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GUNPOWDER PRODUCTION IN POST-REVOLUTIONARY MARYLAND

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ALTHOUGH American colonists began producing small quantities of gunpowder as early as the middle of the seventeenth century, their efforts were grossly inadequate. Only small quantities of the explosive were made by crude household methods; no extensive powder mills existed to turn out tons of ammunition. The colonies were placed in a precarious position at the start of the Revolution, and more than ninety per cent of all powder had to be obtained from outside the country during the first two and a half years of the war.[1] Americans admitted that "for the present we must import from abroad," [2] but the inadequate output of domestic manufacturers brought about a realization of the acute need for an independence of foreign sources of supply. New mills were erected to meet the demands of the frontier and the economic requirements of a growing industrial America, and the powder industry became firmly established during the years following the Revolution.

The success of the young industry was due primarily to efforts in the Middle Atlantic states, where numerous powder mills were established during the half century following the war. The beginning of extensive powder-milling activity usually is associated with Eleuthère Irénée du Pont, who recognized the natural advantages of the Brandywine and began constructing his works near Wilmington in 1802. It was not Delaware, however, but Maryland, which first gained prominence with extensive gunpowder mills.

Recognizing the urgent demand for powder during the war,

[1] Orlando W. Stephenson, "The Supply of Gunpowder in 1776," *The American Historical Review*, XXX (1925), 277. William A. Ganoe in *The History of the United States Army* (New York, 1932), p. 6, claims that a hundred pounds of gunpowder could not be purchased in all the colonies at the beginning of the war.

[2] Robert T. Paine to Elbridge Gerry, June 10, 1775 (MS, New Jersey Historical Society).

the Council of Safety offered liberal proposals to anyone willing to erect the necessary mills in Maryland.[3] This encouragement resulted in a mill being built near Baltimore in August, 1775, and by the following year, saltpeter plants were in operation in Cecil County and in Harford County.[4] Arrangements were made with George Lindenberger and John McClellan to construct a powder mill near Baltimore in 1776, and John and Walter Hanson began erecting another in Charles County.[5] Additional would-be operators asserted to the Council of Safety that they would erect powder mills but never carried out their plans.

Construction of the first important powder works in Maryland was begun in 1790, when the Baltimore *Maryland Journal* carried a notice that "a Society of respectable Gentlemen of this place have raised an adequate Fund for the Establishment of an extensive Manufacture of Gunpowder . . . in the Vicinity of this Town."[6] Evidently there was little fear of the danger resulting from the close location of the powder mill, for the advertisement continued: "This important institution will not only prove highly advantageous to this state and Town, but may, if properly encouraged, become a National Benefit." Early in April, 1792, the newly erected mill exploded, and two or three of the workmen were injured. The owners immediately announced the following precautionary measure: "As there is considerable danger attending the Visits of careless People to the Works, no person will hereafter be permitted to view them, without the express Leave of a Proprietor, in Writing."[7]

[3] An advertisement by the Council of Safety in the *Maryland Gazette* on August 31, 1775, gave encouragement to anyone building a powder mill near Baltimore. See also Edward Spencer, *A Sketch of the History of Manufactures in Maryland* (Baltimore, 1882), p. 22.

[4] The Gunpowder River, despite its appellation, evidently was not a site for early powder mills, although it was one of the oldest place names in Maryland. William B. Marye, "Perry Hall History" (Upper Falls, 1922), p 3.

[5] Dieter Cunz, *The Maryland Germans* (Princeton, 1948), p. 142. The expense account at the Maryland Historical Society for the construction of the Hanson mill during the Revolution contains the following items: "Nails, Hinges and other work done by the smith; Brandy furnished the men when working in water; Timber for boards, shingles and other articles; Carting of Scantling, boards, shingles, stone, shells and sand for Brick. . . ." For a list of individuals from whom the state of Maryland purchased gunpowder during the war, see "An Account of Monies Paid for Ammunition Purchased by the State of Maryland," February 9, 1776-May 17, 1781 (Maryland Historical Society).

[6] November 23, 1790.

[7] *Maryland Journal*, April 10, 1792. An earlier explosion occurred on October 17, 1783, in the yard of a Mrs. Clement in Baltimore, where some gunpowder had been placed to dry. Three boys, two of them Negroes, went into the yard to clean

Despite safety measures, powder mills in Maryland, like those in other states, were demolished time after time by the accidental ignition of their own product. Their existence constantly was susceptible to rapid termination, and the mill owners were keenly aware of "the danger and risk always attending that kind of business." [8] Friction, faulty machinery, sparks, lightning, spontaneous combustion, and carelessness were only a few of the many causes of explosions. Incorporation of the ingredients—saltpeter, charcoal, and sulphur—remained the most dangerous step, despite the replacement of stampers by rolling wheels.[9]

