

Professor in Charge of Thesis

Chairman, Department of Ecology

Chairman, Department of History
 1010 14th St. N.E.
 Washington, D.C. 20002

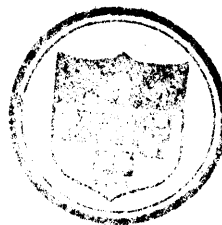
Dean of School of Arts and Science

THE BRANDYWINE WELLS, School of Graduate Studies

1742-1815

by

Peter Corbett Welsh



4
DPPF
WCPN
2014W

A thesis submitted to the Faculty of the University of Delaware in partial fulfillment of the requirements for the degree of Master of Arts.

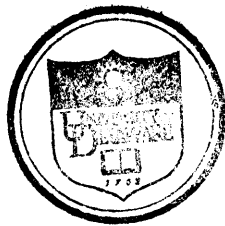
June, 1956

115420

THE BRANNING MILLS.

1782-1812

27



Peter Corbett Welsh

F
9999
1956
.W463

A thesis submitted to the Faculty of the University of
Delaware in partial fulfillment of the requirements for the
degree of Master of Arts.

June, 1956

~~3780~~

~~W46256~~

- (1) Approved Mr. A. Munroe
Professor in Charge of Thesis
- (2) Approved Mr. A. Munroe
Chairman, Department of History
- (3) Approved James C. Kakavas
Dean of School of Arts and Science
- (4) Approved Carl Lee
Dean of School of Graduate Studies

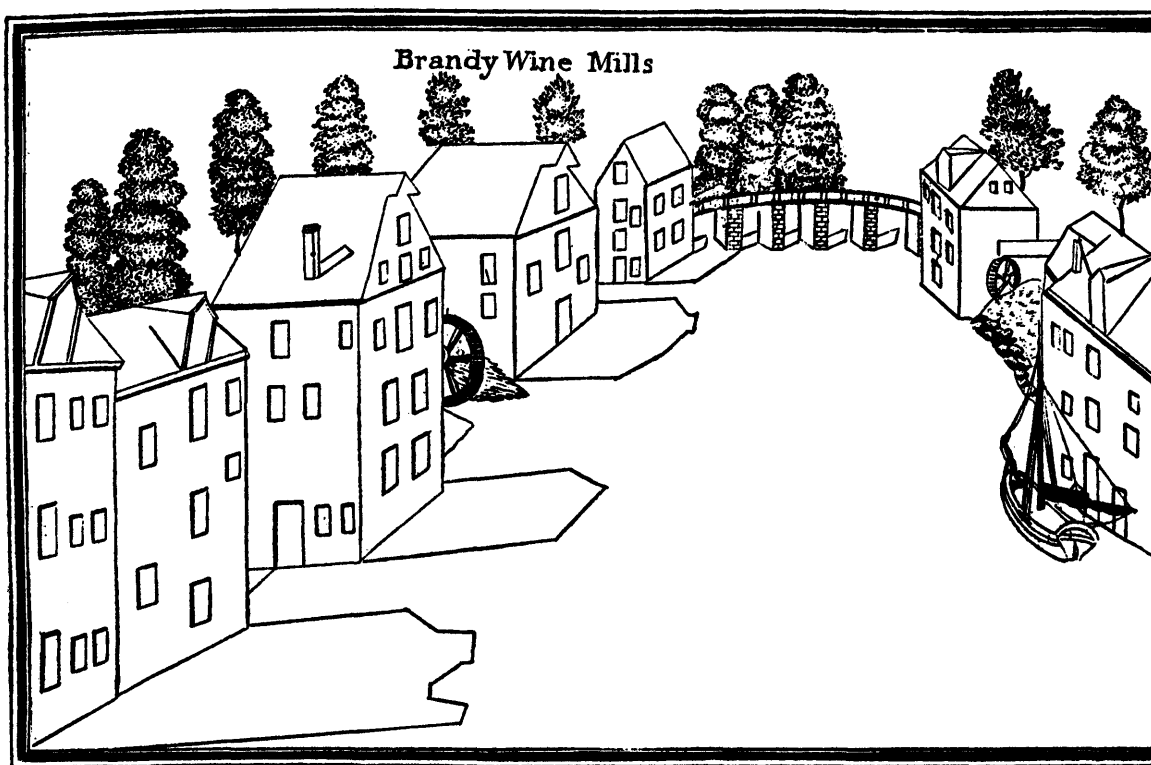
...knowledge has taught us that manufactures are
now as necessary to our independence as to our
comfort. ... Thomas Jefferson, January 1, 1816.

...on the Grandywine in Solvay. ... gunpowder
and flour mills. The latter are vastly superior
to any I ever saw in England. ... James Chandler,
Summary View of America, during a Journey in the
United States (London, 1820), 432.

186020

...experience has taught me that manufactures are now as necessary to our independence as to our comfort.... [Thomas Jefferson, January 9, 1816.]

...on the Brandywine in Delaware...are gunpowder and flour mills. The latter are vastly superior to any I ever saw in England.... [Isaac Chandler, Summary View of America...During a Journey in the United States (London, 1824), 432.]



The Brandywine Mills, c. 1804

PREFACE

The preparation of this thesis was made possible by a fellowship granted by the Eleutherian Mills-Hagley Foundation and the University of Delaware. Primarily, this research paper is intended as a survey of the Brandywine Mills, Delaware's first great industry, through the first seventy-five years of their existence. As the great mills at tidewater on Brandywine Creek marked an adventure in the manufacture of merchant flour, so does this paper denote an adventure. Its completion represents the first study submitted as a consequence of a program designed to depict, in relation to Colony, State and Nation, the magnitude and diversification of Brandywine industry. The termination of this initial adventure would never have been realized without the guidance and advice of Professor John A. Munroe, the interest of Professor H. Clay Reed, and the encouragement of Dr. Walter J. Heacock and his staff.

Peter C. Welsh

TABLE OF CONTENTS

PREFACE	vi
SUMMARY	vii
INTRODUCTION	1
Chapter I. THE RISE OF A MILLING CENTER, 1742-1775	6
Chapter II. WAR AND THE BRANDYWINE MILLS, 1775-1783	17
Chapter III. CONTEMPORARIES, FOREIGN AND DOMESTIC VIEW THE MILLS, 1783-1815	25
Chapter IV. SOME CHARACTERISTICS OF THE MERCHANT MILLS AT BRANDYWINE	38
Chapter V. THE MANUFACTURE OF FLOUR -- BEFORE AND AFTER OLIVER EVANS	44
Chapter VI. OLIVER EVANS AND THE BRANDYWINE MILLS	52
Chapter VII. MILL LABOR AT BRANDYWINE	61
Chapter VIII. MILLERS, MERCHANTS AND MARKETS	75
CONCLUSION	89
APPENDIX	91
FOOTNOTES TO CHAPTERS	98
ESSAY ON SOURCES AND BIBLIOGRAPHY	136

SUMMARY

In 1740, Oliver Canby moved from Bucks County, Pennsylvania, to the newly chartered town of Wilmington in Delaware. Oliver Canby, like many others who came to Wilmington, was a Quaker and as a member of the Society of Friends he had acquired early in life a useful trade or craft. Canby was a millwright by profession and in less than fifteen years after coming to Wilmington he had gained, besides several promising mill seats, the control of important water rights on the Brandywine. During this period (1742-1755) Canby built the first mill of size or consequence on Brandywine Creek. The Canby mill began the history of the merchant flour industry in this area known as the Brandywine Mills.

The initial work of Oliver Canby was followed by that of Thomas Shipley who, in less than ten years after Canby's death (1755), transformed the flour mills on the lower Brandywine from custom mills to merchant enterprises. This was accomplished by building large mills with overshot wheels below the last falls of the stream. These mills were built on the south bank of the creek where, for the first time, they could begin to make full use of the water power so readily available. Even more important than power was the fact that these new mills were at tidewater; therefore they were convenient to ocean navigation by way of the Christina and Delaware Rivers. Similar mills were built on the north side of the stream in the 1770's. The development of this area was mainly due to the resourcefulness of

Joseph Tatnall who is correctly thought of as Delaware's first great industrialist.

Prior to the Revolution the energy of three men -- Oliver Canby, Thomas Shipley and Joseph Tatnall -- had given impetus to the building of eight tidewater mills on the Brandywine. There were four mills on each side of the stream in this period and they ground the grist brought from the rich wheat fields of Delaware, Maryland, Pennsylvania and New Jersey. These mills were located in the heart of America's first extensive wheat belt and were readily accessible to the wheat growers of the middle colonies via river, road and ocean. The Brandywine millers, during the Revolution, the Confederation and the early Republic, expanded the business that had been founded in the colonial period. After the Revolution these mills produced flour for domestic and foreign consumption and provided a stimulus for Wilmington's prosperous economic and commercial life.

The Brandywine Mills between 1770 and 1815 increased in number from eight to fourteen merchant mills, all tightly clustered about the tidal basin of Brandywine Creek. It was during this period that Oliver Evans introduced the idea of automation to flour mill machinery; and subsequently the mills at Brandywine were mechanized. These mills, despite mechanization, provided work for hundreds of individuals including millers, millwrights, coopers, blacksmiths and shallopmen. By the 1790's, the mills at Brandywine annually ground 300,000 to 500,000 bushels of wheat. Every year local merchants shipped thousands of barrels of Brandywine flour to the four corners of the globe and the

Quaker millers reaped a return of a half million dollars in profits from their mill operations. The Brandywine Mills were, in every sense, a large scale enterprise and their history is the story of the industry that preceded du Pont as the industrial giant on Brandywine Creek. This story "fully written out...would afford a complete picture of the rise of the milling interest in the United States."

INTRODUCTION

THE BRANDYWINE MILLS IN PERSPECTIVE

The Brandywine Mills...their story fully written out, giving the details of their development, from the time of their establishment, long before the Revolution, to the present, would afford a complete picture of the rise of the milling interest in the United States.¹

This opinion was rendered almost seventy years ago and it remains a valid appraisal. Why make the Brandywine Mills representative of the development of an industry? They were not the first mills in colonial America nor did they persist until the present as giants grown from small beginnings. Early mills in Pennsylvania such as one at Germantown built in 1683, or Penn's mill at Chester erected in 1695, or "the Governor's mill" at Philadelphia built some five years later might seem more logical points of departure to describe an industry that, in the colonial period, made the middle provinces known as the "bread colonies."² However, the Brandywine Mills located at the tidewater of Brandywine Creek may be chosen as representative of an industry's development because, from the first, they transcended the position of merely local or custom mills and operated as merchant mills. In this capacity they "supply ed the bulk of exports to the West Indies and other places,"³ in direct opposition to the country mills that served only a small community. Early mills, while interesting, were numerous, small and scattered. Millers, to overcome this parochial character of the early mills, had to seek locations where

transportation, raw materials, and a ready source of power were available to facilitate their operations.⁴

In the last half of the eighteenth century mill sites were developed on the tidewater of Brandywine Creek. These mill seats were situated below the falls near the Borough of Wilmington and possessed all the prerequisites necessary for the rise of a milling center. These essentials were power and waterways. The former turned massive wheels and the latter routed grain from the wheat producing areas to the mills and channeled the flour to market. The physical and geographic features of river and farm, and their proximity, remain obvious even today. The element of power, however, is a bit obscured. Few realize that when the Brandywine Mills were first built the average flow in the creek was some "600,000 tons of water every twenty-four hours." Or that in the first four or five miles above the tidewater there was over 120 feet of fall, and that in twenty-five miles the Brandywine fell 21½ feet as it descended toward Wilmington and the Christina. All this meant that mills properly placed, below the falls and on the tide, had for the harnessing a power source equal to any in America in potentiality and situation.⁵

The Brandywine Mills, from their inception in 1742 until 1800, were rivaled as a milling center only by a concentration of flour mills on the Wissahickon -- a creek flowing into the Schuylkill within the limits of Philadelphia. Robert Proud, writing during the Revolutionary years, contended that,

[Brandywine]... creek and that of Wissahickon... a little above Philadelphia, are noted for the best, and most numerous grist mills, either in this province, or any other

part of British America, within the same extent of country; and which, perhaps, are not inferior in quality to any in the world.⁶

In the 1790's a French traveler saw and described the twenty-five, or more, mills "worked by a rivulet called Wissahiccon,...." Three of these mills were owned by one man and ground 40,000 to 50,000 bushels of wheat a year.⁷

* In Pennsylvania the demand for flour in the Philadelphia market served to stimulate the growth of other mill communities. Lancaster, Middletown on the Susquehanna, and Easton were such centers. Tench Cox, shortly after the Revolution, described the increasing industrial development around Lancaster. In a radius "within ten miles" of the town he found no less than "eighteen grain mills...."⁸ At Middletown, besides merchant mills, there were granaries in which 160,000 to 180,000 bushels of wheat were deposited annually. By 1788, "in these mills they [had]...multiplied the machinery, to spare hand labour in all the operations;..." and a German mill owner named Frey was grinding 30,000 bushels of wheat a year.⁹ "On the conflux of the rivers Lehigh and Delaware" was located another large Pennsylvania mill center. It was here that Easton was situated, and from "eleven good mills, [built] upon the same construction as those of Brandywine" went 35,000 barrels of flour annually to Philadelphia.¹⁰

Outside of the immediate area of Pennsylvania the Brandywine Mills had few centers of competition in the eighteenth century. In New York there were numerous mills but they were mostly small "country" establishments. The merchant mill, managed on a large scale, did exist, but milling centers such as those around Philadelphia and in

Wilmington were not to be found.¹¹ It is with the dawn of a new century that real competition began for pre-eminence in the milling industry.

The development of merchant mills and marketing centers, from 1790-1860, at Baltimore and at Richmond soon considerably qualified Proud's appraisal of the Brandywine and Wissahickon mills. As the eighteenth century ended the milling centers of the Ellicotts at Ellicott City, west of Baltimore and the Callego and Maxall mills at the falls of the James River were just commencing extensive activities. These mills, plus mills in western New York State, gained in importance as the wheat belt extended farther west and as the Piedmont and back country areas became more heavily populated. New York, Baltimore and Richmond replaced Philadelphia as the chief marketing center and flour port in the United States, and simultaneously canalization made the natural transportation facilities of the Brandywine and the Wissahickon less important than they were originally. The renown of the flour mills on the Brandywine diminished correspondingly as the hub of the flour merchants' world shifted from Philadelphia to New York and the West. Charles Kuhlmann pointed this out when he wrote that,

The revolution in methods of transportation, together with the growth and westward extension of population during the period 1790-1860 brought great changes in the milling industry. Larger markets brought about a concentration of milling in certain favored sections and cities: Baltimore and Richmond at the fall line, Rochester and Oswego in western New York, and St. Louis in the Middle West.... Hence each step in the westward movement of the wheat belt marked the rise of a new milling center.¹²

Midway in the eighteenth century a mill center arose on the tidewater of Brandywine Creek. On this stream with all its natural endowments a combination of power, facility of transportation, human ingenuity, and mechanization all served to reflect the reason why the Quaker milling community at Brandywine and its merchant mills mirrored the rise of an entire industry. The following pages will attempt to tell the story, from the beginning, of these tide-water mills that became known as the Brandywine Mills. By stressing certain aspects during this period it is hoped that some insight may be given as to why, in addition to "well constructed mills on Red Clay, White Clay and other creeks in the State, those on the Brandywine, were the most celebrated flouring establishments..." not only in Delaware, but in the United States.¹³

CHAPTER I

THE RISE OF A MILLING CENTER, 1742-1775

At Wilmington there has always been a strong manufacturing interest, beginning with the famous colonial flour mills at the falls of the Brandywine....¹

The middle colonies of British North America became an important region soon after their establishment. Their value was chiefly that of a food-producing and food-exporting area. The basis for this value was to be found in the farms and wheat fields of Pennsylvania, Delaware and New Jersey. It was this agricultural industry that, in part, explains why Philadelphia developed as the primary market center of this food raising region. It was mainly from the Port of Philadelphia that the home-grown provisions of the middle provinces were exported overseas. This export trade strongly influenced the rise of a great merchant center and, conversely, the abundance of farms and farm produce stimulated the business of the merchant-trader. While farm and port were complementing one another in the agrarian economy of early America an industrial interest peculiar and necessary to this type of society was simultaneously given impetus. This interest was flour milling. To help satisfy the great demand in Philadelphia for export items in the form of flour, corn meal and breadstuffs, "there early developed a concentration of milling on the Brandywine... with large mills and specialized machinery, which distinguished this region from all others."²

In industry as in other forms of enterprise there are beginnings. The origin of the large mills and specialized machinery in the flour manufactories along the Brandywine dates from the colonial period, well before the Revolution and shortly after Thomas Willing staked out the perimeter of his town. Many years prior to this, there had been mills functioning on or near the Brandywine. On Harvey's Run below Chadd's Ford and on the west bank of Beaver Creek, both tributaries of the Brandywine, were located early Swedish grist mills. These mills were primitive, with short races and undershot mill wheels, geared to operate the grindstones of small mills. The fact that they were on tributary streams, above the falls and away from the tidewater, was an indication that they were not equipped nor designed to carry on extensive milling operations. On the contrary, they were country mills, or custom mills, built specifically to grind grain for local needs. These are in marked contrast to the merchant mills of a later date. These later mills utilized the grain supplies of many areas, ground for the export trade and depended on merchant-traders or middlemen to sell their product.³

↙ Sometime before 1687, on the lower Brandywine, the sons of Dr. Tyman Stedham built a barley mill. This was near Stedham's Ford, above the falls and on the south side of the creek. From tidewater to Rattlesnake Run, the creek frontage was owned by Stedham. On the north side opposite Stedham's the creek frontage was controlled by Tobias Vandever. This Stedham mill was the Old Barley Mill. It was believed an undershot mill because the water apparently was directed upon the lowest part of the wheel.⁴

In 1727, an association headed by Samuel Kirk purchased this Stedham mill site, and, in addition, built another mill of greater size close by the Old Barley Mill. It was possibly a dam built to implement this new mill that caused the shad to stop running and sent the Indians to the Delaware Assembly in hopes of having the water course reopened.

By 1729, there were at least two grist mills on the south side of the creek. These were the Stedham barley mill and the mill erected by Samuel Kirk.⁵ A deed dated May 1, 1729, transferred the Kirk property to John Richardson who subsequently conveyed it back to Kirk.⁶ In this association headed by Kirk, Oliver Canby invested his money. After the death of his father in 1743, Canby purchased the controlling interest of the Kirk company. He gained, through this transaction, ownership of the mills and all the land that belonged to the old Stedham property. This land extended down the south side of the creek to his own river front holdings below the falls, holdings which the Canbys had purchased in 1741 soon after they arrived in Wilmington.⁷

By 1743 Oliver Canby had secured one of the great water power rights in British North America on the edge of a town that was then but "an Infant place." There were scarcely more than "one hundred and fifty families..." residing in the town in May of 1744, and merchants and mechanics were predominant among them. In addition to the businesses carried on by the merchants and mechanics there were "several Ships and other small Vessels in the Stocks a Building and

several other Branches of Workmanship and Commerce seem'd to go on Briskly:...." Not the least among these "other Branches" was the business of flour milling and Oliver Canby was in a position to develop it beyond any scope previously known in Wilmington or on the Brandywine.⁸

Before the power potentiality of Oliver's purchase could be realized, a long race would have to be built, big mills constructed and massive overshot wheels installed. Just above the property Canby now owned outright the Brandywine completes a fall of one hundred feet in a distance of little over half a mile. To all this potential force Canby had the first rights on the south side. In 1742, before he obtained the water rights to all this power he had built a mill of his own.⁹ In addition to the Stedham mill and the Kirk mill further upstream, this gave Canby control of three grinding sites. The mill Oliver built on his own property was near where the King's Road (leading from Philadelphia south to Baltimore) crossed the Brandywine. At this well-chosen site above the falls grain was easily brought to mill and flour taken away. It was here the Brandywine Mills were founded.¹⁰ Oliver Canby's mill was the first of size or consequence built in this locale on a creek that was in a short time to become "famous all over America for its Merchant Mills...."¹¹

Oliver Canby died in 1754. After his death his mill and mill property was divided equally between his brother-in-law, Thomas Shipley, and Canby's heirs, consisting of his wife Elizabeth and two sons, William and Samuel.¹² In the year of Oliver's death Wilmington

was described as "a regular well built town; but not trade enough here to draw together a sufficient number of people to compleat it to its plan."¹³ A little over a decade had passed since Oliver Canby had first come to Wilmington and the fruition of the industry he founded on the banks of the Brandywine was still another decade or more in the future. Thomas Shipley, sometime between 1755 and 1760, purchased additional land along the south side of the creek in an area demarked by the termination of French and Market Streets.¹⁴ In this interim of time Shipley continued the operation of Canby's mill above the falls and in 1760, or shortly before, made plans to build a large mill on the land he had recently acquired. This mill was to be below the falls and on the tidewater. It was this mill that became known as the "Old Shipley Mill."¹⁵

In August of 1760, William Moore and Daniel Byrne, according to law, addressed themselves to two Justices of the peace of New Castle County and requested that they execute the preliminary survey and agreements necessary to implement the construction of a long mill race on the south bank of the creek. Moore, who had a mill in a cove above the Old Barley Mill and King's Road, had already constructed a mill dam.¹⁶ At this point the long race was to begin. It was to continue from Moore's dam to the tidewater. Out of this race terminating at the tidewater, Daniel Byrne and William Moore were to have enough water to turn a proposed overshot mill to be built near the old ferrying place and French Street. William Marshall and Richard Robinson were to have the same right for a mill that they were in the process

of building. Thomas Shipley was to have the same privilege for Canby's old mill and for a mill with a fourteen-foot overshot wheel then under construction. The four overshot sites at tidewater were to have equal water rights from the long race. The Old Barley Mill farther upstream was, as were other breast wheel mills under this new agreement, to stand still except when there was sufficient water to turn the four proposed overshot wheels.¹⁷ In light of these proposals the Old Barley Mill and Kirk's initial grist mill were made obsolete by the harnessing of the Brandywine through the long race and the overshot wheel. Moore's dam, at the head of the last rapids, and the long race provided force by push and by weight for the miller at tidewater.¹⁸ By December of 1762, the long race was "already dug" and four mills, two of which [were] nearly finished..." stood on the south, or Wilmington side, of the stream.¹⁹ These four mills were the overshot establishments proposed in the survey and race agreements of 1760. It was the completion of these four mills on the south side plus the development of the power potential of the north shore that marked "the commencement of the extensive milling operations for which that place has been so celebrated."²⁰

At the same time as the new mills were being built, another new edifice was in embryo, namely, Brandywine Bridge. In August of 1760, David Bush and James McMahan, Justices of New Castle County, ruled that before any of the new mills could begin to grind there would have to be built "a very good Bridge over the Race at Shipleys and Canbys old mill." The bridge was to be "40 feet wide" and was to be finished

promptly, "So that the Old Mill may be discommoded as little as possible."²¹ In 1764, just as the long race and new mills were being completed, the King's Road was ordered built, and on March 31, 1764, "An Act for the better regulation of the roads in New-Castle county" was passed by the General Assembly. This bill provided for new roads but permitted the old thoroughfares and bridges to be kept at public expense until the new highways were opened. One of these old thoroughfares was the Chester road, which crossed the Brandywine at Vandever's Toll Bridge below the new mills. This bridge was to be kept in use until "a new bridge erected at the public expense higher up the Brandywine [at Shipley's and Canby's old mill] on the public road" was constructed. Vandever's Bridge on completion of the new one became obsolete and was destroyed. The new Brandywine Bridge was completed in 1765 soon after the new mills on the south bank. The destruction of the Vandever Bridge (1767) below them and the new road crossing immediately above made the Brandywine Mills readily accessible by road and water. The position of this new bridge and the new road was of paramount importance to the infant industry at Brandywine. Had the bridge been below the mills and the tidal basin inaccessible to river traffic, flour milling in Wilmington would have been dealt a death blow. The location of the road and the bridge, along with early laws to encourage the building of good mills, were early indications that the colonial government of Delaware was anxious to promote private enterprise when essential to the public welfare.²²

The operation of the mills on the south bank in the days prior to the building of the long race and the new bridge was far from perfect. In the early years at Brandywine Mills, meal and flour ground on the Wilmington (south) side of the stream had to be transported in boats across the creek to a bolting mill. It was there that the sifting of the coarse flour took place.²³ Had one followed the flour across the Brandywine in the early 1760's the impression would have been that it was an area unfit for milling activities. This impression was given by the rocky bank and steep slope that rose sharply behind the stream. Years earlier, in 1682, Jacob Vandever had been granted water rights for a mill on the north side. In the 1760's a mill near this site was operated by Tobias Vandever. Apparently this was the bolting mill used by the early south side mills.²⁴

