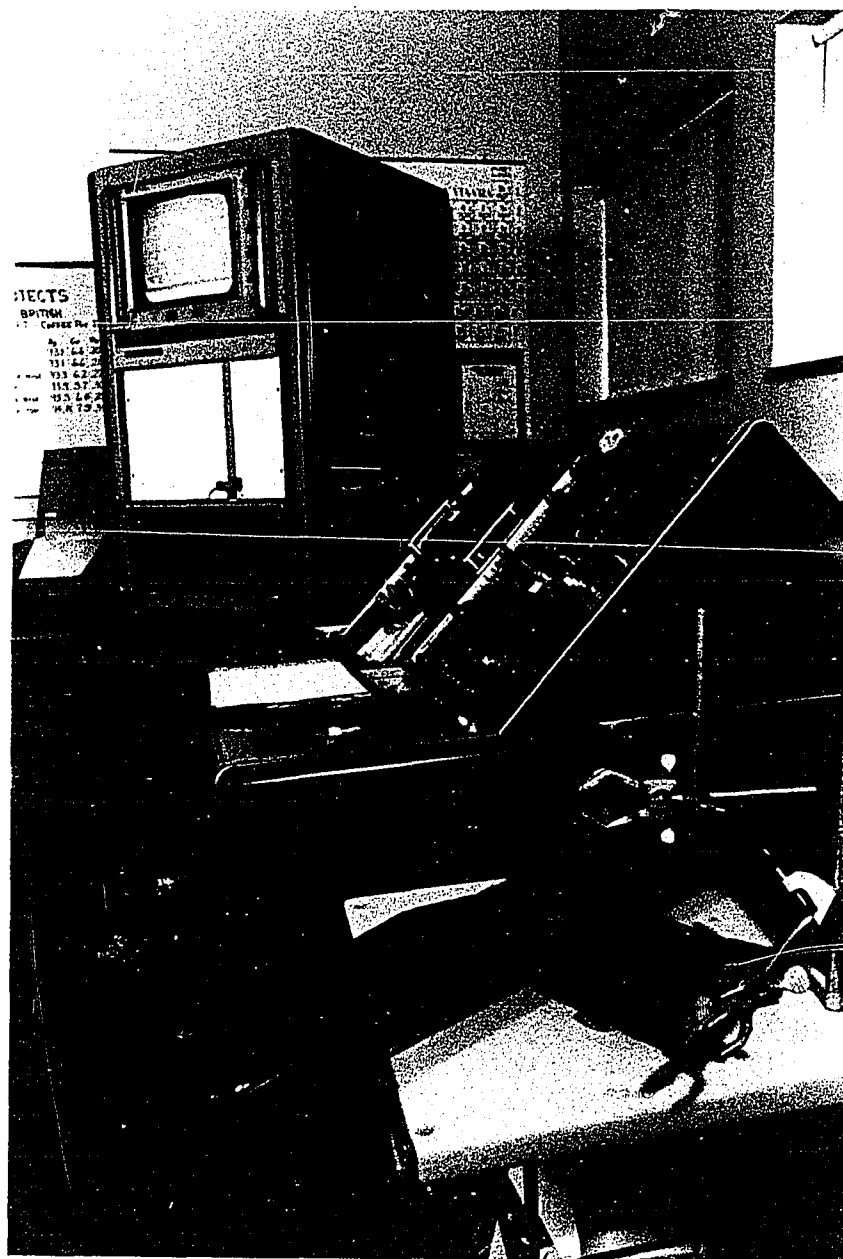


Plate 26

Non-Dispersive X-Ray Fluorescence Spectrometer, Analytical Laboratory, Winterthur Museum. Green glass electrical tube being analyzed, courtesy of The Library Company of Philadelphia.

be measured and the proper elements associated with them. A simple computer program is required to translate the data and perform the necessary correlations. In Plate 26 an electrical tube attributed to Wistarburg is being tested on the Kevex. The radioactive source is located immediately beneath a small part of the tube, while the computer and display screen can be seen to the left.

Although the applications of the Kevex to museum problems are just beginning to be explored, there seems little doubt that it will provide significant data which will assist the identification and authentication processes. It is presumed that an individual glassmaker might have relied upon only a few sources for his raw materials. The elements which could distinguish one sand source, for example, from another are not the major components such as silica, but those elements which occur in very minute amounts--the trace elements. Even with constant sources, however, the specific compositions of melts could vary considerably. The association of a particular factory with a characteristic composition is thus a goal of the analysis.