Another powder mill in the vicinity of Baltimore was erected in 1791 by a company organized the year before; Robert Gilmor, John O'Donnell, Stephen Wilson, John Holmes, and several others were members of the firm.[10] The mill, located on Gwynns Falls, three miles from Baltimore, rapidly attained prominence and attracted the attention of the Du Pont Company.[11] During the War of 1812, William Lorman, head operator, successfully obtained orders from the government.[12] On September 17, 1812, however, a severe accident occurred, and a considerable amount of powder made for the government was destroyed. The fire, originating in the saltpeter refinery, fortunately was discovered in time to permit the workmen to escape unharmed.[13] George

their pistols. One of them carelessly fired his pistol near the powder, causing it to blow up. One boy was killed and the other two seriously injured. *Pennsylvania Journal,* October 25, 1783.

[8] Answer of E. I. du Pont to Peter Bauduy, c. 1818 (Longwood Foundation Library), pp. 8-9. The storage, as well as the manufacture of gunpowder, was extremely dangerous. Consequently, the city of Baltimore was given the power in 1797 "to erect & provide Magazines for the storage of all gunpowder brought to the city or precints [sic] and to compel the same to be stored in the said Magazines." Before this date, the Maryland Fire Insurance Company had control over the safe storage of powder in Baltimore. James McHenry to Henry Dearborn, March 20, 1804 (McHenry Collection, Maryland Historical Society).

[9] Stamping mills were prohibited in England in 1772 because of their danger. Arthur Marshall, *Explosives: Their Manufacture, Properties, Tests and History* (Philadelphia, 1915), p. 16.

[10] J. Leander Bishop, *History of American Manufactures from 1608 to 1860* (Philadelphia, 1861-68), II, 23; J. Thomas Scharf, *History of Baltimore City and County from the Earliest Period to the Present Day* (Philadelphia, 1881), p. 433.

[11] Vincent Boural to E. I. du Pont de Nemours and Company, March 29, 1808 (Longwood Foundation Library).

[12] Lorman to E. I. du Pont, March 13, 1812, in Bessie G. du Pont, ed., *Life of Eleuthère Irénée du Pont from Contemporary Correspondence* (Newark, Del., 1923-26), IX, 28.

[13] Niles' *Weekly Register*, September 19, 1812. Although not all powder makers took the time to make their own saltpeter, they usually refined it themselves, for the quality of the finished gunpowder depended upon the purity of the primary ingredient. The refining process consisted of putting crude saltpeter into a vat, covering

Mayers, manager of the mills, described vividly the disaster in the following account, valuable because of its detailed information about one of the earliest extensive powder mills in the United States:

On Thursday evening, the 17th inst. . . . a fire broke out in the saltpetre-refinery, the awful effects of which are but too distinctly seen & too severely felt by the proprietors of this valuable establishment. Peter Anderson, who was on the spot, at the time, says he saw a fire on the kirbing of the boiler, about the size of his hand; but before he could get water to extinguish it, it communicated to the floor above. I was some distance from the refinery, when the alarm was given, & saw a dark smoke ascending; when I got to the house, it was on fire, above & below; I quenched it, below, & endeavour'd to do so above. The workmen procured a ladder, to enable them to throw water on the upper floor; but the smoke increas'd & the fire spread with such astonishing rapidity, that it was found to be impracticable. I endeavour'd to throw water on the side of the roof next to the falls—but the nitre had begun to melt—& the water falling on it caus'd a number of slight explosions, which compell'd me to desist. Some strove to cut away the roof, but the heat & smoke drove them away. From the time the fire was discover'd till the house was-of-a-blaze was not more than 4 or 5 minutes.

I now saw it was impossible to save the houses; as the store-house join'd them & contain'd a quantity of sulphur—st. petre—st. petre-bags—barrels & lumber; & a variety of other combustible matter; & between the store & packing houses—a quantity of plank timber, &c. The houses being close together, the destruction of the whole was inevitable. My family being much alarm'd, I hasten'd to the dwelling to hurry them off. Several of the men continued to exert themselves to save the property—throwing water on the rooves—cutting the store-roof—carrying powder (12 bbls. which were lost) from the packing-house to the lane &c. As soon as I caution'd my family, I press'd the men to depart; & with difficulty persuaded them of their imminent danger, the fire being now on the store-house roof—they at last moved—& shortly happen'd the first tremendous explosion—which was succeeded by those of the three mills—the shocks were exceedingly severe—a vast quantity of smoke now cover'd the ruins, & adjoining ground to a considerable distance. As soon as the smoke was a little dispers'd, I could discern the drying-house, standing—with the roof flat on the upper-floor, & on fire.[14] I thot all was over & approached—but

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it with water, and placing it over a low fire. The mass was stirred until all the saltpeter dissolved, and as the scum rose to the top, it was taken off. This boiling was repeated as often as necessary. "On the Manufacture of Salt Petre," in James Mease, ed., *Archives of Useful Knowledge*, III (1813), 92-93.