In March of 1761, the Marshalls, James and William, advertised their mill on the south bank for sale.²⁵ It was after this that they turned to the task of constructing, at the tidewater on the Brandywine Village side of the creek, a mill and a long race to match that of the south bank. By 1769 or 1770, this had proved too great an undertaking for the Marshalls. After building a mill they sold it and their privileges to Joseph Tatnall. Tatnall previously had an interest in the south side activities. He relinquished this and pushed the projected long race to completion through "slope and cliff." With this task completed Tatnall soon became the more prominent of all the Brandywine millers.²⁶

Scharf, in his History of Delaware, stated there were eight mills on the tidewater in 1764. Four were located on each side of the stream. Nothing was found to substantiate this date and number. By 1771 or 1772, a community of eight mills seemed more feasible than in 1764, since the long race on the north bank was not completed until 1770 or 1771.²⁷

Soon after Tatnall completed his work on the north side of the creek the General Assembly passed legislation designed for the better regulation of the roads in New Castle County. On June 13, 1772, an act was passed directed at "divers mills... near... roads and highways" whose "water-wheels... when going round are apt to fright and scare the horses of travellers and others passing and repassing..." thus causing "many dangerous accidents...to be occasioned:...." Located on one of the most traveled of colonial highways it may be supposed that the Brandywine Mills were a primary target for this piece of legislation. Four months from the date of publication, or immediately in the case of newly erected mills, mill owners were to "set up and erect between such water-wheel and road...a shed, cover or blind to hide and conceal..." these whirring monsters from the view of passers-by. The miller who refused to comply was subject to a "penalty of Ten Pounds for every such neglect or refusal." This legislation is indicative of the expansion of milling interests in Delaware and specifically on Brandywine Creek. Mill wheels had been turning near public roads and bridges for many years; however, Delaware found them a nuisance and a threat to public safety only after the

mills at Brandywine Bridge and the King's Highway had expanded into a milling center in the years between 1764 and 1772.²⁸

The years after 1772 would best mark a beginning of industrial milling operations on both banks in the tidewater basin. After this date there was little custom business done and the merchant mills at Brandywine were firmly established. At this time there were four mills on the north bank. These were the Vandever mill, the Tatnall mill, the Marshalls' mill (now owned by Tatnall) and lastly, a mill owned in concert by Tatnall, Joshua Gilpin, George Evans and William Canby.²⁹ On the south bank there was Thomas Shipley's old mill below the bridge plus two others built by him. A fourth mill on the Wilmington side was being operated by the Hollingsworths. Apparently they had purchased and were occupying the mill originally built by the Marshalls.³⁰ These mills on the north and south side of the creek were situated below the bridge and were on the tidewater.*

In general, mill properties, as sailing vessels in the eighteenth century, were either owned by one individual, leased for periods of time to different people, or were operated as partnerships or joint ventures. This generalization applied to the Brandywine Mills. In the pre-Revolutionary years and after, the activities of this milling center were controlled first by Oliver Canby and then by Thomas Shipley and Joseph Tatnall. In association with them were their relatives, the Leas, Pooles, Canbys, Prices and Mortons. Additional members of

* See Appendix, Plates I and II.

this mill community were the Hollingsworths, George Evans, John Welsh and John Buckley.³¹ Intimate family and religious (Quaker) ties made this collection of merchant mills at the tidewater "the milling oligarchy...of the Brandywine."³² From this time forward, through the next thirty years, new mills were built until some fourteen establishments were turning grain into superfine flour. Situated on a source of tremendous power and easily accessible to river and ocean transportation, the Brandywine Mills, by "wagon or sail,"³³ could look to the wheat fields of lower Delaware, the Eastern Shore of Maryland, and the fertile fields of neighboring Pennsylvania. Their success in utilizing these natural endowments may be followed in the years of the Revolution, the Confederation and early Republic.

CHAPTER II

WAR AND THE BRANDYWINE MILLS, 1775-1783

Although large numbers of patriots rendered military service of one sort or another in the War of Independence, only a small fraction was in the field at any one time. Some areas...never felt the tread of British troops...and other regions,...experienced little fighting. Civilian life went on, even in the immediate vicinity of the armies. The war was not total. Nevertheless, no one was unaffected.¹

The War of the Revolution, though not a total war as known today, did involve American industry. In any period of history an essential in sustaining a force in the field has been its food supply. The grinding potential of the flour mills during the Revolution early became a priority consideration fully as important in bolstering the colonial cause as the production of gunpowder. The flour mills in the middle colonies were a logistical necessity to Washington and his army. In the mills at Brandywine the great wheels turned continuously in support of the Continental Army.

The war soon evidenced itself to the Quaker millers. In May, 1776, two companies of "the Delaware Blues" arrived in Wilmington; the Brandywine millers, however, made no mention in their business papers of this colorful contingent.² Although they failed to note the arrival of the vanguard of the Delaware Regiment, they could not, despite their pacifism, avoid taking cognizance of a naval action off the mouth of the Christina in the Delaware River. In a daybook ledger, interspersed with business notations, an entry of the eighth of May

recorded that, "This Day the Roe Buck, and Liverpoole Men of War and the 13 pennsylvania Gundeloes had an Ingagement in the Delaware River Opposite Wilmington which Lasted four Hours...." and on the ninth, "the Above Vessels, and five Gundeloes, with two Alarm boats Ingaged for four Hours and a half when the Gundeloes Drove the Men of war Seven Miles and Done them Considerable Damage with the Loss of twelve men Kill'd on the Spot...."³

In the summer of 1777, Howe and his British army landed at the Head of Elk in Maryland. This was less than thirty miles from Wilmington and the Brandywine. On August 23, General Washington, to meet the threat of this landing, moved out of his camp on the Moshaminy. He moved through Germantown and Philadelphia and into Darby. On the twenty-sixth he encamped his main force on Naaman's Creek and proceeded into Wilmington with his staff and a troop of horse. Here, "in a house on Quaker Hill" he made his headquarters.⁴

During his stay in Wilmington, Washington met the "Quaker Patriot" Joseph Tatnall. True to his tenets Tatnall reputedly told Washington, "I cannot fight for thee, but I can and will feed thee."⁵ Tatnall made good his word and through Robert Morris, the financier of the Revolution, he and his associates supplied quantities of Brandywine flour and meal for consumption by Continental troops.⁶ The price of flour and of wheat rose steadily throughout the war. Inflation and Continental paper soon pushed prices in the milling industry to all time heights, with wheat bringing as much as \$24 a bushel.⁷ In January of 1781, Robert Morris paid \$24,800 for 100 casks of flour and for

"hard money" he received 133 oaks at a cost of £326.15.4.⁸

After Tatnall's promise to "feed thee," Washington met the British at Chad's Ford and fought the Battle of Brandywine. The result of this engagement found "the whole American army...in retreat towards Chester,"⁹ and by the thirteenth of September, 1777, a regiment of Fraser's Highlanders had occupied the sleeping town of Wilmington. Soon after the Highlanders, a battalion of Hessians entered the town, deposited their casualties, confiscated all the flour they could find and departed on the fifteenth to rejoin the main British force, whose own supplies of rum and flour were at a low level.¹⁰

During the course of their occupation the British troops fortified the town. Two things were of prime importance in their defensive perimeter -- the bridge over the Brandywine and the flour mills. This area was garrisoned by two officers and one hundred men, and a redoubt was built to strengthen the position. The British troops were in control of Wilmington and the mills for over a month and it was not until October 15, 1777, that enemy occupation of the town ended.¹¹ In rapid succession, after the defeat at Brandywine and the occupation of Wilmington, had come the fall of Philadelphia, the near victory at Germantown and the preparation for the dreadful winter at Valley Forge.¹²

In the interim, after the British departure from Wilmington and Washington's removal to winter quarters, precautionary measures had to be taken to guard against destructive sorties by Howe operating out of Philadelphia. One obvious precaution was to preserve the large milling

establishments, including Friend Tatnall's, that fed the American army. In so doing Washington could make sure that flour from these mills did not find its way to Philadelphia and Howe's Commissary. By mid-November, 1777, General Washington had effectively curtailed Howe's supplies from the region of Chester and Wilmington and for a time the British were seriously inconvenienced.¹³ As early as August 31, 1777, Washington was instructing his commanders to dismantle mills "which may be liable to fall into...[enemy] hands,..." since "this can be of no injury, or but a temporary one to the proprietors, while it will effectually prevent the Enemy from using the Mills."¹⁴

On October 31, 1777, Brigadier General James Potter was directed to execute "some particular matters," one of which was "to remove the running Stones from the Mills in the Neighbourhood of Chester and Wilmington." Particularly urgent was the task at Brandywine, since "the Enemy are about making a Detachment to Wilmington, probably with an intent to take post there, and secure the use of the Mills."¹⁵ There also was the very real possibility that the British troops might put these mills to the torch as they had several at the Head of Elk some months earlier.¹⁶ Not only was this a troublesome thought to the American commander but it must also have caused some consternation among the mill owners at Brandywine. General Potter, therefore, was "To execute this matter at once..." by sending "a sufficient number of Waggoners for the purpose, ...under good Officers with Sufficient parties... to the Brandywine Mills." Potter was also to dismantle several mills at Chester and Robinson's mill on Naaman's Creek. All the millstones

taken away were to "be marked with Tar and Grease or in some other manner,...that they may be returned and made use of in future."¹⁷

Five days after ordering Potter to dismantle the mills Washington received word that his instructions had not been executed. On November 5, General Potter wrote, "I'm a sorey to Inform your excellency that the Officer I send to the Brandywine Mills has not obey'd my orders Instead of Taking the stone away he has taken the Spinnels, Rines and Ironnals heads.... I am Informed that Taking these Artefacts answers the same end as Removeing the stone, I wait to know your Plesure in this matter."¹⁸

The same day John Laurens drafted General Washington's reply. Potter was told that "the Officer employed in this business should be put under Arrest and tried for disobedience of orders," since the parts he removed from the mills could be easily restored and the mills put to use.¹⁹ Three days after this exchange Potter informed Washington that he had "ordered Carriages to be maid for the waggons to move the stones from the Brandywine Mills and sent off one Hundred men for that purpose."²⁰ It seemed that this time the detail sent to the Brandywine succeeded in dismantling the mills. According to Scharf the millstones were carried off and hidden somewhere in Chester County.²¹

During the rest of November, 1777, Washington was constantly alert to the danger of a British attack on Wilmington. His intelligence reported on one occasion that Cornwallis "with Two thousand Granadiers, and light Infantry," intended to march on Wilmington,²² and on December

19, General William Smallwood was ordered to march his Division "immediately for Wilmington, and take Post there."²³ Smallwood's troops entered Wilmington on the twenty-first and it was the hope of at least one member of the division, a captain of the Delaware Regiment, that they would remain "for this Winter."²⁴ A few days after Smallwood took possession of the town he received authority from General Washington for "setting one of the Mills to work to supply" his troops with "Flour and Horse Feed." In giving his approval Washington cautioned Smallwood to keep the reactivated mill "intirely under your own direction, that no more may be ground than what you and the inhabitants may want."²⁵

The operation of the mills at Brandywine had been seriously curtailed for a period of time beginning with the British occupation of Wilmington after the Battle of Brandywine and continuing until Smallwood's arrival late in December of the same year. Even after this it appears that the work of the mills was closely controlled and that it was not until after the threat to Wilmington had dissipated that Thomas Lea and his associates carted home their millstones from their hiding place in Chester County.²⁶ In August of 1778, one William Smith was paid \$4 for "spindles" and John Welsh received \$30 "for hauling home millstones."²⁷ Thus it seemed, by August of 1778, that the effect of Howe's landing of the previous year at the Head of Elk had run its course. This meant that the business of milling at Brandywine now continued without serious interference.

The British troops evacuated Philadelphia in June of 1778,²⁸ but

in their place the spectre of economic chaos loomed large to distress the cause of freedom. At Brandywine Mills the same spectre cast its shadow. Samuel Canby, in 1779, noted that there was "a Universal dislike to the...Circulating Cash prevail[ing], insomuch as it has been impracticable to get Wheat to our Mills as hithertofores..., since... Current for Merchant Wheat is Twenty pounds [per bushel] at the Landing," and the price of "good flour...at Philadelphia is \$75.0.0 [per barrel]." To Mr. Canby the entire economic scene was one of "General Stagnation in useful branches of Business [such] as...Commerce and Building...."²⁹

In the spring of 1780, "Maryland troops on the way to the southward [were] here in our Mills this day," and Canby heard "an account, that the british possessed themselves of Charlestown."³⁰ And in December, 1781, for his own satisfaction, he made the following remarks: "viz...Since the reduction of the fort held by General Cornwallis at York[town] and Gloucester in Virginia...people...seem'd more dispos'd to expect an Independence might take place as there appears little doing to counterbalance a Matter of Such consequence."³¹

All winter New England, New York, New Jersey and Pennsylvania troops were "going up by this place" either to winter quarters, or to join Washington at Williamsburg.³² One transient, Lieutenant Enos Reeves, a member of the Pennsylvania line, was impressed by the Brandywine and its merchant mills. He wrote that "seven of them...[were] built within 150 yards of each other -- and vessels load and unload at the mills." In addition to the mills, "Wilmington is a fine borough, has a number of regular streets, a Court House, Market house, and con-

tains about 5 or 600 houses...with a fine Academy on the Hill."³³

In 1783, one of the last inconveniences of the war was experienced in Wilmington and on the Brandywine. In January, the Duc de Lausun and his legion "came to this Town for Quarters...consisting of About 300 horse and about the same number of foot." Canby thought these Frenchmen better behaved than any troops yet to appear in Wilmington. Their civility to the inhabitants was outstanding and there was "scarcely an instance of their stealing the smallest thing although their pay...Every five Days...[was only] A quarter dollar." To Miller Canby the only inconvenience was a doctor quartered in his home -- "A Low dutchman...named Joseph Eugene Philip Capelle."³⁴

The Revolution produced high prices and, eventually, chaotic inflation. It created a vast need for meal and flour, provoked military activities in and around Wilmington, and saw Washington introduced to the Quaker millers of the Brandywine. It also produced a situation that made these flour mills military objectives. Through it all the Quaker industrialists of Wilmington and Brandywine proved to be patriots. Their mills helped feed an army, their homes sheltered it and in their hearts they had always been "disposed to expect an Independence." With such a disposition they entered the Confederation years and after them, those of the constitution and the new republic, as leading citizens of the first state.

CHAPTER III

CONTEMPORARIES, FOREIGN AND DOMESTIC, VIEW THE MILLS

1783-1815

April 14, 1796 -- The Brandywine mills, for grinding corn, are very celebrated, and their great neatness and flourishing activity had a very pleasing appearance from the road. Here America already exhibited a spot which might be compared with any similar scene in England.¹

In 1814, the first Directory printed for the Borough of Wilmington and Brandywine Village made the observation that "the remarkable grandeur of the Brandywine can be better viewed than described."² In the years after the Revolution the best view of the creek and of the Brandywine Mills was left by travelers and contemporaries who saw the mills and recorded their impressions.

After the war Dr. Johann Schoepf, while traveling in the Confederation, passed through Delaware. "Near to Wilmington" he noted, "the Brandywine is crossed over a good stone bridge." Looking upstream as he crossed he saw that the banks of the creek were "deep and rocky" and that the "narrow gorge through which the stream flows makes a view particularly pleasing and rough." The stone at the surface of the creek caught Schoepf's eye. It was "a grey, fine grained mixture of quartz and black horn blende" [Brandywine granite]. As he looked downstream from the bridge he was impressed by the "several mills...so conveniently placed...that large shallops can be close to them, and unload and load wheat and flour with great ease." Translating

this into dollars and cents and not just to a pleasing view, Dr. Schoepf stated that "the flour trade has now so increased the value of this profitable situation that an acre of land on the creek fit for a mill-site costs 100 pd/pounds and more Pennsylvania current."³

In the middle of January, 1785, shortly after Schoepf's visit, Elkanah Watson arrived in Wilmington. He found the town, as did most travelers, a very pleasant place, well laid out, with the dwellings extremely well built and seemingly quite new. Watson, however, saved his greatest enthusiasm for a scene on Brandywine Creek, "near this village," where he "stopped to examine the most extensive flouring mills on the continent,...." At the Brandywine mills Watson found a new type of mill machinery in operation: "A new kind...invented by Evans, and calculated to effect, in manufacturing, an immense saving of manual labor."⁴

Another visitor to Wilmington, in 1785, was Robert Hunter, a young London merchant traveling in America. Hunter, as had Watson, found the mills at Brandywine of particular interest. "The river Brandytownwine" recorded Hunter, "is famous for turning fifteen mills." These mills he considered to be "the first in America and perhaps in the world."⁵ The fifteen mills described by Hunter were in reality only nine. Two mills stood above Brandywine Bridge; however these should not be included in Hunter's estimate for presumably he was referring only to those on the tidewater accessible to navigation. Of the nine mills below the bridge it is supposed that at least six were large double mills that turned several pair of stones each and had two water wheels

per building. These double-wheeled structures could easily have been counted as two mills. By 1772, as stated previously, there were eight mills on the tidewater of Brandywine Creek. In September of 1776, Nicholas Cresswell "Passed Brandywine Mills," and saw these eight mills all located within a quarter of a mile of one another.⁶ Between 1776 and 1777, a new mill was built presumably on the south bank of the stream.⁷ This brought the total to nine mills. What then would Hunter have seen as he looked from the bridge toward the Christina? He would have seen six double structures that he counted as twelve mills, in addition to three smaller ones, or a total of fifteen in all to be seen from the stone bridge. Hunter wrote that "these mills belong to eleven people and bring them an immense income" and that "four of them are in the possession of one person." (The double mills were owned or rented in halves -- a person would operate half a mill.) Located in a place that was "truly beautiful and romantic" these mills "were never known to cease working, summer or winter."⁸

If Hunter had been traveling in the winter months perhaps he would have qualified this statement. The cold weather often stopped operations on the Brandywine by freezing races and icing mill wheels. Nor was it unknown that after a severe drought the never failing Brandywine would fail to produce enough water to turn the tidewater mills.⁹

Three years after Robert Hunter had been duly impressed by the immense incomes derived from merchant mills Brissot de Warville enthused about the advantages accruing from the manufacture of flour. "The millers....," in America, wrote Brissot, "are flour-merchants; [and]

mills are a kind of property which ensures a constant income." He noted that the village of Brandywine was famous for its fine mills and found Wilmington, "a handsome town, well-built, and principally inhabited by Quakers." The basis of their commerce was "the exportation of flour...."¹⁰

So immense were these profits and so demanding was this flour trade that they attracted the attention not only of travelers, but also of the residents of New Castle County. The local inhabitants, however, were not praising the situation, they were damning it. Emoluments were so great from merchant milling that the owners of the Brandywine Mills, and others in the county, either refused entirely "to grind grists of grain for...family-consumption....," or else they discouraged customer grinding by rendering poor service. The miller was naturally loathe to interrupt his mass production operation merely to grind an individual's parcel of wheat. Obviously if Mr. X brought his wheat to be ground Mr. X wanted the flour from his wheat and not that from several bushels inferior to his own.¹¹

On February 5, 1785, the General Assembly of Delaware supported the hypothetical Mr. X, and all his real counterparts. On this date "An Act for the regulation of certain water grist-mills in New-Castle county" was passed. By this act the public interest was placed ahead of the milling interest and flour for the general public was deemed as essential as was money to the miller's pocket. The "mills on Brandywine creek below the bridge, on the public road leading from Wilmington to Chester," were ordered to grind for the public. The procedure out-

lined by the Legislature required,

the Justices of the Peace of New-Castle county..., at the Court of General Quarter Sessions of the Peace... [to] fix and determine which day in every week for the year thence next ensuing, the said mills shall appropriate to the grinding and manufacturing wheat...into flour, for the family-consumption of the inhabitants of the said county beginning with the mills commonly called or known by the name of Shipley and Canby's and Marshall's, and...fixing the days of rotation so that two mills on every day on each week may be employed in that service....

Notification of these public or custom days was to be prominently displayed on the door of every mill and "at five of the most public places in Christiana and Brandywine hundreds...."¹²

Any miller found in violation would be subject to a fine of twenty shillings and any miller who, on public grinding days, falsely claimed his mill to be out of order would incur a like penalty. In January of 1790, a supplement to this act was passed since the milling fraternity found it to their advantage to pay the twenty shillings rather than disrupt their operations. Business was so good that the twenty shillings was sacrificed for the greater profits that accrued from merchant milling. It was far better to alienate a local resident than to keep a loaded vessel from missing the tide. In raising the fine "to the sum of Five Pounds" it may be supposed that the legislature forced greater attention to be given to custom business.¹³

In 1789, Dr. James Tilton, that "sour, wry-faced, incorrigible democrat,"¹⁴ never mentioned this neglect of the public interest when he wrote glowingly, in Matthew Carey's American Museum that, "in Delaware the manufacture of flour is supposed to be in the utmost perfection...

within...[any] like space of ground known in the world; and...this... applies equally to the state at large as to the particular district on the Brandywine." Of this particular district on the Brandywine Tilton pointed out that "there are in one view..., ten mills, with not less than twenty pair of stones, capable of grinding two thousand bushels a day."¹⁵ Ten months later, in February, 1790, the Delaware Gazette echoed Tilton's estimate. It reported that "the Brandywine affords perhaps the best situation for mills in the world," and added, "there are now 12 mills (near this Borough) on this stream and it is capable of supporting several more...."¹⁶ Extending Hunter's statement that the mills were never known to stop grinding, winter or summer, Tilton noted "in active or busy times, the mill grinds perpetually day and night."

On April 20, 1791, William Loughton Smith, a Federalist Congressman from Charleston, South Carolina, was traveling from Philadelphia to that city. En route he passed through Wilmington via the bridge at Brandywine where "just before I entered the town I passed by the Brandywine Mills, about thirteen in number.... They are substantially built of stone and, being placed contiguous to each other along the banks of the creek have a handsome appearance."¹⁷ Eight months after Congressman Smith, George Bush, tax collector for the District of Delaware, reported on the state of manufactures "in Wilmington...& its vicinity including the Brandywine Mills." Bush listed the latter as consisting of twelve merchant mills and employing forty-five men.¹⁸ As will be seen below the only discrepancy between Bush's report and Smith's observation was a saw mill.

Several years after Bush had tabulated Wilmington's principal industries, Moreau de St. Mery visited "the most important city in Delaware." He found the location of the town to be splendid, but more superlative than anything else were the mills at Brandywine which were "magnificent and their manner of loading and unloading grain... most ingenious."¹⁹ In 1795, Joseph Scott, in his Gazetteer, declared that this magnificent scene comprised "the most valuable collection of mills in the United States, or...in any other country." The milling center at this date consisted of a total of thirteen mills and "Twelve of them...[were] merchant mills, and one a saw mill."²⁰

Along with the handsome appearance of the mills, William Winterbotham, writing of the United States in 1796, described Brandywine Village to travelers as "a charming prospect...." It was "a small town of forty houses, principally stone and brick, which, together with the mills and vessels loading and unloading beside them...", could all be seen at one time from the bridge. From this vantage point could also be seen "at one view, twelve merchant mills (besides a saw mill) ..., " and these were "called the Brandywine mills...."²¹ In April of 1796, Thomas Twining, a most observant Englishman, saw the mills with the ships alongside of them. He estimated these craft to be "about ten or fifteen tons; but...understood that sloops of a much larger size could mount the stream...." Twining also learned that "These mills... furnish a very considerable part of the best flour consumed in Philadelphia,"²² and Jedidiah Morse, a year later, wrote that "it...[was] frequently the case that a cargo...[was] taken from the mills and delivered at Philadelphia the same day."²³

Isaac Weld was touring North America at approximately the same time as Thomas Twining. He too crossed the Brandywine "about half a mile before you come to Wilmington...." He found it "remarkable for its mills,...[with] no less than thirteen being built almost close to each other upon it." It was Weld's observation that "The water, just above the bridge..., comes tumbling down with [such] great violence over a bed of rocks;...[that] seats, at a very trifling expense, could be made for three times the number of mills already built."²⁴

The eighteenth century was fast coming to a close when a French traveler, the Duke de la Rochefoucault Liancourt, saw and described the operation of the merchant mills at Brandywine. He made some interesting comments concerning the number and location of the mills. Liancourt was conducted on a tour of Joseph Tatnall's mill on the north side of the stream. His guide for this inspection was Thomas Lea (Tatnall's son-in-law), whom the Duke described as "a quaker, about thirty..., [and] a handsome, cheerful, active man." He wrote, "their mill is not employed for the public but solely for their own private service. It is called a flour manufactory." Near Tatnall's mill were located eleven others, "four of them are very large, the others much smaller." On the north side, including Tatnall's mill which he visited, Liancourt saw "three pair of mills..., that is to say, six mills and twelve millstones." These mills were similar to those at London Bridge and also to those of Paris. Liancourt pointed out, however, that in Paris the mills were set in motion by a steam engine.²⁵

Robert Sutcliffe came to Wilmington in October, 180⁴, some eight

years after Liancourt, and while in the town he visited "the Brandy Wine River Mills." Most of the mills were "in the hands of friends; ...and each...[ground] upon an average, per day, about three tons and a half of flour, and about ten tons of Indian meal." Sutcliff thought Wilmington possessed "every advantage" and felt "the neighborhood of these mills...one amongst the many pleasant spots I have seen in this country."²⁶ By 1806, the value of property in this area that Sutcliff found so choice, varied in price from twenty-two dollars to one hundred and fifty dollars an acre,²⁷ and mill sites on the Brandywine demanded a price close to the latter figure.