A second application of the Kevex is in the exposure of fakes, again the result of the machine's sensitivity to the trace elements. Certain elements were unknown in the eighteenth century, or, if known, the technological level was such that they could not be separated from other elements. Gold, for example, is

generally found with silver. The eighteenth-century artisan had no means by which he could extract all of this valuable substance from the silver ore. By the late nineteenth century, however, the extraction processes were improved so silverware from that period on will lack the trace element of gold. It is obvious that an alleged eighteenth-century piece of silver which contains no gold should be reconsidered and perhaps relegated to a study collection. Modern glass can similarly be detected by the relatively lower concentration of impurities. Consideration of certain manufacturing or extraction processes may explain specific variation in levels which, in turn, supplies convenient date limits for glass objects.

Only two analytical projects have been attempted on the Kevex involving glass. In 1971 the documented pieces of Amelung glass at Winterthur were analyzed by Victor Hansen; from that limited test no obviously uniform composition emerged. The other test concentrated on distinguishing a genuine body of blown three-mold glass of the early nineteenth century from a suspect group. The tests confirmed curatorial suspicions as the modern pieces displayed consistently lower levels of some impurities which could only be accounted for by technological innovations in processing.

Wistarburg glass was selected for the third glass test for several reasons. First, Winterthur had obtained a number of

fragments from the site which could act as a control group. Secondly, the research conducted for this thesis uncovered considerable documentary information about the factory, the materials used, and the types of glass made; similar data has been gathered only for a few other glasshouses. Thirdly, there is such difficulty in visually isolating Wistar glass from the mass of "South Jersey-type" glass that if a characteristic composition for Wistarburg products were proved the curatorial process would be simplified.

The analysis of Wistar glass was directed by Dr. George Reilly of the Winterthur staff. He was able to test not only the fragments from the site but also a number of objects of possible Wistar origin. This was achieved only through the kindness of Wistar descendants, collectors, and museum personnel who were willing to bring their glass to the laboratory.

The project is not yet completed, for little consistency of composition has yet been discovered, suggesting the need for additional data primarily from the site fragments. Even then, the significance of the results will only be realized when glass from many countries, time periods, and factories can be tested and the data used for comparison. The Wistar data if nothing else represents an important contribution to the accumulation of such information.

One may rightfully inquire why a glassworks which operated forty years should have retained the same formulas or sources for materials throughout the entire period. It needn't have, of course, and this may explain the very wide range of results. Also, the use of cullet as a flux in the batch would radically alter the composition. But it is known that glassmakers followed formulas for their various glass batches and that apprentices would perpetuate the ideas of their masters.

Some of the results of the major pieces of possible Wistar glass tested are summarized in the following tables.

	K ₂ O%	CaO%	K/Ca	Ti%	Ba%	Ba/Ca
Electrical tube (Library Co.)	4.84	23.6	.24	.12	1.9	.11
Blue Candlestick (Plate 14)	8.11	4.6	2.04	Trace	.02	.006
Colorless candlestick (Winterthur, 57.90.3)	10.78	6.1	2.06	Trace	.03	.007
Engraved tumbler (Plate 21)	3.61	4.6	.91	.04	.37	.11
Range for groups:						
Fragments from site (15)	.42-	1.6-	.06-	.03-	.2-	.03-
	5.52	27.5	.95	.23	2.5	.82
Colorless sugar bowls and lids (Winterthur 59.30;59.3028)	8.06-	4.53-	1.96-	.01-	.07-	.02-
	12.4	7.36	2.10	.02	.11	
Green glass: animal bottle (Plate 12); Franklin site mug (Plate 20); Newark sugar bowl and lid (Plate 15); Winterthur sugar bowl and lid (Plate 16).	1.70-	14.1-	.12-	.10-	.9-	.06-
	7.11	1.25	.58	.16	1.75	.21

Trace elements, measured in parts per million

	Cr	Mn	Fe	Cu	Zn	Rb	Sr	Zr
Electrical tube	0	1344	1653	0	46	47	1541	307
Blue candlestick	0	410	505	116	89	78	0	32
Colorless candlestick	0	582	517	166	183	112	39	37
Engraved tumbler	0	604	458	0	0	19	299	182
Range for:								
Fragments	0- 172	485- 1509	996- 6483	0- 57	0- 152	12- 89	120- 2170	152- 363
Colorless sugar bowls and lids	175- 606	558- 916	392- 577	43- 157	70- 94	141- 170	20- 46	21- 40
Green glass	0	531- 1516	768- 2636	0- 13	0- 40	16- 57	598- 2601	194- 592

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