[14] The drying house produced artificial heat to remove moisture from the grains of gunpowder. Although large powder works had extensive drying houses, most mills used only small rooms warmed by a stove. See *The Emporium of Arts and Sciences*, new series, II (1814), 317. Powder also could be dried on large tables exposed to the sun.

soon perceived it had not exploded; the men however return'd to extinguish the fire on the upper-mill. I call'd repeatedly to them to make their escape, but to no purpose, they either did not hear me, or did not attend. The fire on the drying-house increas'd, & I escaped but a small distance—when it blew up with a tremendous report. The scene was awfully sublime; the air was fill'd with flaming matter, resembling sky-rockets play'd off by immense fireworks—what sensations of horror fill'd my agitated mind—destruction with its horrible visage seem'd on every hand. I expected every man in the yard to be number'd with the dead—but in this I was happily mistaken—none were hurt. It is owing to their industry that the upper-mill is still standing.

Much cr.[edit] is due to Mr. Lucas, Mr. Rall, & some of the powder-makers for their great & hazardous exertions, in the most critical moments. They were in & about the mill when the drying-house blew up—but were not aware of their danger. Several of our neighbours now assisted us in bringing water to extinguish the fire; which was happily effected.

The machinery of the upper-mill is in tolerable order—some of the stampers are burnt—the mortar block & bolting-cloths are lost—the wheels & stones are all good—the wall is not much injured—but the roof, windows, & doors are ruin'd. The water-wheel of the granulating mill [15] is somewhat injured from the fall of the wall, but I believe nearly all the other wheels & shafts are good—the house is destroy'd—the water-wheel of the lower mill is all that is saved of it—excepting the wall, the front of which is injured. The magazine, coal,[16] & dwelling houses are materially injured—the packing & drying houses are entirely ruin'd—the walls of the st. petre-house & part of those of the store-house are standing—the large & one square, copper-boiler are not injured—the melting kettle [17] is good—and, excepting three, the iron kettles appear to be on good order. . . . The kettle for refining sulphur is safe—one stove belonging to the drying house is whole—the other one has one plate broken—the

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[15] Powder was cut into grains of various sizes in the granulating mill. A simple graining procedure used during the Revolution made use of a sifter "with a sheep-skin bottom, burnt full of holes . . . which, being moved to and fro, will force the powder through the holes, and form the grain. . . ." Purdie's *Virginia Gazette*, February 16, 1776. E. I. du Pont patented a graining machine on November 23, 1804, which consisted of a revolving copper barrel, pierced with holes the size of powder grains.

[16] "Coal" refers to charcoal, another ingredient of gunpowder. Charcoal made from light woods, such as willow, alder, and poplar, is most suitable, for it can be finely divided, absorbs little moisture from the air, is readily inflammable, and leaves little ash after combustion. The wood was used in the form of branches about an inch in diameter, cut in the spring and stripped of their bark; the branches then were baked to form charcoal. Lammot and/or Alfred du Pont, undated notebook on the method of manufacturing gunpowder (Longwood Foundation Library).

[17] Kettles were used both for refining saltpeter and for sublimating sulphur. After crude sulphur was melted in an iron pot over a low fire, it was strained through a double thickness of cloth. George Napier, "Observations on Gunpowder," *The Repertory of Arts and Manufactures*, II (1795), 284.

irons belonging to the new grinding mill are all found; but the harden'd ones have lost their temper, which may easily be restor'd. The mill which was building is much injured. The cog-wheels are not much so—the water-wheel is considerable torn—but it would not be very expensive to repair it. The floors are tolerable; but the principal part of the wall is broken.

I have now given as correct an account of this terrible accident as possible—as well as the present state of the apparatus. Now, must beg leave to address myself to the worthy proprietors of this once valuable factory. The loss is indeed exceedingly great, who can view it without the strongest emotions of sorrow. I feel with the keenest sensibility my best designs frustrated. . . . I humbly hope no blame will be attach'd to me—I feel a consciousness of having done my best endeavours, both to preserve the mills & other parts from accident, & to economize things as much as possible. I should indeed have been guilty of the vilest ingratitude to have done otherwise. . . .[18]