In this same year, Priscilla Wakefield, during her excursions in North America, visited "the largest and most agreeable town in the State" of Delaware. She remained in Wilmington for an entire day for the sole "purpose of examining some of the mills...which stand upon the Brandywine River, there being no less than thirteen, almost close to each other;...." Her chief fascination seemed to be the mill machinery which she thought "extremely ingenious, and so contrived, that a great many operations are performed with a very little labour."²⁸ John Melish, a contemporary of Priscilla Wakefield, estimated that, regardless of this mechanization, the Brandywine Mills gave "employment to upwards of 600 hands;...."²⁹ The entire scene was summarized in 1807, when Fortesque Cuming wrote, in a tourist's vein, that "the Brandywine runs through a rich and well settled country, and abounds with mills, where a vast quantity of flour is manufactured for exportation."³⁰

In 1811, Thomas Lea built the largest mill ever constructed on

the Brandywine.³¹ This new mill stood on the site of Jacob Vandever's old one and was on the north side of the creek.³² Several years after it was built, John Palmer, a British traveler from Lynn, England, stopped in Wilmington. Here, in the course of a day, he not only saw the Gilpins' paper manufactories and the "Messrs. Duponts' celebrated powder mills..." but also was introduced to "Mr. Pool[s]", one of the proprietors of the flour mills," who gave him a personally conducted tour of the largest and newest of the Brandywine Mills. The mill "work[ed] six pair of stones..." and all of its operations were done mechanically. Palmer was quite convinced "that in mill machinery the Americans were equal if not superior to the British." The candid Palmer noted that, in addition to Lea's, there were "thirteen of these flour mills, all within half a mile, and all owned by members of the Society of Friends."³³

In 1814, D. B. Warden mentioned "In the immediate vicinity of Wilmington...fourteen mills for grinding corn,"³⁴ and by 1815, Miles' Register could report "on the Brandywine,...14 mills...of 2 pair stones each, and capable of manufacturing 500,000 bushels per annum;...." Within five miles of Wilmington, the water of the creek turned thirty-six water wheels and had power and fall remaining to accommodate thirty-six more.³⁵ "On the whole," it appeared Wilmington was "likely to become one of the most important manufacturing towns in the United States."³⁶

In a little over forty years (1772-1815) the Brandywine Mills had increased in number from eight to fourteen. These mills were all below the bridge and on the tidewater. The development of this milling center

has been reconstructed from the following contemporary sources: -- travel accounts, periodicals and newspapers, a survey map of the area, and local histories. The progression from eight to fourteen mills may best be seen in a summation of these sources, giving the date, the number of mills, and the source.

NUMBER OF BRANDYWINE MILLS, 1764-1815

<u>Date</u>	<u>No. of Mills</u>	<u>Source</u>
1764-1776	8	J. T. Scharf N. Crosswell (1776)
1776-1785	9	New mill built -- Lea, daybook ledger (1776-1777) R. Hunter (1785)
1785-1789	10	J. Tilton (1788)
1790-1797	12 / 1 saw mill	<u>Delaware Gazette</u> (1790) W. Smith (1791) S. Bush (1791) J. Scott (1795) W. Winterbotham (1796) I. Weld (1796) J. Morse (1797) Liancourt (1797)
1797-1810	13	Priscilla Wakefield
1811-1815	14	Lea's new mill built (1811) D. B. Warden (1814) <u>Miles' Register</u> (1814-1815) Survey of Brandywine (c. 1815) J. Palmer (1817)

It is with these fourteen mills that the milling center reached its zenith. Below the Brandywine Bridge stood eight mills on the Wilmington side of the stream (south) and on the Brandywine Village side stood six. The south bank had doubled its number of mills since the 1760's when the scheme to build the tidewater mills had first been conceived. Even more important were the six great mills directly across the creek on the north side. It was only fifty years before that most individuals considered this area unfit for merchant milling.

In 1815, five people owned the eight mills on the south side of the creek. The first mill below the bridge was Joseph Shipley's. The two mills immediately below his were owned by James Canby. The fourth mill below the bridge was operated by J. Cuming and the fifth, sixth and seventh were owned by William Poole. The eighth and last mill below the bridge belonged to Thomas Lea. On the north side of the stream the first three mills below Brandywine Bridge were owned by Thomas Lea. The fourth and fifth mill belonged to Tatnall and Price and the sixth mill was owned by James Canby. Thus were the mills and their owners midway through the second decade of the nineteenth century, some seventy-three years after Oliver Canby had built the first mill of consequence in this area.³⁷

In the years after the Revolution, in an area renowned for "the most notable concentration of mill industries..." in America,³⁸ the Quaker millers at Brandywine continued as the dominant force in an

* See Appendix, Plates III-VI.

industrial valley that was "making rapid strides toward perfection."³⁹ Their leadership had been continuous almost from the inception of their mills. But already, a few miles upstream, the powder mills of E. I. du Pont were grinding, under massive stones, the product which in the nineteenth century would replace superfine flour as the product synonymous with the name of the creek. At the end of the eighteenth century Brandywine flour was a watchword in America. By the end of the nineteenth it would be gunpowder that focused the attention of a nation on the Brandywine.

With this predominance of the flour milling industry on the Brandywine in the eighteenth century, one might well wonder what type of mills and machinery turned wheat into superfine flour. What were these mills like, and how did they work?

CHAPTER IV

SOME CHARACTERISTICS OF THE MERCHANT MILLS AT BRANDYWINE

TO BE LET,

A new Stone MERCHANT-MILL and SAW-MILL, with...Dwelling House, Granary, Cooper's-Shop and Stable on the premises.

---In the Merchant-Mill are one pair of good Burr, and one pair of Bucks County Mill-Stones, and Boulting Clothes, compleat for Merchant and Country Business... For terms apply to

Joseph Shipley, or
Samuel Canby.

Brandywine Mills, 12th mo. 19.¹

In 1761, William Marshall advertised in the Pennsylvania Gazette that he had for sale "Half of a Cnist-mill, on Brandywine, near Wilmington...." In Marshall's mill were "two Pair of Stones, and all other Utensils...", and with the mill went "a Stone House, Spring House, Log House, and a good Stable...."² A short time later Jehu Hollingsworth advertised "One Half of a good Merchant Mill...one Half of a good Stone Dwelling-house, Spring-house, &c....," and in his mill were "two Pair of Stones, One Pair French Burs, the other Cullings, [and also] good Boulting cloths...."³ These descriptions were typical of mills being advertised for sale or rent. The two mills advertised above were both components of the Brandywine Mills. An advertisement for still another of the Brandywine establishments, Samuel Morton's, appeared in the Gazette in 1774. This time it was "An extraordinary Merchant Mill" for rent, located on the Brandywine, "below the bridge on a never failing stream." This mill had "two water wheels, two pair of burr stones, and every thing compleat for the manufacturing of superfine flour." In addition to the mill there was for rent "a commodious

brick dwelling-house, cooper's shop, and stable...[plus] the advantage for the sale of flour of two considerable markets, viz. Philadelphia and Wilmington...."⁴ This mill was again advertised in 1799, and it still had two water wheels, but now instead of two it had three pairs of burr millstones and the house was described as being of brick, two stories high and adjacent to the mills.⁵

What were the physical proportions of these mills? A stone mill, perhaps that advertised, located on the Brandywine at tidewater "between King and French Street...[was] 92 feet in front and 48 feet in depth and [was] three stories high with one overshot and one undershot wheel...." The overshot wheel turned "2 pair of 4 feet 6 inch mill stones" while the undershot activated "2 pair of 5 foot stones."⁶ The diameter of a mill wheel in one of these overshot establishments was fourteen feet.⁷ The mill just described was a double mill and would correspond to one of four mills that Lianscourt, in the 1790's, called "very large." Adjoining this mill was "a corn kiln with four [drying] pans...." Within the mill itself were all the implements necessary "for cleaning wheat in the best manner...."⁸

One of the lesser mills of the cluster was situated on the pool at tidewater "between King and Walnut street." This was a stone mill, "46 feet 9 inches in front and 47 feet in depth." This mill had "two pairs of 4 feet 6 inch mill stones and machinery...[including] a pair of rubber stones, screws, etc...."⁹ Lastly, there was the smallest type of mill. This mill was on the "property known as the Barley Mill property...on the south side of Kings Road...."¹⁰ It should be noted

that the mills previously described were stone and were below the bridge. The Barley Mill property was above the bridge and was the mill site that preceded the larger establishments downstream. It was probable that this mill was the "good grist and saw mill..." advertised for sale in 1749 by Peter and Jonas Stedham.¹¹ On the property stood a "stone house and a frame kitchen 28.4 feet in front by 43 feet deep, a frame mill 40.3 feet in front by 30½ feet deep...[and] also a blacksmith's shop 34 feet in front by 18 feet deep...."¹²

The above indicates three types of mills in the metamorphosis of the Brandywine group, namely, the double mills, the single or smaller structures, and the earliest type, which were of frame construction. Henry Canby estimated that to build one of these large mills, including the race, cost £2,000, exclusive of the labor employed.¹³ In 1827, the corporate authorities of Wilmington purchased the mill formerly belonging to Joseph Shipley. Shipley's was one of the first mills built on the long race and it "was purchased for \$28,000 dollars."¹⁴ It should be recalled that land for a mill site exceeded £100 an acre shortly after the Revolution and probably over \$150 dollars an acre after the turn of the century. Interpreted in the light of what a pound would buy it is obvious that a mill on the tidewater at Brandywine constituted a considerable investment. Some of the materials, their cost, and the labor involved in the construction of a new mill will afford a splendid picture of industrial construction in the last quarter of the eighteenth century.

In Thomas Lea's daybook the first entry for this "New Building"

was in September of 1775. This was for 4,600 shingles purchased at a cost of £14.1.7. On the fourteenth of November, Nicholas Fuss was paid for thirty and one-half days work as a mason. At the same time a drawer named Edwards received £2.3.9 for twelve and a half days work on the new building. In the last week of November, 1200 bushels of sand, four hogsheds of lime, and eighty feet of boards were purchased. The boards were received from G. Springer at a total cost of £2.3.9. The sand cost £9.10 and the lime £4.16.0. On the first of December, an additional 1050 feet of poplar boards were purchased from a Robert Green. On December 15, 1775, George and Richard Grubbs were paid for seventy-four and one-half days labor. This included work on the wall of the new building, 243 perches of mortar work and twenty-seven perches of pillar and beam filling. A perch of masonry work was equal to 24 3/4 cubic feet. For the work on the wall they were paid £12.18 for the mortar work £20.3.4 and for the filling job, £2.5. Ten days after his account with the Grubbs was settled, Lea paid William Talley for forty-two weeks and four days work on the new building. Talley's rate of pay was eight shillings a day. At the same time £17 was expended for the boarding of masons.

On January 11, 1776, John Hawkins supplied 247 pounds of nails and eighteen pounds of brads at a shilling a pound for the nails, and at a total charge of £13.3.6 for both items. This entry was followed by one that credited Mark Elliot for £25.4. This represented payment for 168 perches of stone for the new mill. Elliot received an extra three shillings for measuring -- presumably the stone. On the second

of February, William Smith again profited from the new construction going on at Brandywine. He hauled eight girders and was recompensed in the amount of £6.5.6. He supplied sixty-three scaffold poles for which he was paid £1.11.6. And finally, he realized £6.6.8 for eighty bushels of lime. Not until November 5, 1776, did Lea make another entry against the new building's account. On this date a total of 2,000 feet of boards were purchased -- 1200 feet from Robert Green and 800 feet from Samuel McClintick. Green was paid £4.16 and McClintick, £3.15. The final entry for the new building was recorded January 14, 1777, when fourteen pair of hinges, seventeen hooks and sundry spikes and staples were purchased from Edward Hughes for £5.12.10.

In this limited statement of material and labor over £250 had been expended. There had been 3,800 feet of boards purchased, and, most important of all, at least ten individuals had profited from the expansion of operations at Brandywine Mills. If it was possible to ascertain all the entries made against the new building it would be found that Canby's estimate of £2,000 to build a new mill would not be excessive.¹⁵

Oliver Evans, in his Young Mill-Wright and Miller's Guide, outlined in tabular form the amount of scantling and large irons required to build a mill of three stories "32 by 55 feet..." with "the walls of mason work" and housing "two pair of stones." For the roof alone Evans suggested "5½ rafters, 22 feet long, 3 inches thick, 6½ wide at the bottom, and 4½ at the top end." In addition "25 collar beams [tie beams connecting the rafters] 17 feet long, 3 by 7 inches" were required, plus "2760 feet of laths..." and "7000 shingles." The large

mills at Brandywine were nearly twice this size.¹⁶ In August, 1802, Peter Bauduy wrote a most interesting memorandum to E. I. du Pont outlining, in detail, the costs of mill construction along the Brandywine. Bauduy's letter adequately focuses and summarizes the information derived from the Lea ledger, the estimate of H. S. Canby, and the specifications of Oliver Evans pertaining to the cost of building a new mill.

On the morning of August 20, 1802, Bauduy wrote that he had "been to the Brandywine [Mills?]..." where, "from the miller's books,..." he ascertained that to build a mill "98 feet long by 48 wide and 40 feet high..." it would cost "nearly 7000 dollars."¹⁷ When Canby's estimate of £2000 exclusive of labor is compared to Bauduy's total cost of \$7,000.00 one finds the difference to be approximately one thousand dollars. If the pound is taken as equal to about three dollars this difference in the two estimates would be that which Bauduy cited as the cost of "all carpentry and labor."¹⁸ Materially, the large merchant mill at Brandywine would have cost between five and ten thousand dollars to build and spacially such a mill would have occupied an area of some 4,704 square feet.

Very simply stated these mills on the Brandywine were big and they were expensive to build.

After establishing the size and the cost of building one of these merchant mills many questions come to mind. The very first would seemingly be, how was flour manufactured in these big mills?

CHAPTER V

THE MANUFACTURE OF FLOUR -- BEFORE AND AFTER OLIVER EVANS

Before Mr. Evans' improvements were made public, the Brandywine millers and others generally believed, and frequently said, that the manufacture of flour had arrived to its greatest perfection, and no improvement could be made on the art.¹

In considering the manufacture of flour a before-and-after approach must be taken. In the conversion of grain into flour there was the pre-Oliver Evans method and the post-Evans technique. This ingenious Delawarean, through a series of mechanical inventions or innovations,² revolutionized milling procedures. Evans' devices brought improvement in flour making not only on the Brandywine but throughout the country and in Europe.³ The saga of Mr. Evans will be paraphrased here only in relation to the Brandywine Mills. The end of the old and beginning of the new method may be dated roughly as 1783-85. In this interval Evans formulated his theories, erected a mill, and incorporated in it his newly invented machinery for the improvement of milling techniques.⁴ Prior to this time the manufacture of flour in merchant mills proceeded in a manner that was hard physically and inefficient economically.

Suppose that a wagon load of grain had just arrived at a mill and the miller had, as Liancourt described, paid "for it in ready money...."⁵ The miller, or an assistant, would proceed to carry the grain from the wagon into the mill. These sacks generally held three bushels and a bushel of wheat weighed sixty pounds.⁶ These sacks were carried, by way of stairs, to an upper loft of the mill where they were emptied

into a tub with a capacity of four bushels. Such a tub was elevated by a jack activated by the power of the mill. The tub was jacked to the granary floor where it was manually emptied. This operation required a man in attendance below and one above to receive the tub from the jack. This was hard labor and not light work. "All this required strong men." After the grain reached the granary "it was moved, by hand [shovel] to the hopper of the rolling screen...." The rolling screen, used in the initial cleaning of the wheat, preceded the introduction of the grain to the millstone hopper. From the screen to the millstone hopper the grain was again moved manually. As the grain was ground it fell, full of moisture, from the stones to a large trough. Out of this trough it was shoveled into tubs and lifted to the meal loft. It should be noted here that these tubs had to be attended above and below. When the tubs reached the meal loft they were emptied in large heaps and the contents spread with shovels and rakes to dry and cool. This was an operation which, at best, was only partially effective, and was directly proportional to the efficiency of the mill hand. When cooled and dried the ground grain was heaped up over the bolting hopper. This hopper was either constantly overfed or "at other times let run empty...." Attendance day and night was required to avoid either occurrence. Manually, this was a process that found dirty feet constantly trampling through the meal on the loft floor. As a result of this, meal was trailed all over the mill. Worse, it caused considerable dirty flour to pass the bolter for packing. In the eighteenth century people did not like eating dirt any more than they do today and very often a flour barrel contained more than its fair share. At

best the pre-Evans milling process was just hard work with results often unrewarding.⁷

The method described above was used almost universally and it is not surprising that the same procedure was followed on the Brandywine. Hemekiah Niles, recollecting mill operations in the vicinity of Wilmington prior to the installation of Evans' inventions, remembered,

When at the Brandywine mills, they used to hoist the flour from the lower story to the loft, in large buckets or tubs, filled by shovels from the chests into which the flour fell from the mill-stones: he has also frequently seen a man employed at these mills in heaping the flour over the hopper to let it pass into the bolting cloth below. Born in the neighborhood of these mills,...he has passed through these mills...many hundred times before and since the improvements were introduced.⁸

In the old process the power generated by the water wheel was not utilized to its fullest extent since only the millstones and jacks were activated by this mechanical force. It is clear that more manual than mechanical force was applied in the internal functioning of the mill. Between 1785 and 1791, Oliver Evans perfected machinery powered by the energy generated by the water wheel. The harnessing of his machines to the power of the mill took the heavy sack from the miller's back and generally reduced the manual labor involved in making flour. Evans, by a series of inventions, produced simple machines whereby grain could be conveyed up and down and through a mill. In addition the grain could be raked, spread, and cooled with a minimum of handling and muscular effort. The Bathes, the most definitive students of Evans, cite five original inventions that made such operations possible. These were the conveyer, the drill, the descender, the

elevator and the hopper-boy.⁹ As Evans himself pointed out "These five machines...variously applied...would perform every necessary movement of the grain, and meal,...from the time the grain is emptied from the wagoner's bag, or from the measure on board the ship, until it... is completely manufactured into flour,...."¹⁰

"The Conveyor," wrote the Bathes, "was a succession of wooden plows staggered along a revolving wooden core, but shortly...improved into an endless screw...." This screw consisted of "two spires made of sheet iron and wound around a wooden shaft from five to twenty feet long...," and "this in turn revolved in a close fitting trough of boards." In this conveyor Evans had a device that could move grain in a horizontal plane to any part of a mill.¹¹

The drill was a device that was similar in use to the conveyor. "It consisted of an endless barrel with wooden rakes affixed to it and pulleys to revolve it as in the elevator." The drill found utilization on horizontal surfaces and also on gradual inclined planes. "It pushed grain along in a trough until it reached the necessary chute" eliminating much handling.¹²

The descender was even more ingenious. It "ran by gravity and was...a thin broad strip of leather, canvas or flannel running over two pulleys. The meal fell on the top side of this belt and by its weight kept the belt in motion and distributed the meal to the point where it was required." This belt had to be fixed on an angle and could not operate in a vertical plane. The falling meal was supposed

to be enough to keep the belt moving; however, for best results Evans recommended that "where...motion can be readily obtained from...water ...it is to be preferred...."¹³

The elevator was an improvement which, in large merchant mills, lessened by two the number of men needed to get grain from the lowest to the highest floor of a mill and vice versa. "The elevator was an endless band with wooden or sheet metal buckets to hold about a quart of grain each." The buckets "were spaced twelve inches apart on the belt" and were motivated by a pulley that "revolved at twenty-five revolutions per minute." By fixing one of these pulleys on an upper floor of the mill and one on the lower a belt could "elevate continuously three hundred bushels of grain or meal per hour."¹⁴

The fifth of Evans' inventions was called the "hopper-boy." It was so designated because it replaced in the mill a boy specifically detailed to guide meal from the meal loft into the bolting hopper. "The hopper-boy was...a large revolving rake some twelve feet long adjustable for height on a vertical driving shaft by means of a cord or balance weight." In operation this mechanical boy spread "the meal evenly on the upper floor of the mill, called the meal loft, and guided it...to the chute over the bolting hopper" from whence it passed into various grades of refined flour.¹⁵

The combined effect of these inventions lifted grain to the grain loft preparatory to feeding it to the millstones and, after grinding, carried the meal, via an elevator, to the hopper-boy for spreading and

cooling on the meal loft floor prior to guiding it to the bolting hopper and the bolting chest. Perhaps the best way to see Evans' milling devices perform is to see a mill in operation using his machinery. As the grain proceeds through the mill the advantage of this new over "the old process of manufacture of flour" is readily apparent. On December 19, 1787, Evans and his brother addressed themselves "To the Millers." In a broadside they described the operation of their merchant mill "on Redelay creek, 3 miles above Newport, Newcastle County, Delaware....," where they had lately installed Oliver's inventions. The operation of the mill proceeded as follows:

One of the Elevators receives the Wheat at the Tail of the Waggon, and carries it up into Garners, out of which it runs through Spouts into the Screen and Fan, through which it may be turned as often as necessary, till sufficiently cleaned, into a Garner over the Hopper which feeds the Stone regularly -- Another Elevator receives the meal when ground and carries it up, and it falls on the meal-loft, where the Hopperboy receives it and spreads it abroad thin over the Floor, and turns it over and over perhaps an hundred Times and cools it completely, then conveys it into the Boulting-Hopper, which it attends regularly; said Elevator also carries up the Tail Flour with a Portion of Bran, and mixes it with the ground Meal to be boulted over, by which means the Boulting is done to the greatest Perfection possible, and the Cloths will be kept open by the Bran in the hottest weather without Knockers. -- All this is done without Labour, with much less Waste and much better than is possible to be done by hand, as the Miller has no need to trample in the Meal, nor any way to handle or move it from the Time it leaves in the Waggoner's Bag, until it comes into the superfine Chest ready for Packing. -- The Expense of the materials and erecting said Machinery will not exceed from Twenty to Forty dollars, as the Mills may differ in construction. One Hand can now do the Work that used to employ two or three, two Hands are able to attend a mill with two Waterwheels and two Pair of Stones steady running, with very little Assistance, if the machinery be well applied If millers will think on this when they are fatigued carrying heavy Bags, or with hoisting their Wheat or Meal, spreading to cool, and attending the Boulting-Hopper, Screen and Fan, and when they see the Meal scattered over the Stair

and wasting, or when they Hoist their tail Flour with the Bran to bould over -- and when their Flour is scrapped for neglect in Boulding, and when the Superfine is let run into the Middlings by overfeeding, &c. &c. and consider that these Machines will effectually remedy all this, and save great Expense in Wages, Provisions, Brushes and Candles -- he may conclude that it is not best to continue in the old Way, while such excellent Improvements are extant.¹⁶

What did the miller do in this automatic mill? By comparison to earlier standards his work was lessened, but his labors were still a long way from being an easy day's work. It was stated above that it was not unusual for a mill to grind day and night. In doing so, what essentially were the duties of a miller "for keeping the mill, and business of it, in good order?"¹⁷

If there be two of them...taking charge of the mill, the time is generally divided as follows. In the day-time they both attend to business, but one of them has the chief direction. The night is divided into two watches, the first of which ends at one o'clock in the morning, when the master miller should enter on his watch, and continue till day-light that he may be ready to direct other hands to their business early. The first thing he should do,...is to see whether the stones are grinding, and the cloths bolting well. And, secondly, he should review all the moving gudgeons of the mill, to see whether any of them want grease, &c.; for want of this, the gudgeons often run dry, and heat, which bring on heavy losses in time and repairs; for when they heat, they get a little loose, and the stones they run on crack, after which they cannot be kept cool. He should also see what quantity of grain is over the stones, and if there be not enough to supply them till morning, set the cleaning machines in motion.

.

Early in the morning all the floors should be swept, and the flour dust collected; the casks nailed, weighed, marked, and branded, and the packing begun, that it may be completed in the fore part of the day....

When the stones are to be sharpened, every thing...should be prepared...that as little time as possible may be lost.... Things being ready, the miller is then to take up the stone;

set one hand to each, and dress them as soon as possible, that they may be set to work again;....

In the after part of the day, a sufficient quantity of grain is to be cleaned down, to supply the stones the whole night; because it is best to have nothing more to do in the night, than to attend to the grinding, bolting, gudgeons, &c.¹⁸

With this prospect for such an easy night Oliver Evans ended his essay devoted to "The Duty of the Miller." It was true that the sack was off the miller's back, but no one had yet heard of an eight hour day.

With these excellent improvements and labor saving devices Oliver Evans naturally turned to the great mills at Brandywine Village, and their proprietors, as the most logical establishments to introduce his machinery. The relations of Mr. Evans with the oligarchy on the Brandywine constitute an amusing as well as an important part in the story of the Brandywine Mills. As will be shown, it was but a short time until Shipley, Tatnall, Canby, Lea, et al., put Evans' machines to work in their mills. In so doing they reaped excellent results, but they apparently were none too willing to acknowledge their gratitude for a merchant flour mill whose,

...powers combine and carry thre',
About a mill, all man can do....¹⁹

CHAPTER VI

OLIVER EVANS AND THE BRANDYWINE MILLS

We rent machines of him, the Elf!
Each man invented his himself;
Or for it paid some honest millwright,
Then pay him too, ha! -- not a mite.¹

In January of 1786, the General Assembly of Delaware received a petition from Oliver Evans. It requested exclusive privileges within the State for the production, sale and installation of his "Mill Machines...for the term of twenty-five years or such time as your Honours may think proper."² On November 10, 1787, the General Assembly enacted a law that gave Evans "the sold and exclusive right of making and selling...the said machines...for...the...term of fifteen years from thence next ensuing [January 1, 1788]...."³

The proximity of the inventor's mill to Wilmington must have, from the onset, caused the Brandywine millers to be interested in what was going on there. Also, together with the broadside printed to advertise his machinery, Oliver must have stumped the immediate area to proclaim his genius and encourage installation. At any rate, by March 28, 1791, Joseph Tatnall, Thomas Lea, Samuel Hollingsworth, Thomas Shallcross and Cyrus Newlin certified "that we have introduced Oliver Evans' improvements into our mills at Brandywine, and have found them to answer, as represented to us by a plate and description.... We therefore recommend them.... Brandywine Mills, 3rd month, 28th, 1791."⁴

There is some evidence that Evans' machines were clattering away at Brandywine before 1791. A suggestion that this was the case is apparent for three reasons. First, eye witness accounts prior to 1791 comment on the mechanization of the mills at Brandywine. Secondly, the quantity of flour produced is an indication that production methods were mechanized. And thirdly, variations of Evans' machines could have been installed prior to the granting of his patent privilege. Perhaps the reasons depict a situation more apparent than real. The evidence which follows merely offers an alternative to the standard version of the Evans--Brandywine millers relationship.

The earliest contemporary observation giving notice to the type of machinery in the Brandywine Mills was that of Elkanah Watson in January of 1785. Watson, as mentioned in a previous chapter, stopped at the Brandywine "to examine...a new kind of machinery, invented by Evans" designed primarily "to effect...an immense saving of manual labor."⁵ This was six years before the first testimonial was offered by the millers acknowledging the use of such equipment. Three years after Watson, in April, 1788, while describing the Brandywine Mills in the American Museum, James Tilton wrote that all the operations in these mills were "performed by machines, that move by the force of the same water that turns the mill." Tilton described the mills further saying that they were "generally constructed in such a manner, that one set of gears serves two pair stones..." so that while one pair was being dressed the other continued to grind. Emphasizing Evans' major talking point, Tilton described a ~~milling~~ operation surprising for the "little

manual labor....required...." The whole procedure required only "the oversight of one man to each mill." If Tilton is to be believed, the mills at Brandywine took their wheat and other grains (corn) "from the shallops or wagons" and placed it in the granaries, carried it to the grinding-hopper, back to the cooling floor, spread it and cooled it, then conveyed it to the bolting hopper, all by means of troughs and screws and sundry machines invented by Oliver Evans.⁶

The amount of flour produced was cited as an indication that the Evans equipment was in use before 1791. In the fall of 1789 and spring of 1790, there was produced at the Brandywine Mills, 50,000 barrels of superfine flour.⁷ This was considerable production and presumably required considerable mechanization.

Lastly, perhaps Evans' inventions were adopted surreptitiously by the proprietors of the Brandywine Mills. It has been stated that the Brandywine millers opposed Evans' innovations and prejudiced "smaller establishments" against them.⁸ Evans, many years after the fact, wrote that the Brandywine millers caused most of the initial difficulty encountered in selling his inventions to the milling trade. He accused these men "in particular," claiming that they opposed, "with all their influence" the installation of his labor saving machines.⁹

In actuality the remonstrances directed at the Brandywine millers are hard to believe. Evans was a bitter individual. His inventiveness was questioned.¹⁰ His prerogatives were undoubtedly usurped and his machines freely installed by any millwright clever enough to observe

and copy. At Brandywine this conceivably could have been the case prior to the actual "official" adoption of the machines by Tatnall and his associates. There is no direct evidence of this, but Evans' complaint against the Quakers at Brandywine must have had more substance than the charge that they failed to adopt his machinery. For this they did, as we have seen, soon after the General Assembly authorized the exclusiveness of his invention. After Oliver had his mill in operation in 1785, the "rattle traps" in the mill at Red Clay were certainly known on the Brandywine by the largest milling industrialists of the area. Legally, nothing prevented their introduction there until January of 1788. Prior to this date, mills in the cluster at tidewater could have been converted at the discretion of their owners. After this date they had to call in Evans.

Thus, if Tilton and Watson are reliable, and the suppositions are allowed, then some mills at Brandywine had been modernized before the adoption and certification of the machinery in March of 1791. The Bathes held that it took great courage for Tatnall to alter his mill and install Evans' machines in the face of ridicule by others of the milling fraternity.¹¹ Joseph Tatnall was the first great industrialist of Delaware,¹² and the leader of this milling community, consequently there does not seem much reason to believe that he would be subjected to ridicule. It seems, rather to the contrary, that his example would be emulated. Proceeding from this point of view the decade 1790-1800 shows clearly the mechanization of the Brandywine Mills through conveyers, drills, elevators and hopper-boys.

In October of 1790, "all persons concerned in manufacturing grain into flour....," were invited by Oliver Evans "to see a complete model of my improvements in that art which will be shown at my house, nearly opposite the Academy, between the hours of four and five in the evening...."¹³ A Brandywine miller, Joseph Tatnall,¹⁴ witnessed this demonstration of the manufacture of flour "without the aid of human hand....," and the next day contracted with Evans to modernize one of his mills.¹⁵ Tatnall, as recalled by Evans, said, "Oliver...if thou wilt furnish all the materials, and thy own boarding, and come thyself to set up themachinery, in one of our mills, thee may come and try...." However, if the machinery proved of no value, "thee must take it all out again and leave the mill just as thee finds it, at thy own expense."¹⁶ Thomas Shipley, who witnessed the same demonstration reputedly exclaimed that such a mill "will not do, it can not do, it is impossible that it should do!"¹⁷ But, in so saying, he said nothing that negated installation of such machinery in a Shipley mill.

Apparently what Evans found most aggravating was that after installation, inspection, and approval of the mill he had converted, several of the Brandywine millers reported to competitors in the neighborhood that the machinery just installed was nothing but a "set of 'rattle-traps.'"¹⁸ Perhaps this was a trifle unfair to Oliver, but it was good business on the part of the mill owners. The longer it took for others to discover the merit of Evans' inventions the better for the Brandywine Mills, since everyone to whom Evans attempted to sell his automatic mill invariably asked, "have the Brandywine millers adopted it?"¹⁹ It must

have been apparent to the proprietors of these larger establishments that competition for their mills would increase proportionally to the number of lesser mills mechanized by Evans' five inventions.

Eventually, in 1791, Tatnall gave formal recognition to the fact that Evans' machines were in operation in his mills. Tatnall indorsed them in The Young Mill-Wright and Miller's Guide, finding "them to answer, as represented...." Evans concerned himself unnecessarily over such testimonials for in the next few years these converted mills would speak for themselves, catching the attention of all who passed. Although mere acknowledgment was considerably less than Oliver desired for the use of his machines, it was a fact that the Brandywine Mills long stood as "a lasting memorial of one of the most ingenious mechanics this country has produced."²⁰

Dr. Tilton and Elkanah Watson, as pointed out above, both noted the operation of the mills. William Smith pointed out the advantage of the mills and their location whereby vessels with wheat and grain could be loaded and unloaded beside them by means of cranes.²¹ And Thomas Twining thought that mill operations at Brandywine were comparable to any similar scene in England.²² One traveler, in fact, was so impressed by the mechanization he saw that he recorded the impressions of an English millwright who was employed in the Wilmington area. It was the opinion of this millwright, Thomas Oakes, "that in mill machinery the Americans were equal if not superior to the British."²³ Isaac Weld thought, after seeing the Brandywine Mills, that "improvements...made in the machinery of the flour mills in America are very great." Chiefly,

as Weld saw it,

...these consist in a new application of the screw, and the introduction of what are called elevators, the idea of which was evidently borrowed from the chain pump. The screw is made by sticking small thin pieces of board, about three inches long and two wide, into a cylinder, so as to form the spiral line. This screw is placed in a horizontal position, and by turning on its axis it forces wheat or flour from one end of a trough to the other. For instance, in the trough which receives the meal immediately coming from the stones, a screw of this kind is placed, by which the meal is forced on, to the distance of six or eight feet..., into a reservoir; from thence, without any manual labour, it is conveyed to the very top of the mill by the elevators, which consist of a number of small buckets of the size of tea-cups, attached to a long band that goes round a wheel at the top, and another at the bottom of the mill. As the band revolves round the wheels, these buckets dip into the reservoir of wheat or flour below, and take their loads up to the top, where they empty themselves as they turn around the upper wheel. The elevators are inclosed in square wooden tubes, to prevent them from catching in any thing, and also to prevent dust. By means of these two simple contrivances no manual labour is required from the moment the wheat is taken to the mill till it is converted into flour and ready to be packed, during the various processes of screening, grinding, sifting, &c.²⁴

The processes that Weld described, Winterbotham also commented on, stating that "there have been instances," at Brandywine Mills, "of 1000 bushels [of wheat] being carried to heights of four stories in four hours." Besides this it was estimated "that these mills [could] grind four hundred thousand bushels in a year," although annually only "about two hundred and ninety to three hundred thousand bushels of wheat and corn [were] manufactured...."²⁵ All this flour produced was hoisted, sifted, ground and bolted without manual labor and "all the operations of the mill [were] performed by water from the unloading the sloops which bring the corn [grain], to the complete finishing of the flour."²⁶

One of the most complete and descriptive accounts of flour production from a contemporary source is Liancourt's. It leaves little doubt that Brandywine Mills employed Oliver Evans' techniques. In Joseph Tatnall's mill the duke observed that,

...the flour falls as it is ground upon a wooden roller, armed with little detached wings, which are so arranged as to form a screw. This roller, fixed in a trough, is inclined towards a bin in such a manner that it serves as a conductor to the flour, which would descend too rapidly if it fell perpendicularly, and too slowly and at intervals if it were...conducted by a simple inclined plane. A chain of small troughs, about three or four cubic inches long dips into the bin, which receives the flour.

This chain is enclosed in long perpendicular wooden cases. It turns upon two pivots, one...is placed in the bin, where the little troughs fill themselves with flour which is deposited there;...the other on the fourth floor where the same little troughs empty themselves and...recommence their perpetual operations.

The flour, conveyed above by these troughs, falls on an inclined circular floor in the center of which are several holes; it is there spread about by a rake as large as the floor, the teeth of which are so placed as to conduct the flour towards the holes, through which it falls, cooled, into the bolters. The bolters are...different from those used in France and England, as the stuff which covers them, and through which the flour passes, is a fine silk, very closely woven. The millers assert,...they pay six dollars an ell for this stuff, it is cheaper than the common bolting cloth, to which it is...to be preferred for giving a more beautiful colour to the flour. These bolters will last five years in constant use...; about twelve ells of stuff is sufficient to cover them. Hitherto the stuff has been brought from Holland; but a manufactory of it is about to be established in Wilmington. Each pair of mills is furnished with its winged roller; its chain and troughs, its inclined circular floor and its bolters.... This mechanism for conveying the flour from the mill-stone to the bolter was invented five years ago by Mr. Evans....²⁷

And so they ground day and night when the icing of the river or a shortage of wheat did not preclude their operation. In so doing, particularly in the 1790's, they became one of the first successful examples

of cooperative standardization and an early example of production line techniques.²⁸ The years in which Evans complained most bitterly about not having received "a mite" saw the mills at Brandywine, which he held in such low esteem, prove to be a source of remuneration far more valuable than money. The recurrent praise of all who saw them and their "new kind of machinery, invented by Evans...."²⁹ would in the end long outlast the material reward of the inventor.

Much has been said above about labor in the operation of the merchant mill but little has been said specifically. At Brandywine Mills there is a chance to see the human element as well as the mechanical in the production of flour. Despite mechanization, a considerable number of individuals were involved in the milling process. They were either involved directly or in allied industries.

CHAPTER VII

MILL LABOR AT BRANDYWINE

Mount Vernon, April 15, 1798.

Sir:....

Knowing that no place is more likely to furnish a good Miller than Brandywine, and that you must be acquainted with the Millers there on whose recommendation of one you could depend, I give you the trouble of receiving this letter, praying you to make the enquiry, and to inform me of the result.¹

The labor required to operate a merchant mill at Brandywine was of two types -- that required for the internal functioning of the mill and that for the external. Internally, the miller and his immediate assistants engaged in the flourmaking process. Externally, coopers, millwrights, blacksmiths, bolting cloth manufacturers, and shallopmen contributed their specialties to the ultimate goal -- the manufacture and marketing of flour. It should be remembered that specialization was not so pronounced as to preclude mill employees from performing in dual capacities depending upon the exigencies of the moment. A miller, for instance, might be expected to perform the tasks of a cooper or a millwright, as well as his general duties of supervising the work of the mill.

Within the mill Oliver Evans' machinery had considerably reduced the physical burden of milling. At the same time these machines increased the productivity of the flour mill. A mill that used Evans' innovations could turn out twenty barrels of flour per day per man

while in one day an old type mill "required one man for each ten barrels" of flour produced.² Apparently, at Brandywine, his inventions did not substantially reduce the number of persons required for operation; however, in February, 1813, Henskiah Niles could recollect "to have heard it stated that the introduction of this machinery would throw more than twenty persons out of employ at Brandywine;...."³ In a several-storied mill the men formerly employed to tote, hoist, and handle the raw or finished product were, after Evans' innovations, engaged in tending the equipment that made their work lighter. Prior to Evans, mill labor carried the sacks and barrels. After Evans, the individuals working at Brandywine Mills were chiefly machine tenders who, as a consequence of the new machinery, had had "three quarters of the manual labor..." removed from their work.⁴

Liancourt, a visitor at Joseph Tatnall's manufactory, observed that "the whole labour of the mill is performed by six men only...."⁵ Another, describing the scene collectively (12 mills) in the same period, noted the required labor to be "about forty to tend the mills."⁶ The larger or double-wheeled structures required more people than the smaller establishments. This would explain the disproportion in contemporary observations. The duties of the six men employed by Tatnall primarily were "to place the flour barrels."⁷ In addition, mill hands could be expected to work at mending and tending the long race, repairing the dam, improving the race bank, or cutting briars.⁸ At other times the miller and his assistants might be engaged in fighting the elements. Winter ice, spring floods and summer droughts frequently interfered

with normal grinding operations.⁹ Entries recorded in Lea's daybook and ledger show that mill hands in his employ received both wages and board.¹⁰ In August of 1781, one Robert Richardson was paid six pounds per month for "milling," with no allowance. In November, Jacob White, for "milling," received four pounds per month and was allowed an additional seven shillings per week for board.¹¹

In January, 1792, President Washington was anxious to know what a "first rate Miller" was paid in the way of wages and other perquisites, at "the Brandy Wine and other noted Mills."¹² To obtain this information Tobias Lear, the President's secretary, wrote to Oliver Evans. In reply Evans informed Lear that at "the Brandy-Wine Mills" the current wage for such a person was "from \$5.10 to \$6 pr. month, without any perquisites, and the duties heavy."¹³ In a previous letter Evans had written that "Gentlemen from the southward offer higher wages that are given at the Brandy-Wine Mills....," however, "there are frequent instances where those who go [south] for the sake of wages, return for their health."¹⁴

What did Washington offer a miller in the way of wages and perquisites? In 1798, he wrote to Patrick O'Flynn of Wilmington hoping that O'Flynn could find him a miller who would quit the Brandywine for Degue Creek and the higher wages paid in the South. Washington wrote,

The wages, and allowances I now give...are \$166 2/3 pr Ann: flour, Meat, fish &c. ample; but the quantity of each to be specified, to prevent disputes. A Cow to afford milk, and wood sufficient, to be laid at his door; A house (and Garden adjoining) close by the Mill, and a

Coopers shop at a convenient distance from it, all adequate to the wants of a person in that line.¹⁵

On the Wissahickon, a major milling center not far from the Brandywine, one of the merchant millers there employed five men to work his mill. Three of the men were paid wages. The chief miller received one hundred and twenty dollars a year and two of his assistants received eighty. The other two mill hands were "apprentices who received nothing but victuals and clothes, &c."¹⁶

In the same years at Brandywine Mills a miller's wage was estimated to be "from six to eight dollars per month." It was generally thought that Tatnall and his associates paid their men so well that even in the winter months, when grinding was suspended because of ice and freezing weather, "they experienced no difficulty in supporting themselves...." In fact, the pay received was so high that, "after a few years service" they could quit the mills and "purchase lands in newly inhabited parts of the country."¹⁷

The comparison of wages at Washington's mill with those at Wissahickon and at Brandywine indicates that millers were well paid. It also indicates that conditions at Brandywine were at least matched if not exceeded in other communities.

Liancourt commented on the source and type of labor employed by the Brandywine millers. He found almost all the workmen to be either English or Irish. He observed no Negroes working in Tatnall's mill and was sure that Frenchmen would be more desirable and satisfactory

laborers than those currently employed. The good Quakers complained that their men were indolent and over-indulgent drinkers.¹⁸ Unfortunately, a good supply of virtuous Frenchmen could not be substituted for the English and Irish labor supply that still flowed in through the ports of New Castle and Wilmington. Beginning with the earliest days of colonization and extending into the nineteenth century, indentures and apprentices provided the labor reservoir in America. At Brandywine wage labor seemed to be the rule for no indentures or articles of apprenticeship were located. However, as early as 1755, Thomas Canby employed an indentured cooper and bricklayer.¹⁹ It seems reasonable to believe that the millers, when not using local apprentice labor (in the form of sons, relatives and other local talent), made some use of the thousands of individuals that annually entered America through New Castle and other Delaware River ports.²⁰

Before turning to the related or allied tasks that demanded labor at Brandywine Mills, several examples of occupational hazards in the flour industry should be cited. In buildings where stairs were precipitous and where floor hatches connected one story to another, it could be expected that accidents would occur. In November of 1779, William Canby went down to his mill and, "without taking proper care for his own safety," fell down such a hatch. He fell one story and, as his brother Samuel recorded, "was very much bruised. He had 2 very bad convulsive fits, the doctor bled him and he is in away of mending."²¹ Other similar accidents must have occurred, although no others were recorded. The nearest thing was an accident of production. This

happened on December 5, 1789, at Samuel Hollingsworth's mill when instead of flour being contained in a barrel there turned out to be "one dozen men and boys, White and Black hats...."²² Perhaps Liancourt's charge of drunkenness on the part of mill laborers could explain this bizarre occurrence.

Far more serious than finding hats in barrels intended to contain flour were the "peculiar accidents by which mills are subject to catch fire." In the Miller's Guide, Oliver Evans warned of six ways in which mills commonly were burned down through carelessness or accident. Three of the six main causes of mill fires were attributable to friction, "There being many moving parts in a mill." The three other causes were all the result of carelessness in the use of candles, the source of mill illumination, and of branding irons used in the marking of barrels. As Evans aptly stated, the careless use of these materials was often "not... discovered until the mill is in a flame."²³

Essential to the existence of merchant mills was the barrel industry. It was the cooperage trade that provided the containers necessary to carry on the flour trade. Where flour was milled in great quantities many coopers were employed actively supporting the mills. In 1791, there were fifty-nine coopers working in Wilmington.²⁴ And Jedidiah Morse, in 1797, estimated that "from 50 to 70 coopers....," were employed at Brandywine Mills.²⁵ Liancourt wrote of Joseph Tatnall's mill that "twenty-four men [were] employed...for working the vessels, and making the barrels."²⁶

The basic barrel used varied little in construction. In the 1750's

Peter Kalm observed that the staves were made of white oak, the hoops of hickory and the ends of pine.²⁷ The skill of the cooper was an important factor. Quantities of lumber were readily spoiled by inexperienced or careless workmen.²⁸ After September, 1796, the dimensions of flour casks were prescribed by law. It was specified that:

all flour casks...be made of good seasoned materials, well made, and tightened with ten hoops, sufficiently nailed... and of the following dimensions, viz. the staves of casks, No. 1, 2, and 3, shall be of the length of twenty-seven inches, but different diameters at the heads, according to the numbers; That is to say, cask No. 1, shall be of the diameter of eighteen inches at each head; cask No. 2,...sixteen inches and an half...; cask No 3,...fifteen inches and an half...; and cask No. 4, commonly called half barrels, shall be...the length of twenty-three inches, and of the diameter of twelve inches and an half at each head....

All barrels for shipment out of the state were to be branded with the miller's brand plus the size of the cask. Furthermore millers were required to,

...put in...cask No. 1, the full...weight of two hundred and twenty-four pounds of flour; in...cask No. 2,...one hundred and ninety-six pounds of flour; in...cask No. 3, ...one hundred and sixty-eight pounds..., and in...cask No. 4, the full quantity...of ninety-eight pounds of flour....²⁹

The barrel became such an important item in the export trade that ship dimensions were often given in barrel capacity rather than by weight.³⁰ Coopers worked by the piece and it was estimated that they could earn as much as a dollar a day. At Brandywine the barrel makers had to board and clothe themselves.³¹ This they did from the money earned in their numerous shops. By 1815, the fifty to seventy coopers mentioned in Morse's account had a total of twenty-two shops in Wilmington

and Brandywine, and each mill was employing a hundred or more coopers to make their barrels.³² Their shops were the most important adjuncts of the flour milling industry.

Information concerning millwrights, blacksmiths and shallepmen is not as abundant as that describing millers and coopers. The millwright in his true capacity was a person concerned in building, installing and maintaining a mill and its machinery. At Brandywine Mills, one individual employed as a millwright was William Talley. Thomas Lea's ledger, from 1775 to 1783, shows Talley received remuneration as a millwright but gives no description of the work performed. Ledger entries record only that a millwright had been boarded for a period of time and paid for the number of days he worked. On one occasion three weeks board for a millwright cost Lea £5.8.0. At another time \$4.1.3 was paid a millwright. In 1796, a group of millwrights in the Wilmington area published an "Article of Agreement...for the rules and wages of mill-wrighting,...." In addition to specifying a minimum daily wage of "ten shillings per day" the articles stipulated the fee to be charged for some thirty-nine or forty millwrighting tasks. These included every conceivable type of job about a mill ranging from the mending of water wheels and flood gates to the installation of conveyers, elevators, and hoppers. The names of the following millwrights were affixed to this document.

JOSEPH DUTTON, Brandywine.
JAMES CORBETT, Wilmington.
JOHN HARLAN, Nottingham.
EMOR HARLIN, Do.
JACOB DERRICKSON, Brandywine.
GEORGE DAVIS, Do.
WILLIAM CLARK, Do.