William Lorman, head operator, explained that "explosion succeeded explosion—till every mill on the place, with the Drying house & packing house, were demolished or nearly so."[19] In a letter to E. I du Pont on September 26, Lorman indicated that the accident had not been intentional: "I am happy to state to you, that I believe it did not originate from design. No stranger had been at the mills the day of the accident—nor were there any persons about the place upon whom suspicion could rest." Perhaps DuPont, interested in protecting his own property, feared that Lorman's mills had been blown up by a supporter of the English cause in the war. The editor of the *American & Commercial Daily Advertiser*, aware of the urgent need for powder, claimed that "the *times* and the merit of the owners, cause this accident to be much regretted."[20] Suffering a loss of twenty thousand dollars, the proprietors decided to "decline rebuilding the mills,"[21] and the history of the works ended with the 1812 disaster.[22]

[18] Mayers, "Narrative of the Destruction of the Balt. Powder works" (MS at Hagley Museum received as gift from Lammot du Pont Copeland in January, 1957). Mayers' document contains information about early powder mills difficult to find elsewhere.

[19] Lorman to E. I. du Pont, September 26, 1812 (Longwood Foundation Library). The *Federal Gazette* of September 18, 1812, reported that five or six buildings were demolished by the accident.

[20] September 19, 1812.

[21] Lorman to E. I. du Pont, September 26, 1812 (Longwood Foundation Library).

[22] Spencer, *op. cit.*, p. 29. E. I. du Pont wrote to William Lorman at Baltimore on March 5, 1814, commenting that the latter had since "given up this Kind of

Other extensive powder works, the Bellona mills, were established on Jones' Falls, about seven miles from Baltimore, in 1800 or 1801. Although gaining a national reputation under the ownership of James Beatty, the firm experienced a series of crippling disasters. The first occurred on November 18, 1801, when a workman took " the burning snuff of a lamp-wick " in his fingers and threw it hastily into a heap of powder:

> The explosion was instantaneous—the house [mill], 30 by 40 feet, with every atom in it, was mounted in the air. Of the roof, not a vestige can be found; and the walls, which were of massy stone, are levelled with the ground. The man who was least injured, says, the first place he found himself in, after the return of his senses, was the mill-race, without knowing, for a while, what could have placed him there.[23]

In September, 1812, a large quantity of saltpeter was destroyed when the refinery of the Bellona mills burned. The flames were intense, and sparks spreading to the roofs of four adjacent powder mills caused them to explode. The sulphur storehouse also caught fire and was totally destroyed with all its contents.[24] Despite the accident, the Bellona firm became the leading Maryland producer and competed actively with E. I. du Pont de Nemours and Company. By 1814, the product was " warranted to be fully equal . . . to any at Market." [25] In the following year, E. I. du Pont stated that " one of our principal motives is to strive against the competition of the Baltimore factories." [26]

On August 29, 1820, the Bellona mills were rocked again by a severe explosion, which produced a shock felt in Washington. At least three workers were killed, and others severely wounded.[27] One laborer was blown three hundred yards from the mill in which he was working, and " his head, body, legs and arms, in detached pieces, [were] found in several directions! " [28] The *Federal Gazette* on August 30 reported that the powder yard was

business." Letter Book of E. I. du Pont de Nemours and Company, Old Stone Office Records (MS, Hagley Museum). The abbreviation L. B. will be used in subsequent citations.

[23] *New-York Evening Post*, November 24, 1801.

[24] Alfred Victor du Pont to Benjamin Gerhard, July 20, 1850, in Allan J. Henry, ed., *The Life of Alexis Irénée du Pont* (Philadelphia, 1945), I, 152.

[25] *Sentinel of Freedom*, April 19, 1814.

[26] To A. C. Cazenove, March 29, 1815, L. B.

[27] *American & Commercial Daily Advertiser*, August 30, 1820; *Daily National Intelligencer*, September 1, 1820.

[28] Niles' *Weekly Register*, September 2, 1820.

"a scene of awful and utter desolation." The stamping mill, drying room, graining mill, and packing house were seriously damaged,[29] and James Beatty was not certain whether or not he should rebuild. He was greatly discouraged by his failure during previous years to receive as profit more than three per cent of his investment, which was not nearly enough to cover losses from explosions.[30] According to E. I. du Pont, "A Powder manufacturer who would only clear 10 pr. ct. of his capital, which in any other business would be a reasonable profit, would be sure to go to ruin one day or another, as he would not be able to bear the losses occasioned by explosions." [31] Realizing that complete rebuilding of the damaged structures would require both time and energy, Beatty in the 1820 census listed his profit as variable due to "casualties in the Machinery & Buildings." [32]

After beginning to repair the mills, Beatty was handicapped again when a serious explosion took place on October 15, 1821. Four persons, including the manager, were killed, and two others were injured.[33] Another workman was killed by a minor explosion on January 23, 1830, but Beatty recovered quickly from the financial loss and could compete with other leading firms by June.[34] E. I. du Pont, realizing the strength of the Bellona establishment, was unwilling in 1831 to surrender completely his sales in Maryland: "Nevertheless we should not like to give up altogether the Baltimore market on account of the competition of Mr. Beaty [Beatty]." [35] The Bellona mills were rebuilt following a subsequent accident on April 19, 1833, only to be damaged by

[29] All of the buildings included in the 1820 census figures were damaged badly. Twenty-three men at this time were employed in the operation of the mills. Fourth United States census, 1820, original returns from the assistant marshals (National Archives and Records Service, Division of Commerce).

[30] Bradford & Cooch to E. I. du Pont de Nemours and Company, August 30, 1820 (Old Stone Office Records, Hagley Museum).

[31] To P. P. F. de Grand, June 22, 1821, L. B. Financial strain placed upon powder manufacturers by explosions was very great, for the expense of repairing and rebuilding the mills had to be met at the same time that production rates were lowered. Borrowing, rapid rebuilding, and extension of sales enabled many operators to recover from explosions.

[32] Fourth United States census, 1820, original returns from the assistant marshals (National Archives and Records Service, Division of Commerce).

[33] J. Thomas Scharf, *Chronicles of Baltimore* (Baltimore, 1874), p. 400.

[34] *New-York Evening Post*, January 27, 1830; E. I. du Pont to Patrick Durkin, June 21, 1830, L. B .

[35] To Bradford & Cooch, April 2, 1831, L. B. Du Pont sold a considerable quantity of powder in Baltimore, "where our powder obtained a decided preference at the very door of Beatty's factory." E. I. du Pont to John A. Forsyth & Co., November 26, 1827, L. B.

other explosions until 1856,[36] when the site finally was sold to the city of Baltimore for its waterworks. The stream was dammed, so that most of the old mill area is now covered by Lake Roland. The name of the powder works still is preserved, however, in Bellona Avenue.[37]

Another powder mill of importance was located about seven miles from Baltimore and operated by a Mr. Levering. The establishment is first mentioned in 1808, and by 1811 Levering was selling his product at such low rates that the Du Pont Company was forced to reduce its prices.[38] On October 4, 1817, the property was destroyed by three successive explosions, creating a shock throughout Baltimore. Five workers were killed instantly, and four others were injured seriously by the ignition of two hundred barrels of gunpowder. One of the foremen believed that the workmen "must have accidentally carried some sparks into the mill, which . . . alighted upon the sleeves of their coates, or . . . upon their pantaloons."[39] The escape of one of the survivors was most miraculous: "He was blown by the first explosion . . . from one mill on the roof of another; another explosion immediately afterwards ensued, by which this unhappy victim of the second explosion was thrown on the water wheel, and from thence into the stream."[40] The difference in time between the various explosions was caused by the spreading of the flames from the burning rafters and beams of the first mill to the adjoining buildings. Fortunately, the fire did not ignite the powder magazine, but property damage was estimated at forty thousand dollars. E. I. du Pont indicated the severity of the explosion when he

[36] *Daily National Intelligencer*, April 24, 1833; *Delaware Gazette*, April 23, 1833. On March 6, 1840, the drying house blew up with a loud explosion, reported to have been felt as far as Chestertown. *The Sun*, March 18, 1840. Two persons were killed in another disaster on May 30, 1848. Scharf, *Chronicles*, pp. 527-528.

[37] James Beatty, owner of the mills, gave the name "Bellona" to the powder works for the Greek goddess of war, because his daughter was born on the day of the Battle of Waterloo. See column by Carroll Dulaney, *Baltimore News-Post*, July 9, 1937. The Bellona mills quickly sank into oblivion, and on January 24, 1936, Edmond Fontaine wrote in the *Baltimore News-Post*: "After years of inquiry I cannot find any one who knows much about the powder factory." Information about Beatty, an influential and respected citizen of Baltimore, is contained in the biography file of the Maryland Department, Enoch Pratt Free Library, Baltimore.

[38] Briscoe and Partridge to E. I. du Pont de Nemours and Company, September 13, 1811 (Longwood Foundation Library). Du Pont wrote on September 6, 1817 to Vaughan & Dahlgren that the explosives he sold at Baltimore were "the lowest powder we have ever sold." L. B.

[39] *Federal Gazette*, October 6, 1817.