JOHN SCOTT, Wilmington.
RICHARD THOMAS, Newtown.
DANIEL CALVERT, Brandywine.
GEORGE HINKSON, Providence.
JOHN EARL, Whiteslay-Creek.
SILAS GREEN, Concord.

These millwrights agreed to be retained by a miller when needed, worked at a daily wage, boarded if necessary, and paid for the amount of material they expended on the job.³³

A millwright's work was often performed by the mill owner. Samuel Canby's diary shows that he or his brother, William, executed such millwrighting tasks as freeing jammed mill wheels, cleaning mill gears, and repairing waste gates and head gates.³⁴ In a true sense the mill owner or operator was a well qualified and practicing millwright. In all probability, as the Brandywine Mills grew larger and larger, the actual performance of their owner's millwrighting skills decreased proportionately. In 1815, Miles' Register cited twenty established millwrights practicing their trade in Wilmington and Brandywine in a total of three shops.³⁵

George Bush, in his report on manufactures in 1791, listed twenty-eight blacksmiths plying their craft in the vicinity of Wilmington.³⁶ By 1815, there were eight blacksmith shops in the Borough and the Village.³⁷ Originally, in the early days, the blacksmith shop was associated directly with the mill. The old frame mill on the Barley Mill property, it will be recalled, had a blacksmith shop adjoined.³⁸ As time passed and the smith's talent was in greater demand, these individuals expanded their operations. A small shop run by one man could grow to the extent that the original operator might have a business with several apprentices or indentured assistants. In March of 1790, Thomas Reynolds, "The Miller's Friend," exemplified this when he announced that his business at Brandywine Mills would, in the future, be carried on "in a

more extensive manner than formerly." Reynolds made and repaired "Screws for raising millstones," and for raising timber wheels. He banded and stamped copper and iron and cut steel in the "neatest manner." In fact, Reynolds thought his business was so enlarged that "Orders from any part of the continent..." could be filled.³⁹ Seven months after expanding his operations Reynolds must have needed additional help to see it through. In October, 1790, he advertised for "A journeyman Blacksmith who...[could] be well recommended for his sobriety, industry, and ability in that profession,...."⁴⁰

The Brandywine Mills, in the 1790's, gave "employment to two hundred persons...."⁴¹ Forty-five individuals were engaged in the actual operation of the mills while the rest were engaged in subsidiary occupations necessary in the manufacture of flour.⁴² Millers, coopers, millwrights and smiths all have been briefly mentioned as part of this labor force. Along with them were "a sufficient number [of men] to man 12 sloops of about 30 tons each...."⁴³ These individuals were employed to transport wheat to the mills and carry flour to Philadelphia and elsewhere. These sloops, or shalleps, were owned by the Brandywine millers. Each mill had at least one. Samuel Canby frequently referred to these craft in his diary,⁴⁴ and entries in Thomas Lea's daybook were for payments to shallopmen. Independent shallopmen, or those who owned their own boats, carried wheat to and flour from the Brandywine. One such individual was Isaac Starr whose receipt book from 1760-1806 has frequent entries of payments made him by Thomas Shipley, Joseph Tatnall or the Mortons for wheat brought to the mills.⁴⁵ Nothing was found

to indicate whether or not the shallepmen in the employ of the millers were boarded or if they were solely wage laborers, clothing and feeding themselves.

In closing this examination of the type, number and relative importance of labor at Brandywine Mills, an allied industry must be mentioned. This subsidiary business was the manufacture of bolting cloth. The product was fully as important in the making of fine flour as were the millstones that ground the wheat. For many years at Brandywine, as elsewhere, bolting cloths were obtained either as products of home industry or imported. The bolting of flour is the process whereby the meal is separated from the bran. "The method of applying a sieve in the form of a bag to the work of the mill which could be shaken by machinery was first applied early in the 16th century."⁴⁶ Soon, special cloth was being woven for the purpose of bolting. These early cloths were made from wool yarn and the best variety came from England and from the fish-net factories of Holland.⁴⁷ The machine used for bolting was a hexagonal frame approximately twenty-two inches in diameter and ten feet in length. This frame supported bolting cloths of different mesh. Set on an angle and revolving from thirty-six to forty revolutions per minute this contraption served as a rotary sieve. The fine flour passed out first, then the middlings and finally the bran. A bolter was said to last five years even in constant use.⁴⁸

In the early days at Brandywine Mills home-woven and imported cloths served the miller's needs. In 1774, Daniel Byrnes advertised "for sale a complete assortment of fine, superfine, middling and course..."

bolting cloths "at his house in the borough of Wilmington." Byrnes may have purchased his supply from looms in the immediate area or imported them from abroad. His source was not stated; however, these cloths were held "equal in quality to any boulting cloth in Philadelphia."⁴⁹

In the 1790's, the expansion of the mills created a greater demand for bolting cloth. Robert Dawson answered this demand when, in 1794, he established a manufactory for making cloths in Wilmington.⁵⁰ Before the year ended the following appeared in the Delaware and Eastern-Shore Advertiser:

Whereas Robert DAWSON hath established in WILMINGTON, a Manufactory of BOLTING CLOTHS, and being desirous to have them recommended to the PUBLIC, has submitted to our examination, some of each kind, (they also having been tried by several MILLERS at this place). WE, who are the Subscribers, are willing to certify that those we have had experience of, or have tried, have ANSWERED WELL all the purposes of imported cloths; and as the SILK, as well as MANUFACTURE, is of our Own Country, it is our opinion, that they ought to obtain a Decided Preference to those fabricated in any foreign Country.

(Signed)

SAMUEL CANBY
TATNALL & LEA
SHIPLEY & POOLE

Brandywine-Mills, 12th mo. 9th, 1794.⁵¹

In July, 1795, the Brandywine millers attested the fact that Dawson's cloths were "superior to any foreign variety...."⁵² A year later Lewis and Seal, Hollingsworth and Morton, and John Elliot added their names to the other "millers at Brandywine" who used cloths manufactured by Dawson.⁵³

It was soon after this that Liancourt "visited the manufactory for

making bolting silk." He observed that in Dawson's establishment all the "labourers are Irishmen as well as the proprietor," and that the silks produced were suited to the different qualities of flour ground at the mills. The duke wrote that three workmen were employed by Dawson in producing the cloths and that the finished product was preferred by "all most all the millers...in preference to linen...." These silks manufactured by Dawson were cheaper, better and lasted longer than those sent from Holland.⁵⁴ The "PATENT BOLTING CLOTHS" of Robert Dawson not only bolted better in damp weather and helped produce finer flour, but also provided another source of employment along the Brandywine.

The mills, the immediate labor to operate them, the subsidiary industries and occupations that supported them, all contributed to making Wilmington an example of what V. S. Clark has entitled the "Beginnings of Industrial Towns."⁵⁵ Prior to the outbreak of the War of 1812 a slump in mill activity was felt in the flour mills on the Brandywine. In an article decriing the fact, the Delaware Statesman enumerated the labor force dependent on these flour mills for work. It should be recalled that, in 1791, twelve mills employed forty-five men for mill operations and fifty-nine coopers. Thirteen mills were in operation in May, 1812, and the Statesman revealed that it now required thirty men to operate each mill, thirty men to sail the vessels that belonged to the millers and one hundred coopers per mill to turn out barrels. Besides these individuals there were wheat growers, lumbermen (supplying barrel staves), and independent shallopmen, all dependent

on the mills. The Quaker millers were estimated to be putting \$32,000 in circulation each week and giving employment to a total of four thousand men. These figures are important for two reasons. First, they reflect the growth of the milling industry at Brandywine between 1791 and 1812. Secondly, they emphasize, more vividly than anything else, just what V. S. Clark meant when he designated Wilmington as an example of an industrial town in the making.⁵⁶

Certain geographical and physical factors complemented what has been previously described. These were primarily the accessibility of raw materials to the site of production and ready markets for a finished product. Both these were made possible by transportation -- land, river, and ocean. The story of Brandywine Mills is not complete unless one knows where the wheat that was ground came from, and where the flour produced was marketed.

CHAPTER VIII

MILLERS, MERCHANTS AND MARKETS

The river and the seas and the shipping upon them saved Wilmington from being a town merely of butchers of meat, of bakers of bread and makers of candlesticks.¹

The first major expansion of the milling industry occurred in the 1750's. Less than twenty years before this initial boom several Quaker families moved to Willingtown in Delaware. Among these newcomers to Delaware were the Shipleys (1735), the Tatnalls (1735-40), and the Canbys (1740). They came from Delaware, Bucks and Chester Counties in Pennsylvania to avail themselves of the natural advantages of this area and to give impetus to the town that had recently been staked out by Thomas Willing. These three families were instrumental in founding the Brandywine Mills. In concert with their in-laws and relatives, the Leas, the Mortons and the Pooles, they continued for over one hundred and fifty years to mill flour on the banks of Brandywine Creek. The sons and grandsons of William Shipley, Edward Tatnall and the founder of the mill community, Oliver Canby, all prospered as a true milling oligarchy. As good Quakers the early representatives of these families encouraged each younger generation to learn "some useful trade or skill." These closely related families, beginning with Oliver Canby in 1741, directed the attention of their sons to the art of milling flour. With no particular interest in higher education, since the education of a clergy was not essential to Quakerism, the Brandywine millers continued for successive generations the useful profession which

originally had been encouraged as a tenet of their faith. The names of these Quaker millers of Brandywine were signed to petitions that championed abolition, care of the poor, penal reform, and internal improvements (roads, canals and bridges). Locally, they fostered secondary education since it was essential that, along with a useful trade, a man "be able to read the Scriptures." Politically, during the years of the early Republic the residents of Quaker Hill were inclined to be Democrats. This was in opposition to their brethren in Philadelphia who were Federalists. In general, the millers of Wilmington seemed far more interested in business than in politics. The Brandywine Mills, from their inception in 1742 through their heyday between 1790-1815 until they ceased to exist in the last decade of the nineteenth century, were owned by individuals who could look directly to Oliver Canby, the Shipleys and the Tatnalls for the antecedents of their business.²

The expansion of the flour milling industry mentioned above was directly attributable to a considerable increase in the price of flour. Coincidental with this expansion was the beginning and development of the Brandywine Mills. A correlation is found in the fact that Wilmington was situated in the best grain producing area of America. The town was advantageously situated to tap the country's first great wheat belt, and to serve Philadelphia and New York, the two great flour ports of the late colonial and early national periods. This first wheat belt consisted of the following areas: at the north, the Hudson Valley; in New Jersey, an area extending from New York City to Philadelphia;

in Pennsylvania, the southeast portion of the state; in Delaware, most of the state; and finally, the Piedmont of Maryland, Virginia and northern North Carolina. Brandywine Mills, at one time or another, drew their supply of raw materials from all of these regions.³

Beginning with Oliver Canby's mill and continuing throughout the next seventy-five years, farmers brought their grain in shalleps or small boats from the New Jersey shore and from inlets along the Delaware and the Christina. The lower counties of Delaware were equally as accessible to small boat traffic. The principal creeks and streams of lower Delaware served as starting points for many a boat-load of wheat headed for the Brandywine Mills.⁴ The millers, as the size and importance of their mills increased, went farther afield to purchase their grain. They purchased "their corn [wheat] in Virginia, Maryland and in the state of New York..." and brought it to the mills in their own ships.⁵ Besides their own ships, vessels owned by others brought wheat to Wilmington. In the 1790's, countless sloops and brigs arrived from New York port laden with grain to be sold at Brandywine where cash was paid and where "the American price of wheat and flour was determined...."⁶

As a flour port Wilmington was dwarfed by Philadelphia. However, the ascendancy in the volume of business in favor of the latter should not convey the idea that Wilmington merchants were left only the crumbs of the trade. In April, 1792, a firm of local merchant-traders wrote to a prospective customer on the Dutch island of St. Eustatius in the West Indies. Their letter is an excellent statement of the advantages

offered by the Port of Wilmington, not only as a flour port, but as a seaport. The West Indian importer was told that,

we have found...Flour can, for the most part, be purchased here for six pence per barrel less than at Philadelphia...[since] there are many thousand barrels pass from hence to Philadelphia for a Market....[Furthermore] that Article can be shipped [from] here, clean and in Good order, where as it suffers abuse,... when sent to Market elsewhere,.... This we presume is an object worthy of attention, for Altho bright & Clean Flour should not always Command a greater price, it will at least Command a preference.

To this sound advice about the quality of flour fresh from the mill the Wilmington merchants added a reminder of the excellence of their town as a port facility.

We find that many times in Winter we can send our Vessels out from hence when it is not practicable from Philadelphia and always at the break-up of the Winter, our Vessels can depart several days sooner than from thence. The advantages derived from these circumstances, are too obvious to need a recital.

Along with the larger vessels that called regularly at the wharves lining the Christina came numerous smaller craft, either to bring wheat or to carry away flour. These ascended the Brandywine with the flour mills as their destination. When these small boats arrived alongside the mills, entries in mill ledgers showed only that wheat was purchased "from a stranger," or that cash was paid "to a Jersey man" for so many bushels of wheat.⁸ Samuel Canby recorded the arrival of shallops and sloops usually when they were the first of the spring or the last of the fall to ascend the creek before the ice shut them out. "John Starr," wrote Canby, "came in the creek this morning with wheat for Joseph Tatnall from Duck Creek," but unfortunately the commonplace

arrivals failed to interest Samuel and only an occasional wheat purchase is noted.⁹

Grain arrived at the mills by land as well as water. Conestoga wagons brought grist to the mills from the fertile fields of southeastern Pennsylvania. Quakers and Pennsylvania Germans from Dauphin, Lancaster, York, Berks and Chester Counties drove their "inland ships" to Brandywine in groups of twenty or thirty. The wagons and their six-horse teams congested streets for blocks at a time. The noise of wheels, animals and drivers was a bedlam as each wagon waited its turn to come up beside a mill to be unloaded. Rather than come all the way into Wilmington the wagons from Lancaster could, if desired, be stopped at Newport where their wheat was transferred to shallops destined either for the mills of the Leas, Tatnalls or Canbys, or for Philadelphia.¹⁰

At the Brandywine Mills thousands of bushels of wheat were purchased at a time.¹¹ Out of every one hundred bushels could be extracted nineteen barrels of fine flour, two barrels of common (second quality), three barrels of middling (third quality) and "thirty bushels of bran." On an average, in the 1790's, for every one hundred bushels of wheat, 5,910 pounds of marketable product was derived. In this process there were ninety pounds of waste or unmarketable residue.¹² The merchant miller with modern equipment (Evans') could expect a yield of 64.33 per cent superfine flour from the average parcel of wheat processed.¹³ Liancourt estimated in time of peace the common price paid by merchant millers for a bushel of wheat was seven shillings. In time of war, or great foreign demand, as high as thirteen or fourteen shillings was

paid for a bushel.¹⁴ The Canby diary, Lea's ledgers and prices current at Brandywine Mills confirm estimates given by Liancourt. In these sources the lowest and highest prices paid per bushel varies from four shillings to twelve shillings and six pence. From 1790 to 1815, three hundred thousand to five hundred thousand bushels of grain a year were ground at Brandywine. In monetary value this represented a half million dollars worth of flour marketed annually.¹⁵

At Brandywine three types of flour were produced -- superfine, common and middling. Superfine was the product most in demand. In addition, ship bread and corn meal were staple export items.¹⁶ This export trade in marketable flour was as intimately a part of the millers' business as was the import of grain to their mills. An idea of the volume and importance of the flour trade may be seen from June 1, 1788, to June 1, 1789. Out of the Port of Wilmington, in this interval, went 21,783 barrels of superfine flour, 457 barrels of common, 256 barrels of middlings, 346 barrels of ship stuff, 238 barrels of corn meal and 5,958 bushels of Indian corn. In the next year at Brandywine there were produced "50,000 barrels of superfine flour, 1,354 barrels of common, 400 barrels of middling, as many shipstuff and 2,000 barrels of corn meal."¹⁷

Some indication as to the lucrativeness of flour milling can be realized when, in the mid-1790's, the finest flour in the local markets sold for eight to twelve dollars a barrel and the poorest for five dollars.¹⁸ The newspapers in Wilmington and elsewhere carried the current price of flour from all parts of the world as reported by ship

captains and merchants. American superfine flour, in 1790, sold in Sicily for twenty-four shillings (sterling) per 112 pounds, and in Liverpool the same quantity brought nineteen shillings. In West Indian markets, from 1796 to 1799, the price of flour of the best quality varied from eleven to thirty-four dollars per barrel, while in France, in 1795, a cargo of Wilmington flour sold for thirty dollars per barrel when the same flour was selling in Wilmington for twelve! The Brandywine Mills and their owners produced this product that provided the basis of Wilmington's commerce. In this commerce the convenience of river and ocean transport played a major role.¹⁹

In America, in the eighteenth century and first decade of the nineteenth, merchant milling was second only to lumbering as the most profitable industry providing products for export. The markets that demanded more American flour than any other were the sugar plantations of the West Indies. Before the Revolution the British West Indies "were mainly fed from this country," and after our independence was achieved, the French, Dutch and Spanish islands were provisioned from North America. This demand for flour caused milling centers to be created. The Brandywine Mills was one of the earliest of these, along with other centers at Lancaster, Middletown (Pa.) and on the Wissahickon. All contributed their share of the 250,000 barrels of flour that, by 1772, was being exported annually from Philadelphia and the Delaware River region. The importance of the flour barrel to the trade of colony and nation can not be too greatly stressed.²⁰

Brandywine flour was sent either to Philadelphia for transshipment

overseas or was shipped directly out of Wilmington. "Nearly all the leading citizens, from 1741 to 1775, owned or were interested in one or more sailing vessels...."²¹ In the van of leading citizens, along with the well known commercial and merchant interests, were the Quaker millers at Brandywine. From the very beginning they owned or were interested in seagoing vessels. Several alternatives were open in the marketing of their flour. They could ship it to Philadelphia or New York, ship it directly to foreign markets, or sell the flour they produced to local (Wilmington or Philadelphia) middlemen who disposed of it as they saw fit. The latter alternative was most frequently employed. The reason was the obvious advantage that commercial and maritime interests had over a milling fraternity whose interest in trade and commerce was only secondary. The merchant-trader, however, neither excluded the merchant-miller from "adventures" in commerce on the high seas nor from participation in the flour trade.

In 1741, the brig "Wilmington" sailed for Jamaica. This vessel was jointly owned and laden, and her voyage has been considered the first of record from the Port of Wilmington.²² It is interesting that her cargo consisted of flour, ship bread and barrel staves. The driving force behind the venture was William Shipley, the progenitor of several generations of Brandywine millers. It is of further interest that a year later, on a subsequent voyage, Oliver Canby was paid \$14.7 "for One tun of Flour on bord the new Brig." If Canby's interest aboard the "Wilmington" is taken as the first ocean venture by the millers at Brandywine then it marked a beginning and set a precedent that was

long followed by his successors. The "One tun" (large-sized barrel) shipped in 1742 would, by 1789, have increased to some 21,783 barrels of superfine flour exported from Wilmington.²³

Through the years, as their business expanded, the proprietors of the flour mills had a constant interest in the shipping trade. In 1749, Thomas Shipley and Oliver Canby were among the joint owners of the sloop "Dolphin." The ship "Recovery" in 1752, had Oliver Canby as one of her owners, and in 1758, Thomas Canby, Jr., had an interest in the sloop "Sally." The fifty-ton brig "Union" in 1767, was owned in part by William Shipley, Jr., as was the brig "Venus" in 1770. In the same year Joseph Tatnall and Joseph Shallcross each had a quarter interest in the brig "Success." All of these men were merchant-millers. All had a quarter or an eighth interest in the above vessels. Of the ships listed, all were built in Wilmington.²⁴ There is no doubt that there was "a smart trade carried on from...Wilmington to the West Indies Islands," and there is no question that the millers were gainfully involved.²⁵

The years immediately preceding the Revolution were busy ones for the trade-conscious millers. From 1773-1776, they were mutually concerned in "Adventures" aboard the brigs "Nancy" and "Dolphin." In April and June, 1773, Thomas Lea had successively, a quarter interest in the "Nancy" and the "Dolphin." His input, financially, for "fitting out" these vessels was, in each case, slightly over four hundred pounds. Besides Lea, John Morton, Joseph Tatnall, Vincent Gilpin and William Pyle were at one time or another, between 1773 and 1776, concerned in

the activities of these two brigs. By April, 1775, the "Nancy" had made seven voyages and was fitting out for an eighth. Previously she had carried individual consignments of flour and lumber to the West Indies and had brought home, among other things, quantities of Antigua rum. On her eighth voyage she was to sail to Lisbon, then to St. Christopher and then home. Thomas Lea, for example, had aboard the "Nancy" as his share of the cargo, 110 barrels of superfine flour and 20 half barrels; 53 barrels of common; 16 barrels of middlings; 27 barrels of ship stuff; 25 barrels of ship bread and 1/4 of the lumber on board. In exchange for her cargo out, the "Nancy" brought home such varied items as wine, rum, sugar, molasses, coffee, and chocolate to be sold in the millers' behalf by commission merchants either in Wilmington or Philadelphia. The same story may be told of the "Dolphin." She carried out cargoes identical to those of the "Nancy" and brought home the same. The trading and sailing routes taken on these several voyages were similar. A frequent course was one that took the brig out of Wilmington across the Atlantic to Lisbon, to the Canaries, or the Azores and from thence on favorable winds back across to the West Indies where she touched at random, trading wherever the markets were best and filling up her lading for her return home to Wilmington.²⁶

The advent of war sharply curtailed these ventures, at least as reflected by Lea's daybook. It was not until after the war that a joint account book of Lea and Tatnall showed a renewal of their maritime activities. Only once after 1776 does a shipping entry appear in Lea's

bookkeeping. This was in 1777. On April 11, £113.11.3 was paid by John Morton and Thomas Lea to James Marshall for 1/8 interest in the sloop "Freemason."²⁷ In March of 1780, Samuel Canby noted that Captain Davies had arrived from Hispaniola in a vessel belonging to Rumford and Company. The vessel brought in sugar, coffee, and cotton, but no indication was given that Canby had an interest in her.²⁸

An excellent example of the use made of the Delaware River by the millers occurred in March, 1780. On the eleventh, Samuel Canby loaded Shipley's shallop with 33 barrels of corn meal, 12 barrels of superfine flour and several barrels of ship stuff. This was done in the afternoon and at two o'clock in the morning on the twelfth the shallop departed Brandywine Mills for Philadelphia. It arrived there at four in the afternoon. Canby sold what he had aboard to Timothy Sloan and received £90 per hundred weight for his superfine flour. Except for the exceptional price received, this excursion was typical of the countless voyages that conveyed flour from the Brandywine to Philadelphia.²⁹ Canby's diary entry made clearer Morse's statement that it was nothing for a cargo of flour to be "taken from the mills and delivered at Philadelphia the same day."³⁰ Morse failed to mention just how long a day it was.

The years after the Revolution brought a revival in trade and commerce, and "between 1790 and 1807 seafaring and trading interest dominated the economic life of the country."³¹ In Wilmington, in "the last decade of the eighteenth century and the first of the nineteenth..." commerce flourished as it never had before nor would again.³²

Nationally, foreign trade was stimulated by the formation of a strong federal government, the wars following in the wake of the French Revolution and the breakdown of the British West Indian trade regulations. American flour was again in demand both in Europe and in the West Indies. Locally, merchants and millers exported this product to help satisfy a hungry market. Wilmington, a city of mills and ships and favorable situation, had her commercial interests further motivated by the yellow fever epidemics that raged in Philadelphia in the mid-1790's. During this period the merchant-traders of the fever-ridden metropolis moved down the Delaware to Wilmington and established themselves in "every nook and corner" of the town. At a time when "ships crowded the wharves" and the odor of "boiling tar and pitch" permeated the air, the owners of the Brandywine Mills not only supplied the product that made local commerce important but also participated actively in foreign trade.³³

An account book kept by Lea and Tatnall from 1785 to 1800 clearly indicated their connection with maritime Wilmington.

Mostly utilizing the brig "Christianna" Joseph Tatnall and Thomas Lea dealt with merchants of St. Christopher, Antigua, Martinique and Surinam. From these ports came rum, sugar, and coffee exchanged for the flour sent.³⁴ During this period many ports besides Wilmington enjoyed active relations with the West Indies. Because of this it was of particular interest to find a Cape Francois importer writing to a merchant house in Wilmington specifically requesting Canby flour.³⁵ The West Indies were not the only markets where the millers did business.