[40] *Ibid.*

stated that it "put out of the market one of our largest competitors." [41]

Another Maryland powder maker was Thomas Ewell, who established a mill near Bladensburg in 1811. Not being a professional powderman, Ewell needed much technical assistance if his mill was to succeed. After securing sizeable government contracts, he pleaded with E. I. du Pont for help in filling them—either in the form of a good superintendent or a partnership.[42] Du Pont, however, refused to aid Ewell, who continued to plead for assistance and became abusive when his requests were turned down: "Are you alarmed that the manufactory of Essone [powder works of the French government] which you have copied is about to be introduced over all the U. States? And that the eyes of the people will be soon opened to the impudence of the pretensions of the exclusive powder-makers of Brandywine?" [43] Forced to admit that he did not understand the technical problems of making powder, Ewell advertised in newspapers for a capable superintendent for his mills.[44] He even tried to entice workmen from the Du Pont mills:

> A preference will be given to those who have worked at the manufactories in the United States, made on the principles of the French establishment at Essonne and at L'isle de France, and as an inducement for the best hands to come on, there shall be a regular promotion in the establishment from the more laborious work and low wages to better situations. . . .[45]

Wearied by Ewell's attempts to bribe his laborers, Du Pont referred to the Bladensburg manufacturer as "a kind of crack

[41] To William Cornell, October 28, 1817, L. B.

[42] Ewell to du Pont, December 8, 1811 (Henry B. du Pont Collection, Longwood Foundation Library). The various Baltimore mills at this time were receiving the largest proportion of government orders for powder. See du Pont to Ewell, December 14, 1811 (Henry B. du Pont Collection, Longwood Foundation Library). Ewell, however, hoped to obtain "all the favor heretofore shewn to the Baltimore mills," since the "government had *pledged* itself to give very particular patronage to my manufactory near Washington." To E. I. du Pont, December 22, 1811 (*ibid.*).

[43] Ewell to DuPont, April 12, 1812 (Henry B. du Pont Collection, Longwood Foundation Library).

[44] In the *Daily National Intelligencer*, April 14, 1812, Ewell advertised for an "able superintendent of character—the highest salary will be given to one who can act in that capacity." He needed information about such matters as the size of saltpeter kettles, the amount of water to be added in grinding powder, and the method of punching holes in leather to granulate powder. Letter to Charles Munns, November 24, 1811 (Longwood Foundation Library).

[45] *Daily National Intelligencer*, April 14, 1812.

brained fellow . . . who with all the bombast published by him in the newspapers is obliged to offer to some poor rough Irishmen of our factory $8 or 900 per year for all the science which is to set up his factory above all others. . . ." [46] Ewell resorted to writing letters to various workmen in his attempt to secure a labor supply, but with no success. He finally got some laborers by declaring that his mill belonged to the United States government.[47]

Because of the great demand for skilled powder workers, it was not unusual for manufacturers to entice other owners' laborers away from them. The Ewell case is far from being an exception. It is probable that many of the Baltimore powder mills used workers who had been trained at the Du Pont establishment. At least one former Du Pont employee, John Hagherty, worked at the Bellona mills.[48] In 1816 Pierre Samuel du Pont made the exaggerated claim that each of the twenty-five mills in Pennsylvania had been " formed by workmen enticed from us." [49] Learning from experience to safeguard information, E. I. du Pont made it a policy to prevent " intelligent workmen " from seeing his machinery.[50]

After obtaining a crew of powdermen, Thomas Ewell operated his mill efficiently, although much of the powder was of poor quality.[51] By November, 1812, he would have been willing to let somebody else take the risk of making gunpowder.[52] A month

[46] To William Lorman, April 2, 1812, L. B. Ewell also attempted to bribe workers in Stephen Decatur's mill at Belleville, New Jersey. Decatur to E. I. du Pont, July 17, 1812 (Longwood Foundation Library).

[47] Public statement by E. I. du Pont concerning the Ewell affair, June 16, 1812, in Bessie G. du Pont, *op. cit.*, IX, 33-36. Despite Ewell's claim, the government of the United States, unlike foreign countries such as England and France, did not have its own powder works. During the Revolutionary War, the government imported most of its powder, but after that it increased greatly the number of contracts with domestic manufacturers. The Ordnance Department, established on May 14, 1812, had the duty of inspecting the powder purchased from private individuals. Numerous arsenals were established, but a national gunpowder factory was never constructed. See " Preliminary Inventory of the Records of the Office Chief of Ordnance " (typescript, n. d., National Archives and Records Service, War Records Branch), p. 1 ff.

[48] E. I. du Pont to Samuel Wetherill and Company, October 13, 1826, L. B.

[49] To wife, December 14, 1816 (Longwood Foundation Library).

[50] To William Kemble, November 29, 1821, L. B.

[51] Thomas Law to E. I. du Pont, December 1, 1812, in Bessie G. du Pont, *op. cit.*, IX, 66.

[52] Ewell's " works are to be given for the risque of making the powder for one year." Law to E. I. du Pont, November 14, 1812 (Longwood Foundation Library). By this time, Ewell was considered " a favorite, as his manufacture brings money to the City by employing hands." *Ibid.*, December 25, 1812.

later, he suffered the only accident on record when the drying house with two thousand pounds of powder exploded,[53] but production was not lowered.

On December 7, 1813, Ewell received a patent for the manufacture of gunpowder, which listed three improvements: boiling the ingredients by steam, a method of incorporating them with rollers, and a technique for granulating the powder.[54] These three advancements, according to Ewell, would "most truly diminish more than one half the risk, the waste and the expence of the manufacture." [55] Most important of the improvements was the wheel for incorporating the ingredients—saltpeter, sulphur, and charcoal. Soon wheel mills became regular equipment in the United States, although a few of the more dangerous stamping mills persisted until the early twentieth century.[56] In spite of his patent, however, Ewell could not make a success of his business. In 1817 his property was offered for sale, and the enterprise came to an abrupt end.[57]

Another powder mill near Bladensburg was operated by David Bussard. On April 18, 1817, the first accident occurred when powder in the pounding mill ignited, probably from friction:

> Two men passed in a moment from time to eternity, and two others were dreadfully mangled or wounded—the one a white man with a family, the other a man of color. The injury to the works, it is understood, cannot be repaired at a less expence than five thousand dollars. The explosion, it is believed, occasioned no injury beyond the limit of the works.[58]

A second accident at Bussard's establishment on July 8, 1818, killed four or five persons, but a magazine of powder a short distance from the explosion was "miraculously preserved." [59] The Ordnance Department of the United States government reported on July 18 that Bussard's "powder works having been lately

[53] Law to du Pont, December 25, 1812 (Longwood Foundation Library).
[54] Bishop, *op. cit.*, II, 200.
[55] Advertisement in the *Daily National Intelligencer*, December 30, 1813. See also Thomas Ewell, "Gunpowder," *The Emporium of Arts and Sciences*, new series, II (1814), 317-318.
[56] Arthur P. Van Gelder and Hugo Schlatter, *History of the Explosives Industry in America* (New York, 1927), p. 121.
[57] Bessie G. du Pont, *E. I. du Pont de Nemours & Company, a History, 1802-1902* (New York, 1920), p. 39. In the *Daily National Intelligencer* on July 9, 1817, Ewell offered for sale his powder works, which were "on an extensive plan . . . in complete order. . . ."
[58] *Daily National Intelligencer*, April 19, 1817; *Federal Gazette*, April 21, 1817.
[59] *Daily National Intelligencer*, July 10, 1818.

destroyed at Bladensburgh by an explosion, renders him incapable of fulfilling the engagement [contract]." [60] Bussard recovered from the accident, however, and was able to continue making contracts with the government for quantities as high as forty thousand pounds.[61]

The 1820 census contains information about an additional powder establishment in the Baltimore area—the Aetna Gunpowder Company.[62] Located about four miles from the city, the Aetna mills employed twenty men to operate two stamping mills with thirty-six mortars, a graining mill, a refinery, a drying house, and four magazines. The mills were described as having been " in constant operation near seven years, and preserved from accident." [63] The good fortune did not continue, for on September 25, 1824, a serious explosion resulted in heavy damage, the extent of which was estimated at five thousand dollars. The blast, attributed by the owners to an incendiary, took place in

> the principal building of the factory, amidst several hundred pounds of the combustible materials, and was so violent in its effects as to blow to atoms the house and machinery, even to the foundations. The workmen had suspended all operations and closed the mill at sunset, and were totally unaware of the explosion until it had occurred. One of the workmen had a very narrow escape from the fragments of the mill—but providentially no one sustained personal injury. The report and shock were distinctly heard and felt throughout the city. . . .[64]

Recovering from the disaster, the Aetna mills continued to rank among the leading Maryland powder producers.[65]

[60] *Report of the Select Committee . . . Ordnance Department* (Washington, 1821), p. 22.

[61] On August 1, 1818, Bussard agreed to deliver forty thousand pounds to the government within three years. He made another contract for thirty-five thousand pounds on August 30, 1822. Notebook of contracts and records relating to the procurement of ordnance and ordnance stores, October, 1812-May, 1829 (National Archives and Records Service, War Records Branch). Bussard served as justice of the peace in Georgetown and was a trustee of the Georgetown Poorhouse. Josephine Cobb, Curator of Columbia Historical Society, to author, April 2, 1957.

[62] Another powder mill, owned by the firm of Williams and Stull, was located at Bladensburg. Williams and Stull wrote to E. I. du Pont on July 9, 1816, and offered to sell their mills: " They are in very complete order & being at the seat of Government gives them many advantages. We have done very well with them since they have belonged to us, which is about three years." (Longwood Foundation Library).

[63] Fourth United States census, 1820, original returns from the assistant marshals (National Archives and Records Service, Division of Commerce).

[64] *American & Commercial Daily Advertiser*, September 27, 1824.