They shipped flax-seed to Ireland and received linen in return. When ocean commerce was not pursued there was always the river and the coasting trade. In Philadelphia, the Daves brothers were dealt with, and in New York City, Smith and Wyckoff handled the business of Tatnall and Lea.³⁶

Thus, the West Indian, trans-ocean and the coasting trade were followed by the eighteenth century industrialists at Brandywine. They simultaneously operated their flour mills and acted as merchant-traders. In every way they typified the business man of the times with a universality of interest and a multiplicity of ventures. These millers, from the time of Oliver Canby through the ensuing seventy-five years, availed themselves of their strategic geographic location. The success of the Brandywine Mills may be attributed as much to the water that lay in front of them as to that which turned the wheels and provided the power. Power from fast falling streams was no novelty in eighteenth century America. Many streams could have provided the same power as the Brandywine. The difference was that few opened at their mouth upon a natural highway that led straightway to the markets of the world. It was only natural that the merchant-millers on the tidewater of the Brandywine would travel it in small ships loaded to capacity with the product they manufactured. When, in 1814, it was descriptively written that "a great part of the immense trade of these mills is carried on by navigation,"³⁷ it was in reality being stated why Brandywine Mills "From the time they were built...held their place as the finest mills on the continent, supplying the bulk of exports to the West Indies and other places."³⁸

Without the advantage of navigation there would have been no immense trade nor would there have been the renowned and celebrated mills at Brandywine. Ultimately, it was this facility of operation -- ship to mill to market -- that caused the "manufacture of flour...[to be] carried on to a higher degree of perfection in Delaware than in any state in the Union."³⁹

CONCLUSION

The history of the Brandywine Mills, 1742-1815, presents several conclusions. First, these mills marked a beginning of extensive merchant-milling practices. Actually, they commenced the era of the milling center whose location was, and still is, to be found in the heart of the contemporary wheat belt. Second, these mills on the Brandywine were built in the colonial period. By the time of the Revolution and the new republic they were firmly established institutions. Third, during the Revolution the mills below the bridge on the tidewater of Brandywine Creek were military objectives of logistical import to both the British and American armies as a source of supply. Fourth, the Brandywine Mills were objects of admiration. They were the subject of comment for many travelers, both foreign and domestic, who saw them in operation. Here, on the banks of the Brandywine stood mills and machinery comparable to "any similar scene in England" or in Europe -- a tribute to American ingenuity and the good management of the Quaker miller. Fifth, these mills, perhaps more than any others, demonstrated to advantage the genius of Oliver Evans and his new inventions used in the manufacture of flour. Sixth, milling activities, principally of these great flour mills and the labor they employed, served to create in Wilmington in the period 1790-1815, an example of the early beginnings of industrial towns. Seventh and last, a combination of ready power, ease of transportation through the accessibility of river, road and ocean, and an active merchant interest made Brandywine superfine flour the product of renown from the state of Delaware. It was not until

well into the nineteenth century that DuPont Black Powder replaced this product as the one synonymous with the name of the stream.

Any conclusions drawn from a history of these mills could be adequately summarized by a paragraph from a petition to the Legislature of Delaware in January, 1816. The conclusions reached in this paper must be the same as those reached by the petitioners, namely that, in the year 1816,

The utility and magnitude of the Mills and Works upon the Brandywine are not more celebrated than felt in every part of the United States, and the trade, industry, and importance of the State of Delaware are greatly dependent upon their prosperity. The Farmer as well as the merchant and mechanic, in every part of the State, have an interest in facilitating these operations, and would sensibly feel any blow which might interrupt their business.⁴⁰

APPENDIX

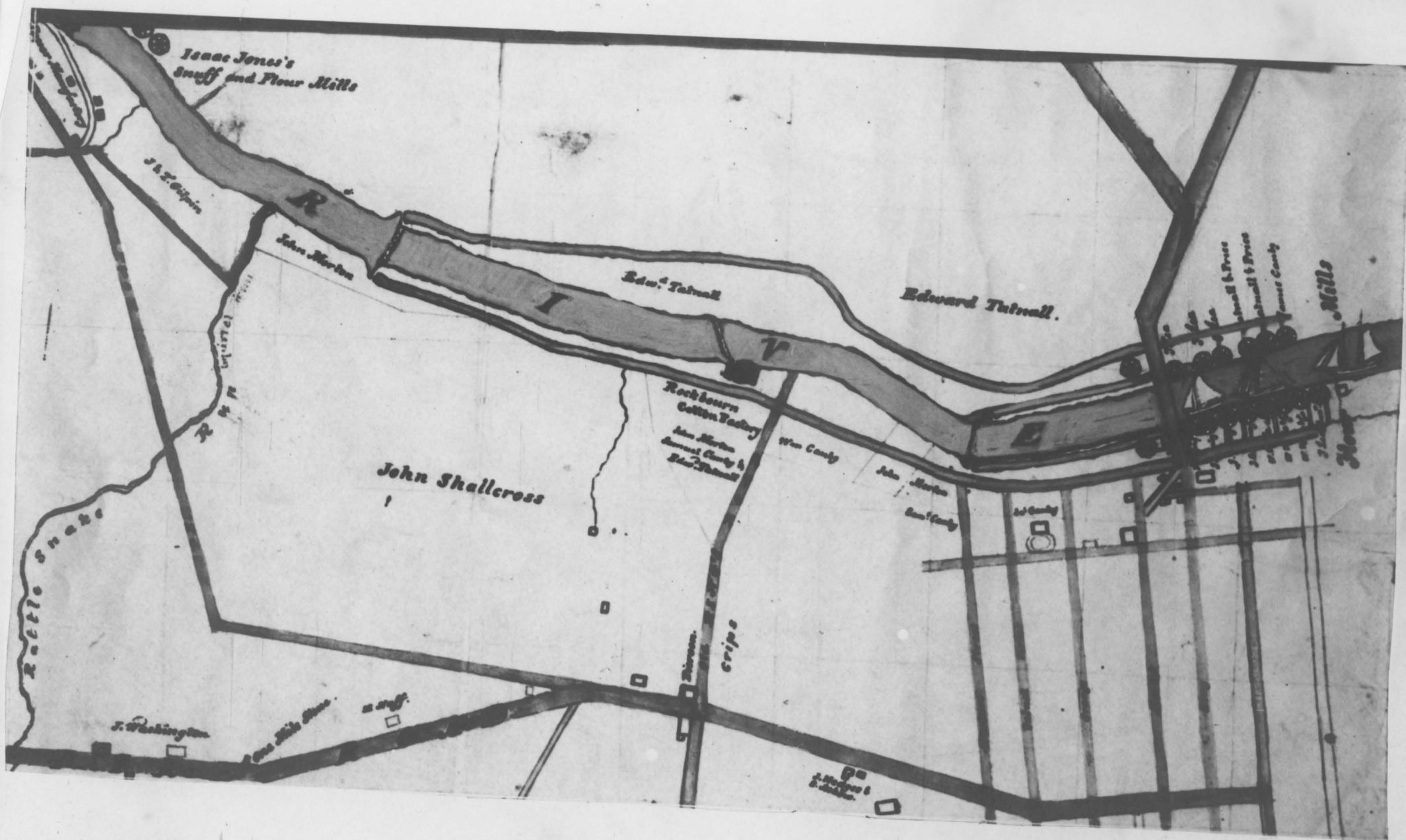
PLATE I

GROWTH OF THE BRANDYWINE MILLS

1762. 4 mills. Oliver Canby had founded an industry and a new mill race was built "to carry water down to the tide for four mills." [Pennsylvania Gazette, December 2, 1762.]
1776. 8 mills. Nicholas Cresswell counted "8 of them in a quarter of a mile, so convenient that they can take the grain out of the Vessels into the Mills." [Journal of Nicholas Cresswell, 160.]
1796. 12 mills. They were described by an English traveler as comparable to "any similar scene in England." [Twining, Travels in America, 69-70.]
1815. 14 mills. The mills at tidewater had reached their zenith and a national weekly cited them as "capable of manufacturing 500,000 bushels per annum." [Niles' Weekly Register IX (1815), 92-93.]

PLATE II

GEOGRAPHIC LOCATION OF THE BRANDYWINE MILLS



This survey map shows the Brandywine Mills and their owners in addition to the two long mill races built to implement the tide-water mills. (Survey of Brandywine mill sites, c. 1815-1820. P. S. du Pont Collection, Longwood, Pennsylvania.)

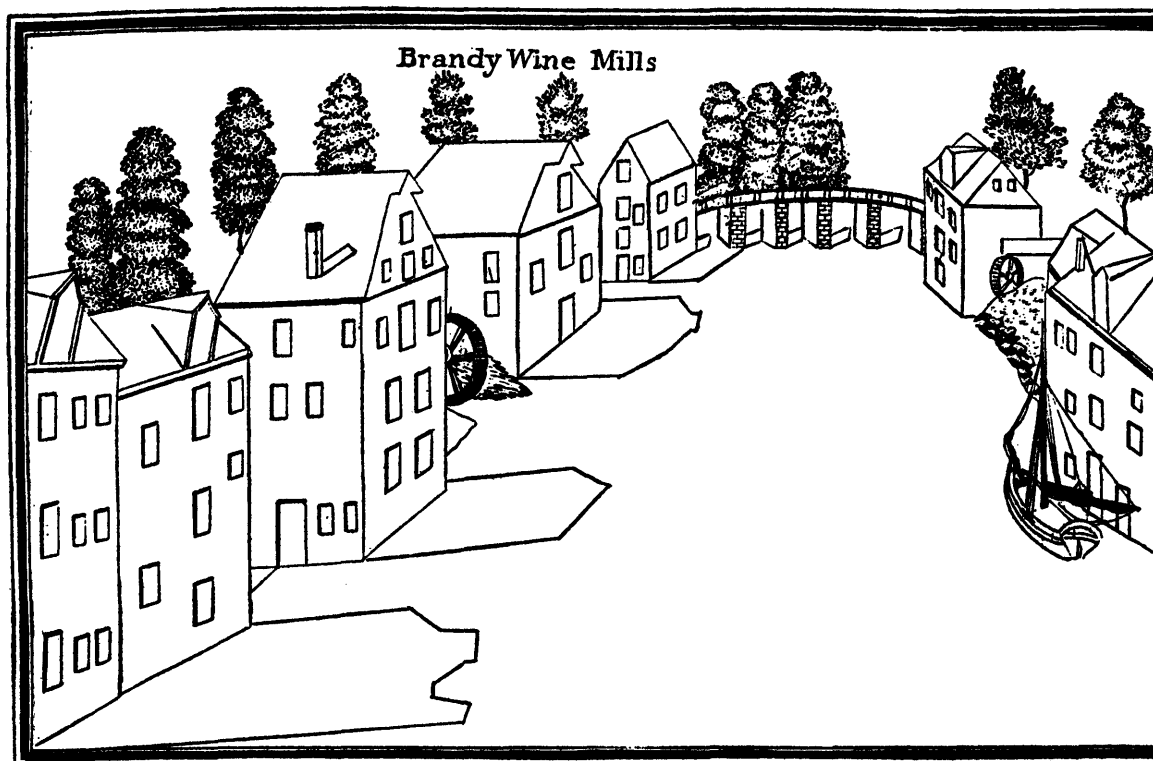
PLATE III

THE BRANDYWINE MILLS AND THEIR OWNERS, c. 1815

Brandywine Bridge		
J. Shipley - 0	0 - T. Lea	
J. Canby - 0	0 - T. Lea	
J. Canby - 0	0 - T. Lea	
J. Cuming - 0	0 - Tetnall and Price	
W. Peele - 0	0 - Tetnall and Price	
W. Peele - 0	0 - J. Canby	
W. Peele - 0		
T. Lea - 0		
BRANDYWINE CREEK		

PLATE IV

THE BRANDYWINE MILLS, c. 1804



An inset on a map of Wilmington c. 1804, from a
copper-plate in the Historical Society of Delaware.

PLATE V

AN ARTIST'S CONCEPT OF THE BRANDYWINE MILLS

"The Lea Mills on the Brandywine," undated; attributed to Albert Thatcher, an artist working in Wilmington in the late 19th century. The original is in the Hagley Museum, Wilmington, Delaware.

PLATE VI

AN ARTIST'S CONCEPTION OF THE BRANDYWINE MILLS



"The Brandywine Mills," c. 1840, by
Bass Otis, owned by Beatrice T. Rumford.

FOOTNOTES TO CHAPTERS

FOOTNOTES TO INTRODUCTION

THE BRANDYWINE MILLS IN PERSPECTIVE

1. J. Thomas Scharf, History of Delaware, 1609-1888 (Philadelphia, 1888), II, 786.
2. Charles B. Kuhlmann, The Development of the Flour-Milling Industry in the United States (Boston, 1929), 19-20.
The early mills mentioned are discussed at length in Samuel H. Needles, "The Governor's Mill, and the Globe Mills, Philadelphia," in Pennsylvania Magazine of History and Biography, VIII (1884), 279-299; and Henry D. Paxson, Sketch and Map of a Trip from Philadelphia to Tinicum Island, Delaware County, Pennsylvania (Philadelphia, 1926), 122-137.
3. Scharf, II, 786.
4. Kuhlmann, Flour-Milling Industry, 33.
5. Henry S. Canby, The Brandywine (New York, 1941), 80-81; Amos C. Brinton, "Early Mills in Delaware," in The Millers' Review (January 15, 1900), 376.
6. Robert Proud, The History of Pennsylvania, in North America,... Written principally between the Years 1776 and 1780 (Philadelphia, 1798), II, 255.

7. Duc de la Rochefoucault Liancourt, Travels through the United States of North America, 1795, 1796 and 1797 (London, 1800), I, 13-15.
8. Tench Coxe, A View of the United States of America...between... 1787-1794 (Philadelphia, 1794), 313.
9. Liancourt, Travels, I, 90-92; J. P. Brissot de Warville, New Travels in the United States of America Performed in 1788 (London, 1792), 188.
10. Liancourt, Travels, IV, 156-158.
11. Robert G. Albion, The Rise of New York Port, 1815-1860 (New York, 1939), 80.
12. Kuhlmann, Flour-Milling Industry, 38. In addition see, 28-29, 47-54, and 71-72. A good description of the Ellicott Mills near Baltimore appears in Joseph Scott, A Geographical Description of the States of Maryland and Delaware... (Philadelphia, 1809), 80-82, 90-91. In comparing the Ellicott Mills on the Patapsco to those on the Brandywine Scott found the former superior, but only slightly so, pp. 170-171. An account of the Colledge and Maxall mills may be seen in Arthur G. Peterson, "Flour and Grist Milling in Virginia: A Brief History," in Virginia Magazine of History and Biography, XLIII (1935), 97-108.
13. J. Leander Bishop, History of American Manufactures from 1806-1860 (Philadelphia, 1861-1868), I, 145.

FOOTNOTES TO CHAPTER I

THE RISE OF A MILLING CENTER, 1742-1775

1. Sydney G. Fisher, The Quaker Colonies: A Chronicle of the Proprietors of the Delaware, in The Chronicles of America Series, Allan Johnson, editor (New Haven, 1919), 226-227.
2. Kuhlmann, Flour-Milling Industry, 19.
3. For statements concerning early mills see Amos C. Brinton, "Early Mills in Delaware," in The Millers' Review (December 15, 1899), 340; and Canby, Brandywine, 82-83. Kuhlmann, Flour-Milling, 26, gives a contrast in the business done by the early and the later mills.
4. Canby, Brandywine, 82; Scharf, II, 786; and Henry S. Canby, Family History (Cambridge, 1945), 23, all give information relating to the Stedham and Vandever mill properties. A corrected edition of Canby, Family History, is in the Historical Society of Delaware. The statement describing the Old Barley Mill is from Brinton, "Early Mills in Delaware," in The Millers' Review (December 15, 1899), 340. Cornelius Empson was another land owner on the north side of the creek along with Vandever. Empson's property was just above Vandever's. Empson had a saw mill in operation on the Brandywine in 1705 and 1706. For the information concerning Empson's mill see Horace Burr, translator, The Records of Holy

Trinity (Old Swedes) Church, Wilmington Del., from 1697 to 1773
(Historical Society of Delaware, 1890), 109, 128-129.

5. Canby, Brandywine, 82. According to Scharf, II, 786, these mills were located on the south side of the stream between French and Adams Street.
6. Scharf, II, 786, cites a deed dated May 1, 1729. In addition see Anna T. Lincoln, Wilmington, Delaware: Three Centuries under Four Flags (Rutland, Vermont, 1937), 264.
7. Scharf, II, 633; Canby, Family History, 20-23.
8. R. Alonso Brock, editor, "Journal of William Black, 1744," in Pennsylvania Magazine of History and Biography, I (1877), 233.
A description of Wilmington, May 25, 1744.
9. Canby, Family History, 23.
10. This mill stood just below the northeast termination of Orange Street. See Scharf, II, 786; H. C. Conrad, History of the State of Delaware (Wilmington, 1908), II, 418; Canby, Brandywine, 83; Canby, Family History, 20, 23; and John A. Munroe, Federalist Delaware, 1775-1815 (Rutgers University Press, 1954), 28.
11. "Extracts from the Letter-Books of Lieutenant Enos Reeves," in Pennsylvania Magazine of History and Biography, XXI (1897), 239.
Letter dated October 7, 1781.

12. Agreements and survey of lands through which a mill race is prayed, August 9, 1760, Tatnall Papers (MSS in Historical Society of Delaware). In these agreements Thomas Shipley was declared half owner of Oliver Canby's old mill. The other half belonged to the estate of Oliver Canby, deceased.
13. "Governor Thomas Pownall's Description of the Streets and Main Roads about Philadelphia, 1754 -- Road from Philadelphia through the Lower Counties....," in Pennsylvania Magazine of History and Biography, XVIII (1894), 217.
14. Scharf, II, 786.
15. Agreements and survey of lands..., August 9, 1760; Elisabeth Montgomery, Reminiscences of Wilmington (Philadelphia, 1851), 14. Shipley's mill, when built, was the first below the post road on the south bank of the creek.
16. Agreements and survey of lands..., August 9, 1760; and Condemnation of land through which mill race is to pass, August 19, 1760. The executing of such papers was prescribed by law. In 1719, the "Method of obtaining adjacent land for the convenience of a mill" had been established in "An Act to encourage the building of good mills in this government." See Laws of the State of Delaware, from 1700 to 1797 (New Castle, 1797), I, appendix, 53-54. The statement concerning Moore's mill and dam is from Brinton, "Early Mills in Delaware," in The Millers' Review (January 15, 1900), 377.

17. Agreements and survey of land..., August 9, 1760. This source gives the course of the long race, the mills to be built upon it and the names of the several owners of these mills.
18. Canby, Brandywine, 84.
19. Pennsylvania Gazette (Philadelphia), December 2, 1762, p. 1; Victor S. Clark, History of Manufactures in the United States, 1607-1928 (Washington, 1929), I, 185.
20. Bishop, History of American Manufactures, I, 144. In 1762, William Moore left Wilmington and the Brandywine for Baltimore and the Patapsco. There he was a predecessor of the Elliscotts, ibid., I, 146-147.
21. Agreements and survey of lands..., August 9, 1760.
22. Laws of Delaware, I, 330, 411-417, and Scharf, I, 415; II, 670-671, are the sources of information concerning the King's Roads, Vandever's Bridge (at Eleventh Street) and the new bridge across the Brandywine. Map of the lower Brandywine showing the Brandywine Mills drawn by Amos C. Brinton (Historical Society of Delaware), states that the new bridge completed in 1765 was 156 feet in length and 36 feet wide, "Built on abutments at the ends and Four Piers." For laws designated to control and encourage milling see, Laws of Delaware, I, 535-537, and appendix, 53-54, 73-74. The first such law enacted was "An Act to encourage the building of good mills in this government...passed in 1719." This was followed

by a supplementary act passed in October of 1760 and by an entirely new law passed November 6, 1773 "for the encouragement of the owners of mills within this government,...." In Clark, History of Manufactures, I, 63, it is stated that in the "early days mills were considered as affected with a public interest,...." Although nothing was found to directly substantiate the following it seems reasonable that the King's Road and new bridge across the Brandywine at the site chosen was as much a means to encourage the milling interest located there as to satisfy the demands of topography. Kuhlmann, Flour-Milling Industry, 35, states that a "characteristic of the colonial period was the extent to which the industry was controlled by the government." A road advantageously routed and a waterway opened would be an excellent example of governmental control designed to facilitate industrial development.

23. Benjamin Ferris, History of the Original Settlements on the Delaware...and a History of Wilmington, (Wilmington, 1846), 302-304.
24. See Canby, Family History, 41; Scharf, II, 905; Map...showing Brandywine Mills drawn by Brinton (Historical Society of Delaware); and Bishop, History of American Manufactures, I, 145, for geography of the area, the Vandever mill and the use made of it as a bolting mill.
25. Pennsylvania Gazette, April 16, 1761, p. 3.

26. Scharf, II, 786; Canby, Family History, 41.
27. Scharf, II, 786-787.
- X 28. Laws of Delaware, I, 510-513.
29. Map...showing Brandywine Mills drawn by Brinton (Historical Society of Delaware).
30. Montgomery, Reminiscences, 14; Agreement concerning water rights of Jehu and Samuel Hollingsworth, c. 1760; Tatnall Papers; and Pennsylvania Gazette, December 2, 1762, p. 1.
31. Scharf, II, 786-787; Canby, Family History, 26; and Conrad, History of Delaware, II, 418-419.
32. Canby, Family History, 26.
33. Canby, Brandywine, 88.

FOOTNOTES TO CHAPTER II

WAR AND THE BRANDYWINE MILLS, 1775-1783

1. John Richard Alden, The American Revolution, 1775-1783 (New York, 1954), 213.
2. Christopher L. Ward, The Delaware Continentals, 1776-1783 (Wilmington, 1941), 9.
3. Lea Mills, daybook ledger, February 20, 1775 -- September 27, 1783 (MS in Historical Society of Delaware), entries May 8, 9, 1776.
[Hereafter cited as Lea, daybook ledger, 1775-1783.]
4. Christopher L. Ward, The War of the Revolution (New York, 1952), I, 334-335.
5. Canby, Family History, 40, 41, 43. The house was built in 1765 and is now standing at 1803 Market Street, Wilmington.
6. Scharf, II, 787.
7. Ibid., II, 787.
8. Lea, daybook ledger, 1775-1783, entry for January 1, 1781.
9. Ward, War of the Revolution, I, 354.
10. Ward, Delaware Continentals, 212-213.
11. Ibid., 513-514.

12. Ward, War of the Revolution, I, 341-353; II, 543-555.

These pages trace the chronology of events from the landings of Howe at the Head of Elk through Valley Forge.

13. Willard O. Misheff, "Business in Philadelphia During the British Occupation, 1777-1778," in Pennsylvania Magazine of History and Biography, LXI (1937), 168-169.
14. "Washington to Colonel Mordecai Gist, Wilmington, August 31, 1777," in John C. Fitzpatrick, editor, The Writings of George Washington, 1745-1799 (Washington, 1933), IX, 151.
15. "Washington to Potter, October 31, 1777," in ibid., IX, 474.
16. "Washington to Sir William Howe, October 6, 1777," in ibid., 314-315.
17. "Washington to Potter, October 31, 1777," in ibid., IX, 475.
18. "Potter to Washington, November 5, 1777," in Pennsylvania Magazine of History and Biography, XVIII (1894), 482.
19. "Washington to Potter, November 5, 1777," in Writings, X, 11.
20. "Potter to Washington, November 8, 1777," in Pennsylvania Magazine of History and Biography, XIX (1895), 73-74.
21. Scharf, II, 787.
22. "Captain Craig to Washington, Frankfort, 18 November, 1777," in Pennsylvania Magazine of History and Biography, XIX (1895), 483.
23. "Washington to Smallwood, Gulph Mill, December 19, 1777," in

Writings, X, 171.

24. Rev. Joseph Brown Turner, editor, "The Journal and Order Book of Captain Robert Kirkwood of the Delaware Regiment of the Continental Line," in Papers of the Historical Society of Delaware, LVI (1910), 272.
25. "Washington to Smallwood, Valley Forge, December 29, 1777," in Writings, X, 219.
26. Scharf, II, 787.
27. Lea, daybook ledger, 1775-1783, entries for August 5, 6, 1778.
28. Ward, War of the Revolution, II, 571-572.
29. Samuel Canby, Diary, November, 1779 -- December, 1796 (MS in Yale University Library), entry for November 23, 1779.
30. Ibid., April 23, 1780.
31. Ibid., December 8, 1781.
32. Ibid., December 8, 1781.
33. "Extracts from the Letter-Books of Lieutenant Enos Reeves," in Pennsylvania Magazine of History and Biography, XXI (1897), 239.
Letter dated October 7, 1781.
34. Samuel Canby Diary, 1779-1796, entry for January, 1783 (day not indicated). Apparently Dr. Capelle enjoyed Canby's hospitality and life in Wilmington for he became a permanent resident after the

Revolution, remaining until his death in 1796. References to Dr. Capelle may be found in Munroe, Federalist Delaware, 146n, 149, 185; Scharf, I, 481.

FOOTNOTES TO CHAPTER III

CONTEMPORARIES, FOREIGN AND DOMESTIC, VIEW THE MILLS,

1783-1815

1. Thomas Twining, Travels in America 100 Years Ago (New York, 1894), 69-70.
2. Directory and Register for the Year 1814...of the Borough of Wilmington and Brandywine. Printed by R. Porter (Wilmington, 1814), v-vi.
3. Johann David Schoepf, Travels in the Confederation, translated and edited by Alfred J. Morrison (Philadelphia, 1911), I, 377-378.
4. Winslow C. Watson, editor, Men and Times of the Revolution; or, Memoirs of Elkanah Watson...from the Year 1777-1842 (New York, 1856), 277.
5. Louis B. Wright and Marion Tinling, editors, Quebec to Carolina in 1785-1786; Being the Travel and Observations of Robert Hunter, Jr., A Young Merchant of London (San Marino, California, 1943), 176.
6. Samuel Thornley, editor, The Journal of Nicholas Cresswell, 1774-1777 (New York, 1924), 160.
7. Lea, daybook ledger, 1775-1783, entries for "New Building" November, 1775 -- January, 1777.
8. Wright and Tinling, Quebec to Carolina in 1785-1786..., 176.

9. Samuel Canby Diary, 1779-1796, entries for December 15, 1781; January 23, 1782; July 26, 1782; and September 14, 1782.
10. Brissot de Warville, New Travels...1788, 188, 421-422.
11. Laws of Delaware, II, 813.
12. Ibid., II, 814. Unfortunately none of these broadsides or handbills were located.
13. Ibid., II, 814-815; Munroe, Federalist Delaware, 124.
14. William Cobbett, Percupine's Works;... (London, 1801), VII, 168.
Besides this characterization of Tilton, Cobbett presents some extremely acid descriptions of the Quaker residents of Wilmington. Not all the Quakers in Wilmington, but the vast majority, according to Cobbett, were different from "all other Quakers in America: they frown and look fierce, and, if contradicted..., not honey, but wormwood, drops from their lips: they are a sort of Puritan in a Quaker's dress." Ibid., V, 41. In addition see Ibid., VII, 165-168.
15. Dr. James Tilton, "Queries," in The American Museum, or Universal Magazine, V (April, 1789), 381.
16. Delaware Gazette (Wilmington), February 6, 1790, p. 2.
17. "Journal of William Loughton Smith, 1790-1791," in Massachusetts Historical Society Proceedings, LI (1917-1918), 58.
18. "Return of Manufactures, Tradesmen &c in Wilmington Delaware & its Vicinity including Brandywine Mills...November 28, 1791," in

in Alexander Hamilton MSS (Library of Congress) and reproduced in H. Clay Reed, editor, Readings in Delaware History, Economic Development (Mimeographed, Newark, 1939), 39.

19. Kenneth and Anna Roberts, editor and translator, Moreau de St. Mary's American Journey, 1793-1798 (New York, 1947), 88.
20. Joseph Scott, United States Gazetteer (Philadelphia, 1795), "Delaware."
21. William Winterbotham, View of the United States of America (New York, 1796), II, 466-467. It seems unlikely that Winterbotham ever physically saw the Brandywine or the mills.
22. Twining, Travels in America, 70.
23. Jedidiah Morse, The American Gazetteer (1st edition, Boston, 1797; 3rd edition referred to, Boston, 1810), "Wilmington." Morse cites twelve merchant mills and one saw mill.
24. Isaac Weld Jr., Travels through the States of North America and the Provinces of Upper and Lower Canada During the Years 1795, 1796, 1797 (London, 1807), I, 34.
25. Liancourt, Travels, III, 493-501.
26. Robert Sutcliffe, Travels in some parts of North America in the Years 1804, 1805 and 1806 (Philadelphia, 1812), 59-60. Sutcliffe visited the eight mills on the Wilmington side of the creek.
27. Mirror of the Times and General Advertiser (Wilmington), May 21, 1806, p. 3.

28. Priscilla Wakefield, Excursions in North America Described in Letters from a Gentleman and his Young Companion to Their Friends in England (London, 1806), 27-28.
29. John M'lish, Travels Through the United States of America in the Years 1806 and 1807, and 1809, 1810 and 1811 (Philadelphia, 1812), I, 181.
30. Fortesque Cuming, Sketch of a Tour to the Western County, 1807-1809, in Reuben G. Thwaites, Early Western Travels, 1748-1846 (Cleveland, 1904), IV, 30.
31. Montgomery, Reminiscences, 17.
32. Map of lower Brandywine, Brinton (Historical Society of Delaware).
33. John Palmer, Journal of Travels in the United States of North America and in Lower Canada Performed in the Year 1817... (London, 1818), 20-22.
34. D. B. Warden, A Statistical, Political, and Historical Account of the United States of North America (Edinburg, 1819), II, 134.
35. "Wilmington, Delaware and its Vicinity," in Niles' Weekly Register, IX (1815), 92-93.
36. "Borough of Wilmington," in Ibid., VI (1814), 277.
37. Survey map of the Brandywine c. 1815-1820 (Map presented to Historical Society of Delaware in 1946 by P. S. du Pont). This survey shows each of the fourteen Brandywine Mills below the bridge and their owners.

38. Clark, History of Manufactures, I, 185.

39. Directory and Register for the Year 1814...of Wilmington and
Brandywine, 80.

FOOTNOTES TO CHAPTER IV

SOME CHARACTERISTICS OF THE MERCHANT MILLS AT BRANDYWINE

1. Delaware Gazette, December 19, 1789, p. 3. This mill advertised by Shipley and Canby was not in the Wilmington area. It was in Delaware County, Pennsylvania, situated some ten miles from Philadelphia in Darby and Ridley Townships.
2. Pennsylvania Gazette, March 19, 1761, p. 3.
3. Ibid., December 2, 1762, p. 1.
4. Ibid., April 6, 1774, p. 6.
5. Delaware and Eastern-Shore Advertiser (Wilmington), August 22, 1799, p. 1.
6. Description of eight mill sites and mill properties -- Brandywine Mills. Compiled by J. Pusey (MS in Historical Society of Delaware). (The only date appears on a diagram within the manuscript and is April 5, 1836.) Mill #1. Hereafter cited only as, Description of eight mills.⁷
7. Condemnation of land through which mill race is to pass, August 19, 1760.
8. Description of eight mills -- Mill #1; Scharf, II, 787; Liancourt, Travels, III, 500. Kilns or drying houses were built alongside of

the mills to facilitate the drying of corn. Corn has such a high moisture content that it necessitated this procedure prior to grinding. Kilns had brick floors and were heated by flues. Two hundred bushels of corn could be dried in twenty-four hours. The corn, while drying, had to be turned over by shovel every thirty minutes.

9. Description of eight mills -- Mill #2.
- 100 Ibid., mill #4.
11. Pennsylvania Gazette, January 9, 1749/50, p. 3.
12. Description of eight mills -- Mill #4. The italics are mine.
13. Canby, Brandywine, 85.
14. Ferris, ...History of Wilmington, 249.
15. The statistics for the paragraph on construction have been taken from the Lea, daybook ledger, 1775-1783, entries September 20, 1775 -- January 14, 1777; and Thomas Lea and Sons, account book, 1773-1787 (MS in possession of Mrs. W. C. Spruance), (microfilm in possession of Eleutherian Mills-Hagley Foundation), "New Building," p. 111.
16. Oliver Evans, The Young Mill-Wright and Miller's Guide (11th edition, Philadelphia, 1846), 323-328. Scantling refers to the size and dimensions of materials needed in the construction of buildings, etc. A lath is a thin, narrow strip of wood nailed to

the rafters to make a framework for slates or shingles. [The 11th edition of The Young Mill-Wright and Miller's Guide is used throughout this paper unless otherwise specified.]

17. B. G. du Pont, Life of E. I. du Pont (Newark, Delaware, 1923-1926), VI, 104-106. Bauduy copied the following costs for a mill of four stories in which he observed that there was "more stone under ground than in the walls." The cost of:

all carpentry and labor	1000 [dollars]
all iron for machinery in duplicate	600
all wood for carpenters and machines	1500
all masons labor	589
all labor on machinery	600

Materials of every kind and all the labor amount to nearly 7000 dollars, everything was selected and it is the finest mill on the Brandywine as you may judge from its dimensions. Included in that is about 400 dollars for stairways, inclined planes, etc., 204 for limestone; 700 perches of rock for which they paid a dollar a perch.

It is interesting that Bauduy saw in one of the Brandywine Mills a facet of construction stressed by O. Evans, namely, the foundation of the mill. Evans stated it was essential "To lay the foundations with large, good stones, so deep as to be out of danger of being undermined...." Evans, Miller's Guide, 201.

18. B. G. du Pont, Life, VI, 105.

FOOTNOTES TO CHAPTER V

THE MANUFACTURE OF FLOUR BEFORE AND AFTER OLIVER EVANS

1. [Oliver Evans], Patrick N. I. Elisha, Patent Right Oppression Exposed; or, Knavery Detected. In an Address to Unite All Good People to Obtain a Repeal of the Patent Laws (2nd edition, Philadelphia, 1814), 160. The copy referred to is in possession of Professor H. Clay Reed.
2. "Thomas Jefferson to Isaac McPherson, August 13, 1813," as quoted in Saul K. Padover, The Complete Jefferson (New York, 1943), 1011-1017. Jefferson was of the opinion that Evans' inventions were merely innovations of well-known techniques. The hopper-boy, Jefferson thought, was solely original. It was the originality of the screw, elevator and conveyor that he questioned.
3. Bishop, History of American Manufactures, I, 145.
4. [Oliver Evans], P. Elisha, Patent Right Oppression Exposed, 31.
5. Liancourt, Travels, III, 501.
6. Ibid., III, 499.
7. The process, as presented in this paragraph, was taken from "The Old Process of Manufacture of Flour," in James L. Woods' collection of Oliver Evans papers in the Franklin Institute Library and is quoted in Greville and Dorothy Bathe, Oliver Evans: A Chronicle

- of Early American Engineering (Philadelphia, 1935), 11.
8. [Oliver Evans], P. Elisha, Patent Right Oppression Exposed, 127.
quotes Miles' recollection of the Brandywine Mills.
 9. Bathe, Oliver Evans, 11-14.
 10. Evans, Miller's Guide, 203.
 11. Bathe, Oliver Evans, 13. The Bathe's text has been used in describing Evans' inventions because of the clarity of presentation.
Evans' description of his inventions may be found in the Miller's Guide, 203-208.
 12. Ibid., 14.
 13. Evans, Miller's Guide, 207.
 14. Bathe, Oliver Evans, 11.
 15. Ibid., 11.
 16. Broadside, "To the Millers," December 19, 1787, in Massachusetts Historical Society and reproduced in full in Bathe, Oliver Evans, Plate III, opp., p. 20.
 17. Evans, Miller's Guide, 272.
 18. Ibid., 272-274. For a splendid discussion of the impact of Oliver Evans' machinery on the manufacture of flour see John Sterck and Walter Dorwin Teague, Flour for Man's Bread: A History of Milling

(Minneapolis, 1952), chapter XII, "Oliver Evans Invents the Automatic Mill," 158-174.

19. [Oliver Evans], P. Elisha, Patent Right Oppression Exposed, 30.

FOOTNOTES TO CHAPTER VI

OLIVER EVANS AND THE BRANDYWINE MILLS

1. [Oliver Evans], P. Elisha, Patent Right Oppression Exposed, 43.
2. Petition of Oliver Evans to the General Assembly of Delaware, January 16, 1786. This petition may be seen in Bathe, Oliver Evans, 15.
3. Laws of Delaware, II, 915-917.
4. Evans, Miller's Guide (2nd edition, Lancaster, 1807), 239. The broadside "To the Millers," dated December 17, 1787 was referred to in chapter V.
5. Watson, Memoirs of Elkanah Watson, 277.
6. Tilton, "Queries," in American Museum, V (April, 1789), 381.
7. Winterbotham, View, II, 466-467.
8. Bishop, History of American Manufactures, I, 145.
9. [Oliver Evans], P. Elisha, Patent Right Oppression Exposed, 32.
10. Padover, Complete Jefferson, 1011-1017.
11. Bathe, Oliver Evans, 30.
12. Munroe, Federalist Delaware, 28-29.

13. Delaware Gazette, October 20, 1790, p. 3.
14. Batho, Oliver Evans, 18.
15. [Oliver Evans], P. Elisha, Patent Right Oppression Exposed, 33;
Bishop, History of American Manufactures, I, 145n-146n.
16. [Oliver Evans], P. Elisha, Patent Right Oppression Exposed, 32.
17. Ibid., 34.
18. Bishop, History of American Manufactures, I, 145n-146n.
19. [Oliver Evans], P. Elisha, Patent Right Oppression Exposed, 35.
20. Bishop, History of American Manufactures, I, 145.
21. "Journal of William Loughton Smith, 1790-1791," in Massachusetts
Historical Society Proceedings, LI (1917-1918), 58.
22. Twining, Travels in America, 69-70.
23. Palmer, Journal of Travels, 20-22.
24. Weld, Travels through the States of North America, I, 36.
25. Winterbotham, View, II, 466-467.
26. Liancourt, Travels, III, 493.
27. Ibid., 494-495.
28. Canby, Brandywine, 89.
29. Watson, Memoirs of Elkanah Watson, 277.

FOOTNOTES TO CHAPTER VII

MILL LABOR AT BRANDYWINE

1. "Washington to Patrick O'Flynn, Mount Vernon, April 15, 1798," in Writings, XXXVI, 244-245. O'Flynn was a Wilmington innkeeper whose inn stood on "the southeast corner of Market and Third Street." Scharf, I, 271n.
2. Storck and Teague, Flour for Man's Bread, 171.
3. [Oliver Evans], P. Elisha, Patent Right Oppression Exposed, 127.
4. Morse, American Gazetteer, "Wilmington."
5. Liancourt, Travels, III, 498.
6. Morse, American Gazetteer, "Wilmington."
7. Liancourt, Travels, III, 498.
8. Lea, daybook ledger, 1775-1783, entries for December, 1775, January, 1776, and October, 1778.
9. Samuel Canby, Diary, 1779-1796, entries for February, 1780, March, 1780, September, 1782, and February, 1783.
10. Lea, daybook ledger, 1775-1783.
11. Ibid., August 18, 1781, and November, 1781

12. "Washington to Oliver Evans, Philadelphia, January 25, 1792,"
in Writings, XXXI, 465-466.
13. Ibid., February 24, 1792, 483.
14. Ibid., February 5, 1792, 473.
15. Ibid., April 15, 1797, XXIV, 244.
16. Liancourt, Travels, I, 14-15.
17. Ibid., III, 498, 501.
18. Ibid., III, 498. Even George Washington had his troubles with
intemperate millers. In 1785, he wrote that,

My Miller (Wm. Roberts) is now become such an intolerable
set, and when drunk so great a Madman, that...I cannot
with propriety...bear with him any longer.

Writings, XXVIII, 57.
19. Pennsylvania Gazette, March 18, 1755, p. 3. Canby advertised for
two runaway Irish servants.
20. Abbot Emerson Smith, Colonists in Bondage: White Servitude and
Convict Labor in America, 1607-1776 (Chapel Hill, 1947), 34-35.
21. Samuel Canby, Diary, 1779-1796, November 30, 1779.
22. Delaware Gazette, December 5, 1789, p. 4.
23. Evans, Miller's Guide, 274. The Brandywine Mills were lighted by
candles. In the Lea daybook ledger and in the account book, there
are countless entries for the purchase of tallow and candles for

the mill.

24. "Return of Manufactures near Wilmington,...November 28, 1791."
25. Morse, American Gazetteer, Wilmington."
26. Liancourt, Travels, III, 498.
27. Peter Kalm's Travels in North America, edited by Adolph B. Benson (New York, 1937), II, 637.
28. Broom, Hendrickson and Summerl, letter book, 1792-1794 (MS in Historical Society of Delaware). Letter dated May 28, 1792, to Walter Dulany, Esq.
29. Laws of Delaware, II, 1240-1241.
30. Broom, Hendrickson and Summerl, letter book, 1792-1794. Letter dated April 4, 1792, to William Stevenson and subsequent letters. See also Delaware Gazette, October 27, 1798, p. 1.
31. Liancourt, Travels, III, 498.
32. "Wilmington, Delaware, and Its Vicinity," in Niles' Weekly Register, IX (1815), 94; Delaware Statesman, May 9, 1812, as paraphrased in Munroe, Federalist Delaware, 224n.
33. Lea, daybook ledger, 1775-1783, entries for August 14, and December 9, 1778. In Thomas Lea and Sons, account book, 1773-1787, p. 62, may be seen the account of William Talley, millwright. On many occasions Talley was paid in flour. The material concerning

the "Article of Agreement" among local millwrights was taken from "Article of Agreement, made and concluded upon this first day of April, one thousand seven hundred and ninety-six...for the rules and ways of mill-wrighting...." (Printed, in the form of a broadside, an original copy is in the P. S. du Pont Collection, Longwood, Pennsylvania. A photostatic copy is in the library of the Eleutherian Mills-Hagley Foundation.) The only one of the thirteen millwrights found mentioned in the Lea, daybook ledger, or in the account book, was Dutton. See Lea, daybook ledger, entry for September 11, 1780.

34. Samuel Canby, Diary, 1779-1796, entries for February 4, 28, 29, 1780; and March 1, 1780.
35. "Wilmington, Delaware, and Its Vicinity," in Niles' Weekly Register, IX (1815), 94.
36. "Return of Manufactures near Wilmington,...November 28, 1791."
37. "Wilmington, Delaware, and Its Vicinity," in Niles' Weekly Register, IX (1815), 94.
38. Description of eight mills -- Mill #4.
39. Delaware Gazette, March 20, 1790, p. 3.
40. Ibid., October 23, 1790, p. 4.
41. Morse, American Gazetteer, "Wilmington."
42. "Return of Manufactures near Wilmington,...November 28, 1791."

43. Morse, American Gazetteer, "Wilmington." The sloops referred to by Morse were probably shallops. The difference between the vessels, from the merchants' point of view, was primarily carrying capacity. A large shallop might have a capacity of 350 barrels of flour, a sloop or small brig or schooner could carry 600-650 barrels, and the larger type of brigs could carry 900-1200 barrels. For ship types considered in barrel capacity see Pennsylvania Gazette, January 13, 1746/47, p. 4; Broom, Hendrickson and Summerl, letter book. Letters dated April 4, 1792, to William Stevenson, and July 20, 1792, to Gouverneur and Rutgers; and the Delaware Gazette, October 27, 1798, p. 1. The number of crewmen required to sail the smaller craft of the colonial period may be computed at a ratio of one sailer for every eight tons of vessel weight. A thirty ton sloop would therefore require at least a three-man crew. Using this ratio the Brandywine Mills must have employed at least thirty-six men to man their shipping. See Herbert C. Bell, "The West Indian Trade Before the American Revolution," in American Historical Review, XXII (1917), 280.
44. Samuel Canby, Diary, 1779-1796, entries for November 24, December 29, 1779; March 9, 11, 1780; December 15, 1781; and February 18, 1783.
45. Isaac Starr, receipt book, November 15, 1760-March 3, 1806 (MS in the Historical Society of Delaware). References to the Starr shallop may be found in the Samuel Canby Diary, 1779-1796, entries for November 24, 1779; February 15, and March 4, 1780. A description

of the general importance of shallops and their masters to Delaware transportation and commerce may be found in Munroe, Federalist Delaware, 131-132.

46. Bathe, Oliver Evans, 59n.
47. Sterck and Teague, Flour for Man's Bread, 169; Bathe, Oliver Evans, 59n.
48. Liancourt, Travels, III, 495; Bathe, Oliver Evans, 59-60.
49. Pennsylvania Gazette, July 20, 1774, p. 5.
50. Delaware and Eastern-Shore Advertiser, December 29, 1794, p. 4.
51. Ibid., February 18, 1795, p. 1.
52. Ibid., July 15, 1795, p. 4.
53. Delaware Gazette, June 3, 1796, p. 3.
54. Liancourt, Travels, III, 503. The silk came from Georgia.
55. Delaware Statesman, May 9, 1812. This article is paraphrased in Munroe, Federalist Delaware, 224n. The estimate of required labor in 1791 is from the "Return of Manufactures near Wilmington,... November 28, 1791."
56. Clark, History of Manufactures, I, 185.

FOOTNOTES TO CHAPTER VIII

MILLERS, MERCHANTS AND MARKETS

1. Christopher L. Ward, "Leaves from the Log-Books and Letters of James Hemphill: Mariner and Merchant of Wilmington, 1793-1797," in Papers of the Historical Society of Delaware, LXIV (1914), 4-5.
2. The information in this paragraph has been taken from the following sources: Scharf, II, 631-634, 691, 734-735; Munroe, Federalist Delaware, 160-161, 173, 207n, 217, 217n, 244, 244n, 245, 245n, 246, 246n; Thomas Jefferson Wertenbaker, The Founding of American Civilization: The Middle Colonies (New York, 1938), 188-230, and in particular, 207; Isaac Sharpless, History of Quaker Government in Pennsylvania (Philadelphia, 1898-1899), I, 36-37; Canby, Family History, 18-44.
3. Kuhlmann, Flour-Milling Industry, 33-35; Clark, History of Manufactures, I, 76, 185; Canby, Brandywine, 88.
4. Scharf, II, 786; Bishop, History of American Manufactures, I, 144; Munroe, Federalist Delaware, 28. Creeks tapping the wheat fields of Delaware were the Appoquinimink, the Duck, and St. Jones. In 1778, vessels of 1,500 to 2,500 bushels capacity sailed out of the Duck "to Philadelphia, New York and Boston...." The preceding year 40,000 bushels of grain had been shipped via Duck Creek.

Situated on the banks of this creek were "five granaries... held [ing] upon an average from five to six thousand bushels of grain...." The information stated above appeared in a petition to the General Assembly of Delaware requesting that the creek be kept open to navigation and free of dams. See Legislative Papers, Petition for keeping navigation open on Duck Creek, 1778, No. 2 (Delaware State Archives, Dover, Delaware).

5. Liancourt, Travels, III, 497.
6. Statements concerning the arrival of wheat laden vessels may be seen in Broom, Hendrickson and Summerl, letter book, 1792-1794, letter dated July 13, 1792, to Isaac Roosevelt. Liancourt, Travels, III, 501, noted the cash transactions of the Brandywine millers while Montgomery, Reminiscences, 17, cited the fact that Joseph Tatnall had on one occasion paid forty thousand dollars cash to Mr. Lloyd of Cecil County, Maryland, for a load of wheat. Canby, Brandywine, 89, pointed out that the American flour market used the prices current at Brandywine as its standard.
7. Broom, Hendrickson and Summerl, letter book, 1792-1794, letter dated April 4, 1792, to William Stevenson.
8. Lea, daybook ledger, 1775-1783. Such entries are commonplace in this ledger. They appear constantly throughout the eight-year period during which the ledger was kept.
9. Samuel Canby, Diary, 1779-1796, March 4, 1780.

10. Scharf, II, 788; Liancourt, Travels, III, 694; Ward, "James Hemphill," in Papers of the Historical Society of Delaware, LXIV (1914), 5-6.
11. Lea, daybook ledger, 1775-1783, entries for June 17, 24, 1776; and May 24, 1778. It was not unusual for vessels carrying one or two thousand bushels of wheat to pull up alongside the mills. See Winterbotham, View, II, 467.
12. Liancourt, Travels, III, 499.
13. Storek and Teague, Flour for Man's Bread, 171.
14. Liancourt, Travels, III, 499.
15. Bishop, History of American Manufactures, I, 145.
16. The baking of bread was an important adjunct of the flour milling industry since ship bread was a significant export item. The breadstuff industry in the Wilmington area was located at Newport. Occasionally, a bakehouse was built alongside a merchant mill; however, no evidence of this arrangement was discovered as having existed at the Brandywine Mills. See Charles M. Andrews, Colonial Folkways (New Haven, 1919), 227; and Clark, History of Manufactures, I, 179.
17. The statistics were derived from the Delaware Gazette, June 27, 1789, p. 3; and Winterbotham, View, II, 466-467.
18. Liancourt, Travels, III, 499.