[65] E. I. du Pont to Bradford & Cooch, July 28, 1829, L. B. *The Baltimore Directory, Corrected up to June 1829* (Baltimore, 1829), p. 276, contains the fol-

Although handicapped by severe explosions, Maryland powder manufacturers succeeded in producing large quantities of explosives in the post-Revolutionary period. The mills in the state marked " a change in the powder industry from one having more or less a 'homespun' or local character to one of national importance and magnitude." [66] Early in the nineteenth century, the growing industry expanded from Maryland to include the other Middle Atlantic states. As early as 1791, Alexander Hamilton reported that " no small progress has been . . . made in the manufacture of this very important article." [67] In 1807, the Baltimore powder agent of the Du Pont Company wrote to Wilmington: " The market here is fully supplied by the powder made at the manufactories in the neighbourhood of this place, which has latterly been found to be of a very good quality and given every satisfaction to purchasers." The agent concluded his report by observing that " the importations of English powder into this place for a long time past have been very inconsiderate." [68]

The 1810 census figures, which give the first summary of powder production, list Maryland as manufacturing over a fifth of the nation's total of almost one and a half million pounds. Although early census figures frequently are inadequate, those for Maryland powder production are reliable. They indicate that the state ranked first with a total output of 323,447 pounds at nine different establishments. Mills near Baltimore produced 312,500 pounds of the total.[69] Albert Gallatin in 1810 pointed out that gunpowder made in the vicinity of Baltimore was " of a quality said to be equal to any imported," [70] and he indicated that the mills were producing twice as much as the Du Pont works. He informed the House of Representatives that the manufacture of powder in the United States " could at any time be made equal to the consumption, with mills in Delaware, Maryland, Pennsyl-

lowing item: " Rowe, J. K. merchant and president of the AEtna powder company, cor of Pratt and South."

[66] Van Gelder and Schlatter, *op. cit.*, p. 71.

[67] Report by Hamilton on December 5, 1791, in *Reports of the Secretary of the Treasury of the United States* (Washington, 1928), p. 129.

[68] Isaac McKim to E. I. du Pont de Nemours and Company, October 3, 1807 (Longwood Foundation Library).

[69] Third United States census, 1810, original returns from the assistant marshals (National Archives and Records Service, Division of Commerce). The *American Watchman* on February 27, 1811, listed only six powder mills in Maryland.

[70] Quoted in Walter Lowrie, ed., *American State Papers: Documents, Legislative and Executive* (Washington, 1832-61), Finance, II, 429.

vania and other places." [71] One statistician pointed out in 1819 that almost a third of the nation's powder was being made near Baltimore.[72] Maryland, more than any other state, was responsible for the fact that " the improvement in the manufacture of gun powder . . . has exceeded all calculation." [73]

Maryland was the first center in the United States of significant, extensive powder works, and not until the Du Pont Company became firmly established were the Baltimore mills seriously rivaled. Pennsylvania, the other early leader in gunpowder production, had few mills comparable to those near Baltimore; instead, there were numerous smaller works scattered throughout Philadelphia, Delaware, and Montgomery counties.[74]

Holding a prominent place in the powder industry in the early decades of the nineteenth century, Maryland slowly increased its production and reached 669,125 pounds in 1840. Other states, however, increased at a more rapid rate, so that Maryland dropped to fifth place.[75] By 1860, only one powder mill remained, and it was an outgrowth of the Bellona works on the east branch of Jones' Falls.[76] Soon nitroglycerin and dynamite were to succeed black powder as America's leading explosive.[77]

The half century following the Revolutionary War had witnessed the development of a new industry first centered in Maryland—an industry which succeeded in spite of dangers unlike those of any other mills in the nation. Enterprising powder manufacturers in Maryland established mills, overcame many hazards, and produced large quantities of explosives. Through their efforts, the state led the nation in powder production. In these post-Revolutionary years, a new industry—dangerous but essential—was established in the United States.

[71] *Ibid.*

[72] D. B. Warden, *Statistical, Political, and Historical Account of the United States of North America* (Edinburgh, 1819), III, 269.

[73] *American Watchman*, August 18, 1810. The price of powder was lower in Baltimore than in any other section of the country. E. I. du Pont to Briscoe & Partridge, October 23, 1817, L. B.

[74] Most of the early Pennsylvania powder mills were located within forty miles of Philadelphia. See Book II of the Third Census (Philadelphia, 1814), photographic facsimile printed under the title *A Statement of the Arts and Manufactures of the United States of America, for the Year 1810, Digested and Prepared by Tench Coxe of Philadelphia* (New York, n. d.), p. 68.

[75] Van Gelder and Schlatter, *op. cit.*, p. 79.

[76] *Ibid.*

[77] Williams Haynes, *American Chemical Industry* (New York, 1954), I, 187, 366-368.