19. The flour prices were taken from the Delaware Gazette, April 10, 1790, pp. 3-4; March 4, 1796, p. 4; and June 26, 1799, p. 3; and Ward, "James Hemphill," in Papers of the Historical Society of Delaware, LXIV (1914), 20.
20. For the relative importance of flour milling to other industries, for its principal markets, and for its major centers see Clark, History of Manufactures, I, 99, 149; and Kuhlmann, Flour-Milling Industry, 21-22.
21. Scharf, II, 749-750.
22. Ibid., II, 749.
23. Account book of William Shipley for fitting out the brig "Wilmington," 1739-1743 (MS in Historical Society of Delaware); "Ship Registers for the Port of Philadelphia," in Pennsylvania Magazine of History and Biography, XXIV (1900), 111.
24. The names of the vessels, their owners and dates, as well as where the ships were built, have been taken from "Ship Registers for the Port of Philadelphia," in Pennsylvania Magazine of History and Biography, XXIV (1900), 516; XXV (1901), 277; XXVI (1902), 137; XXVIII (1904), 90, 231, 249.
25. Pennsylvania Gazette, April 6, 1774, p. 6.
26. The facts presented in this paragraph have been taken from the Lea, daybook ledger, 1775-1783, entries from February, 1775, to March, 1776; and from Lea and Sons, account book, 1773-1787, pp. 39-40.

27. Lea, daybook ledger, 1775-1783, entry for April 11, 1777.
28. Samuel Canby, Diary, 1779-1796, entry for March 1, 1780.
29. Ibid., March 11, 12, 1780.
30. Morse, American Gazetteer, "Wilmington."
31. Clark, History of Manufactures, I, 237.
32. Ward, "James Hemphill," in Papers of the Historical Society of Delaware, LXIV (1914), 5-6.
33. Clark, History of Manufactures, I, 237; Albion, New York Port, 7; Montgomery, Reminiscences, 210; Ferris, History of Wilmington, 233-234; and Munroe, Federalist Delaware, 134.
34. Thomas Lea's ledger "A", a book of accounts, 1785-1800 (MS in Historical Society of Delaware).
35. Broom, Hendricksen and Summerl, letter book, 1792-1794. Letter dated November 12, 1792, to Peter Victor Dorey. Dorey at Cape Francois, Hispaniola, had written to Broom, Hendricksen and Summerl and requested that specific brands of flour be sent to him. In reply the Wilmington merchants informed Dorey that they would fill his order but could not ship any Canby flour since none was available at the time on the local market.
36. Thomas Lea's ledger "A", a book of accounts, 1785-1800.
37. Directory and Register for the Year 1814...of Wilmington and Brandywine, iv.

38. Scharf, II, 786.

39. Bishop, History of American Manufactures, I, 145.

40. Legislative Papers. Petitions, miscellaneous, January 26, 1816.

Memorial of the Brandywine millers opposing the altering of mill
dams to permit fish to go over them (Delaware State Archives,
Dover, Delaware).

ESSAY ON SOURCES AND BIBLIOGRAPHY

ESSAY ON SOURCES

The bibliography that follows is an extensive list of references. In such a list some items are of greater importance than others. This bibliography is a case in point. Therefore, it is deemed relevant to cite and give weight to the sources, primary and secondary, manuscript and printed, that have been most rewarding in the preparation of this thesis.

First, there are the primary sources. These fall under two general classes -- manuscript and printed. The most useful of the manuscript materials were the journals, ledgers and diary of the Brandywine millers. The business records of greatest value were the Thomas Lea, daybook ledger, 1775-1783, and its complementary journal, the Lea and Sons, account book, 1773-1787. Samuel Canby's diary, 1779-1796, contained a wealth of information. Besides mill activities the diary provided knowledge of family affairs, monthly meetings (Quaker), contemporary events and the weather. Papers of individual millers were also helpful. These are in the Historical Society of Delaware. The Tatnall Papers were the most fruitful. The physical appearance and characteristics of the mills are contained in a small notebook kept by J. Pusey entitled, Description of eight mill sites and mill properties (1836). This manuscript, partially a survey and a prose description, was the only source found giving the exact location and size of the mill buildings. Several petitions among the Legislative Papers in the Delaware State Archives, Dover, Delaware, are

listed. These were of particular interest because they indicated the importance of flour milling and wheat growing to the State of Delaware in her early years. Maps also are listed and of these the Survey of the Brandywine mill sites, c. 1815-1820, was of the greatest value. This map showed the fourteen merchant mills located below the Market Street Bridge and indicated the owner of each mill. The Amos Brinton map is a rough drawing. This map, drawn around 1900, was a part of Brinton's extensive research on early mills in Delaware. The map located the site, gave the name of the builder and the date of construction of various mills that once stood on the lower Brandywine. The Historical Society of Delaware has the Brinton manuscripts. Like the map, the Brinton Papers are also rough draft. The Papers are uncatalogued and, in general, are too confused to be used successfully.

A further division of the primary materials are the printed sources. Of these the travel accounts provided much information. All these listed contained some material pertinent either to Delaware, Wilmington or the Brandywine Mills. Those most detailed in their description of the mills were Hunter, Liancourt, Palmer, Schoepf and Weld. The account of Wilmington given in Winterbotham was extensive; however, it seemed to be lifted in total from Morse's, American Gazetteer (1810). The printed sources for local history were numerous. These ranged in nature from a "Return of Manufactures, Tradesmen &c. in Wilmington...November, 1791," to "The Journal and Order Book of Captain Robert Kirkwood," through Elizabeth Montgomery's, Reminiscences (1851). Along with these, Miles' Weekly Register, the Laws of the

State of Delaware (1797), 2 vols., the works of Oliver Evans, Benjamin Ferris' History (1846) and the Gazetteers of Merce and of Scott (1795) all furnished knowledge concerning Delaware and the flour mills at Brandywine.

In addition to the primary sources there were several secondary works that deserve particular acknowledgment. The first to come to mind, of those listed, are the state and local histories. One of the earliest and most inclusive was Scharf's, History of Delaware (1888). It was a work loaded with material not readily available elsewhere. Although his information relative to the Brandywine Mills was sound, accuracy was not always the rule in Scharf's work. The latest and best history of the state, for the years covered, was John A. Munroe's, Federalist Delaware, 1775-1815 (1954). Using Munroe as a guide and as a medium of verification, Scharf's wonderful conglomeration proved an invaluable source of reference. To date, compared to all others, Munroe's treatment of flour making in Delaware and on the Brandywine is the most succinct, informative and scholarly. One, however, should not overlook H. Clay Reed's, History of the First State (1947), nor Conrad's, History of Delaware (1908),

Listed in the bibliography and relevant to the history of the Brandywine Mills were various histories of American manufactures. There were several classic accounts of American industry, in general, and flour making, in particular. An old but indispensable survey of American manufactures was that of J. Leander Bishop, written in the 1860's. V. S. Clark's, History of Manufactures (1929), extended

Bishop's work and provided a more detailed background for an understanding of the flour-milling industry in relation to other industrial and commercial activities in the colonial and early national periods. Both Bishop and Clark focused attention on the early importance of the Brandywine as an industrial area. The best specific source for a general picture of the flour-milling business in America, from its origins, was Charles Kuhlmann's, Flour-Milling Industry (1929). Kuhlmann gave considerable space to the Brandywine Mills but largely neglected the colonial history of milling for a more definitive treatment of the great Mid-Western mill centers. Sterck and Teague, in Flour for Man's Bread (1952), presented the flour-making story and all of its ramifications from earliest times to present. The work was scholarly and well documented with a splendid bibliography. Their chapter on Oliver Evans and his ¹automatic mill was pertinent to this study. On the subject of Evans and in conjunction with Oliver Evans' own writings, his biography written by the Bathes, gave the best account of the inventor's dealings with the Brandywine millers. Essentially, however, Bathes's Oliver Evans (1935), was a study of the man as an engineer and inventor.

Among the other secondary books and articles listed were those of Christopher Ward. Two of these, The War of the Revolution (1952), and The Delaware Continentals (1941), were heavily relied on for the chapter "The War and the Brandywine Mills, 1775-1783," while his article on "James Hemphill...Merchant and Mariner of Wilmington, 1793-1797," was most enlightening and informative concerning Wilmington commerce.

Lastly, newspapers were of value in preparing this study of the Brandywine Mills. Mainly, of those listed, three were utilized to great advantage. They were the Pennsylvania Gazette (1728-1815), Delaware Gazette (1785-1799) and Delaware and Eastern-Shore Advertiser (1794-1799). In addition the American Watchman (1809-1820) and the Mirror of the Times (1799-1806) were referred to with good results. The Historical Society of Delaware has fairly complete files of these newspapers except the Pennsylvania Gazette, which is on microfilm and is readily available. A collection of Delaware material appearing in the Pennsylvania Gazette is in the process of being collected. Type-script volumes of this material, as extracted to date, may be seen by consulting Professor H. Clay Reed, Department of History, University of Delaware.

BIBLIOGRAPHY

PRIMARY SOURCES: MANUSCRIPT

Business and Family Papers

Broom, Hendrickson and Summerl, letter book, April 4, 1792 -- March 21, 1794, in Historical Society of Delaware.

Samuel Canby, Diary, November, 1779 -- December, 1796, in Yale University Library. Microfilm in possession of Eleutherian Mills-Hagley Foundation, Wilmington, Delaware.

Lea Mills, daybook ledger, February 20, 1775 -- September 27, 1783, in Historical Society of Delaware.

Lea and Sons, account book, 1773-1787, in possession of Mrs. W. G. Spruance, Wilmington, Delaware. Microfilm is in the library of the Eleutherian Mills-Hagley Foundation, Wilmington, Delaware.

Thomas Lea's ledger "A", a book of accounts, 1785-1800, in Historical Society of Delaware.

Lea Papers, in Historical Society of Delaware.

Shipley Papers, in Historical Society of Delaware.

Account book of William Shipley for fitting out the brig "Wilmington", 1739-1743, in Historical Society of Delaware.

Isaac Starr, receipt book, November 15, 1760 --
March 3, 1806, in Historical Society of Delaware.

Tatnall Papers, in Historical Society of Delaware.

Agreements and Survey of Land through which
a Mill Race is Prayed. August 9, 1760.

Condemnation of Land through which Mill Race
is to Pass. August 19, 1760.

Agreement Concerning Water rights of Jehu and
Samuel Hellingwerth. c. 1760.

Maps

Map of Wilmington, old copper plate engraving with
inset of the Brandywine Mills, c. 1804, in Historical
Society of Delaware.

Survey of the Brandywine mill sites, c. 1815-1820.
The original is in the P. S. du Pont Collection,
Longwood, Pennsylvania. Copies are in the Historical
Society of Delaware and the library of the Eleutherian
Mills-Hagley Foundation, Wilmington, Delaware.

Map of the lower Brandywine showing the Brandywine
Mills, in Historical Society of Delaware. Map drawn
by Ames C. Brinton, c. 1900.

Legislative Papers, Petitions

Petition for keeping Navigation open on Duck Creek,
No. 2, 1778. Delaware State Archives, Dover, Delaware.

Memorial of the Brandywine millers opposing the
altering of mill dams to permit fish to go over them,
January 26, 1816. Delaware State Archives, Dover,
Delaware. X

Miscellaneous

Amos C. Brinton Papers. Notes on mills, in Historical
Society of Delaware.

Description of eight mill sites and mill properties --
Brandywine Mills. Compiled by J. Pusey and in
Historical Society of Delaware. Only date appears on a
diagram within the manuscript and is April 5, 1836.

PRIMARY SOURCES: PRINTED

Travel Accounts

[Black, William], "Journal of William Black, 1744,"
edited by R. Alonso Brock, in Pennsylvania Magazine of
History and Biography, I (1877), 233-249.

Brissot de Warville, J. P., New Travels in the United
States of America Performed in 1788. London, 1792

Chandler, Isaac, A Summary View of America...During a Journey in the United States [1822-1823]. London, 1824.

[Cresswell, Nicholas], The Journal of Nicholas Cresswell, 1774-1777. Edited by Samuel Thornley. New York, 1924.

Cuming, Fortesque, Sketch of a Tour to the Western Country, 1807-1809, in Reuben G. Thwaites, Early Western Travels, 1748-1846, IV. Cleveland, 1904.

[Hunter, Robert Jr.], Quebec to Carolina in 1785-1786: Being the Travel and Observations of Robert Hunter Jr., A Young Merchant of London. Edited by Louis B. Wright and Marion Tinling. San Marino, California, 1943.

[Kalm, Peter], Peter Kalm's Travels in North America. Edited by Adolph B. Benson, 2 vols., New York, 1937.

Liancourt, Duc de la Rochefoucault, Travels through the United States of North America, 1795, 1796 and 1797. 3 vols., London, 1800.

Malish, John, Travels through the United States of America in the Year 1806, and 1807, and 1809, and 1811. 2 vols., Philadelphia, 1812

Moreau de St. Mary's American Journey, 1793-1798. Kenneth and Anna Roberts, editors and translators. New York, 1947.

Palmer, John, Journal of Travels in the United States of North America and in Lower Canada Performed in the Year 1817..... London, 1818.

[Pownall, Thomas], "Governor Thomas Pownall's Description of the Streets and the Main Roads About Philadelphia, 1754. Road from Philadelphia through the Lower Counties," in Pennsylvania Magazine of History and Biography, XVIII (1894), 211-218. [Extracted from Governor Thomas Pownall's Journal. London, 1778].

[Reeves, Enos], "Extracts from the Letter-Books of Lieutenant Enos Reeves," in Pennsylvania Magazine of History and Biography, XXI (1897), 238-239.

Schoepf, Johann David, Travels in the Confederation [1783-1784]. Translated and edited by Alfred J. Morrison. 2 vols., Philadelphia, 1911.

[Smith, William Loughton], "Journal of William Loughton Smith, 1790-1791," in Massachusetts Historical Society Proceedings, LI (October, 1917 -- June, 1918), 20-88.

Suteliff, Robert, Travels in some parts of North America in the Years 1804, 1805, and 1806. Philadelphia, 1812.

Twining, Thomas, Travels in America 100 Years Ago. New York, 1894.

Wakefield, Priscilla, Excursions in North America Described

in Letters from a Gentleman and his Young Companion to
their Friends in England. London, 1806.

[Watson, Elkanah], Men and Times of the Revolution; or,
Memoirs of Elkanah Watson, including his Journals of
Travels in Europe and America from the Year 1772 to
1842.... Edited by Winslow G. Watson. New York, 1856.

Weld, Isaac, Travels through the States of North America
and the Provinces of Upper and Lower Canada During the
Years 1795, 1796, 1797. 2 vols., London, 1807.

Winterbotham, William, View of the United States of
America, 4 vols., New York, 1796.

Materials for Local History

"Article of Agreement, made and concluded...[April 1,
1796] for the rules and wages of millwrighting,...."
Printed in the form of a broadside, an original copy
is in the P. S. du Pont Collection, Longwood, Pennsylvania.
A photostatic copy is in the library of the Eleutherian
Mills-Hagley Foundation, Wilmington, Delaware.

"Borough of Wilmington," in Wiles' Weekly Register, VI
(1814), 277-278.

Burr, Horace, translator, The Records of Holy Trinity (Old
Swedes) Church, Wilmington, Delaware, from 1697 to 1773.
Historical Society of Delaware, 1890.

A Directory and Register for the Year 1814...of the
Borough of Wilmington and Brandywine. Printed by R.
Porter. Wilmington, 1814.

Evans, Oliver, The Young Mill-Wright and Miller's Guide.
Philadelphia, 1846. (11th edition).

[Evans, Oliver], Elisha, Patrick M. I., Patent Right
Oppression Exposed; or Knavery Detected. In an Address,
to Unite All Good People to Obtain a Repeal of the Patent
Laws. Philadelphia, 1814. (2nd edition).

Ferris, Benjamin, A History of the Original Settlements
on the Delaware...and a History of Wilmington. Wilmington,
1846.

Montgomery, Elizabeth, Reminiscences of Wilmington.
Philadelphia, 1851.

"Our Manufactures...Wilmington, Delaware, May, 1814,"
in Niles' Weekly Register, VIII (1814), 233-234.

"Return of Manufactures, Tradesmen &c. in Wilmington
Delaware & its Vicinity including Brandywine Mills,...
November 28, 1791," in Alexander Hamilton MSS, Library
of Congress, Washington, D. C. Reproduced in Readings
in Delaware History, Economic Development, M. Clay Reed,
editor. Mimeographed, Newark, 1939.

"Ship Registers for the Port of Philadelphia, 1726-1775," in Pennsylvania Magazine of History and Biography, vols., XXIV, XXV, XXVI, and XXVIII.

Tilton, James, "Queries," in The American Museum, or Universal Magazine, V (April, 1789), 381.

Turner, Rev. Joseph Brown, "The Journal and Order Book of Captain Robert Kirkwood of the Delaware Regiment of the Continental Line," in Papers of the Historical Society of Delaware, LVI (1910), 9-277.

"Wilmington, Delaware and its Vicinity," in Niles' Weekly Register, IX (1815), 92-97.

Cazetteers and Geographies

Coxe, Tench, A View of the United States of America... between the Years 1787 and 1794. Philadelphia, 1794.

Horse, Jedidiah, The American Gazetteer. Boston, 1810.

Proud, Robert, The History of Pennsylvania, in North America, from the Original Institution and Settlement of that Province...in 1681, til after the Year 1742. Philadelphia, 1797-1798.

Scott, Joseph, United States Gazetteer. Philadelphia, 1795.

_____, A Geographical Description of the States of Maryland and Delaware.... Philadelphia, 1809.

Warden, D. B., Statistical, Political, and Historical Account of the United States of North America. 3 vols.,
Edinburgh, 1819.

Writings, Letters, etc.

Cobbett, William, Porcupine's Works.... 12 vols.,
London, 1801.

"Captain Craig to Washington, Frankfort, 18 November, 1777," in Pennsylvania Magazine of History and Biography, XIX (1895), 483.

Du Pont, B. G., Life of E. I. du Pont. 12 vols.,
Newark, Delaware, 1923-1926.

Fitzpatrick, John C., editor, The Writings of George Washington from the Original Manuscript Sources, 1745-1799. 39 vols., Washington, 1931-1944.

Padover, Saul K., The Complete Jefferson. New York, 1943.

"Brigadier-General Potter To Washington, Camp, November 5, 1777," in Pennsylvania Magazine of History and Biography, XVIII (1894), 482.

"Brigadier-General Potter To Washington, November 8, 1777," in Pennsylvania Magazine of History and Biography, XIX (1895), 73-74.

Official Records

Reed, H. Clay, et al., editors, Minutes of House of Representatives of the Government of the Counties of New Castle, Kent and Sussex upon Delaware (1765-1770).
Dover, Delaware, 1931.

Minutes of the Council of the Delaware State, from 1776 to 1792. Dover, Delaware, 1888.

Laws of the State of Delaware, 1700-1797. 2 vols.,
New Castle, 1797.

Delaware Archives. 5 vols., Wilmington, 1911.

SECONDARY SOURCES

State and Local History

Brinton, Amos C. "Early Mills in Delaware," in The Miller's Review (December 15, 1899), 340; and (January 15, 1900), 376.

Canby, Henry S., The Brandywine. New York, 1941.

_____, Family History. Cambridge, 1945.

Conrad, H. C., History of the State of Delaware. 3 vols.,
Wilmington, 1908.

Delaware, A Guide to the First State. Federal Writers' Project of W.P.A. New York, 1938.

Lincoln, Anna T., Wilmington, Delaware: Three Centuries under Four Flags. Rutland, Vermont, 1937.

Munroe, John A., "The Philadelwareans: A Study in the Relations Between Philadelphia and Delaware in the Late Eighteenth Century," in Pennsylvania Magazine of History and Biography, LXIX (~~April~~, 1945), 128-149.

_____, Federalist Delaware, 1775-1815. New Brunswick, New Jersey, 1954.

Reed, H. Clay, editor, Delaware: A History of the First State. 3 vols., New York, 1947.

Scharf, J. Thomas, History of Delaware, 1609-1888. 2 vols., Philadelphia, 1888.

Ward, Christopher L., "Leaves from the Log-Books and Letters of James Hemphill: Mariner and Merchant of Wilmington, 1793-1797," in Papers of the Historical Society of Delaware, LXIV (~~March~~, 1914), 3-35.

_____, The Delaware Continentals, 1776-1783. Wilmington, Delaware, 1941.

Zebly, Frank R., Along the Brandywine. Wilmington, 1940.

Industry, Commerce and Labor

Bathe, Greville and Dorothy, Oliver Evans: A Chronicle

of Early American Engineering. Philadelphia, 1935.

Bell, Herbert C., "British Commercial Policy in the West Indies, 1783-93," in English Historical Review, XXXI (1916), 429-441.

_____, "The West Indian Trade Before the American Revolution," in American Historical Review, XXII (1917), 272-287.

Bishop, J. Leander, History of American Manufactures from 1608 to 1860. 2 vols., Philadelphia, 1861-1868.

Clark, Victor S., History of Manufactures in the United States, 1607-1928. 3 vols., Washington, 1929.

Hutchins, John G. B., The American Maritime Industries and Public Policy, 1789-1914. Harvard University Press, 1941.

Jernegan, Marcus, Laboring and Dependent Classes in Colonial America, 1607-1783. Chicago, 1931.

Johnson, Emory R. and T. W. Van Metre, History of Domestic and Foreign Commerce of the United States. 2 vols., Washington, 1915.

Kuhlmann, Charles B., The Development of the Flour-Milling Industry in the United States. Boston, 1929.

Wishoff, Willard G., "Business in Philadelphia During

the British Occupation, 1777-1778," in Pennsylvania Magazine of History and Biography, LXI (1937), 165-181.

Morris, Richard B., Government and Labor in Early America. New York, 1946.

Peterson, Arthur G., "Flour and Grist Milling in Virginia: A Brief History," in Virginia Magazine of History and Biography, XLIII (1935), 97-108.

Pillsbury, C. A., "American Flour," in One Hundred Years of American Commerce, edited by Chauncey M. Depew, I, 266-273. 2 vols., New York, 1895.

Rawson, Marion Nicholl, Little Old Mills. New York, 1935.

Smith, Abbot Emerson, Colonists in Bondage: White Servitude and Convict Labor in America, 1607-1776. Chapel Hill, 1947.

Sterck, John and Walter Dorwin Teague, Flour for Man's Bread: A History of Milling. Minneapolis, 1952.

General

Albion, Robert G., The Rise of New York Port, 1815-1860. New York, 1939.

Alden, John Richard, The American Revolution, 1775-1783. New York, 1954.

Andrews, Charles M., Colonial Folkways: A Chronicle of American Life in the Reign of the Georges, in The Chronicles of America Series, Allen Johnson, editor. New Haven, 1919.

_____, The Colonial Period in American History. 4 vols., New Haven, 1934-1938.

Channing, Edward, History of the United States. 6 vols., New York, 1905-1925.

Fisher, Sydney G., The Quaker Colonies: A Chronicle of the Proprietors of the Delaware, in The Chronicles of America Series, Allen Johnson, editor. New Haven, 1919.

Oipson, Lawrence Henry, The Coming of the Revolution, 1763-1775. New York, 1954.

Sharpless, Isaac, History of Quaker Government in Pennsylvania. 2 vols., Philadelphia, 1898-1899.

Ward, Christopher, The War of the Revolution. 2 vols., New York, 1952.

Wertenbaker, Thomas Jefferson, The Founding of American Civilization: The Middle Colonies. New York, 1938.

NEWSPAPERS

American Watchman (Wilmington), 1809-1820.

Delaware Gazette (Wilmington), 1785-1799.

Delaware Statesman (Wilmington), 1811-1813.

Delaware and Eastern-Shore Advertiser (Wilmington),
1794-1799

Mirror of the Times and General Advertiser
(Wilmington), 1799-1806.

Pennsylvania Gazette (Philadelphia), 1728-1815.

The Wilmingtonian (Wilmington), November 3, 1883.

Article entitled "History of Old Grist Mills on the
Brandywine and Christina."

24