

Biographical Essay on Lammot du Pont / Nancy Packer
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The decades of Lammot du Pont's life, from his birth in 1831 until his death in an explosion less than fifty-three years later, were years of struggle, growth, and change for the Du Pont company. Still a family partnership rather than a modern corporation, the company had, by the 1880s, grown far beyond the black powder mills established along the Brandywine Creek by E. I. du Pont in 1802 to encompass over thirty mills throughout the country which supplied powder to markets around the world. In his varied roles as chemist, partner, diplomat, negotiator, innovator, inventor, and powderman – indeed as "the life of the business" for over thirty years – Lammot du Pont was a key force in Du Pont's growth and change during this critical period. His improvements in black powder manufacture led the company into the forefront of the blasting powder industry at a period of unprecedented growth, while his entrance into the field of high explosives, with the founding of the Repauno Chemical Company in 1880, set the stage for Du Pont's world dominance in the production of dynamite by the 1920s. In his interests and activities can be seen the kernels of Du Pont's Eastern Laboratory and Experimental Station, the company's innovations in safety management, and its diversification into the production of chemicals and consumer products that would be the foundation of its phenomenal success for over a century. In just three short decades, Lammot du Pont had an indelible impact in shaping the Du Pont company that emerged in the 20th century.¹

The son of Alfred Victor du Pont and grandson of founder Eleuthère Irenée du Pont, Lammot was born on April 13, 1831, and raised near the powder mills built by his grandfather in 1802 along the Brandywine Creek near Wilmington, Delaware. Like his aunts, uncles, and cousins, Lammot's life was bound up from infancy on with the black powder business upon which the family's fortunes rested. The second of four boys and three girls born to Alfred Victor du Pont and Margaretta Elizabeth (Meta) Lammot, Lammot du Pont grew up at "Nemours," the home which his grandfather had built for Alfred and Meta at the time of their marriage in 1824. One of five du Pont homes in the immediate vicinity of the powder yards, Lammot was reared in a large and intimate family environment, surrounded by aunts, uncles, no fewer than twenty-one cousins, six siblings, and the powdermen and their families. E. I. du Pont died in 1834, when his grandson Lammot was just three years old, with red ink from the company's founding and expansion still plaguing the business. After a three-year interval, during which E. I.'s competent son-in-law James Antoine Bidermann cleared the company's debts through rigorous management, a new partnership agreement was drawn up among the family members in 1837. Under the agreement, Lammot's father Alfred, who was the eldest son by nearly fourteen years, was named to the head of the company -- a position that he would hold for the next thirteen years, until 1850.

¹The most complete biography of Lammot du Pont available is Norman Wilkinson, *Lammot du Pont and the American Explosives Industry 1850-1884* (Charlottesville: University Press of Virginia for the Eleutherian Mills-Hagley Foundation, 1984). Wilkinson's study has been a central resource for this essay, and readers interested in more details of Lammot du Pont's life and activities should begin their exploration with that work.

While the close-knit nature of extended family and family business along the Brandywine must sometimes have felt restrictive, it also created a virtually self-sufficient community among the du Ponts, who rarely needed to turn for companionship outside the society surrounding the mills. A surviving sketch by a family friend from the 1830s captures what must have been a fairly typical evening entertainment at the du Pont family homes during Lammot's youth: an animated Meta du Pont playing a vigorous tune on the parlor piano for a group of dancing couples, while a bevy of sleeping infants -- undoubtedly all cousins and siblings -- were packed in beds upstairs.² Members of the du Pont clan were often known by their nicknames -- "Bishop," for example, for Lammot's reserved elder brother Irénée, or "Toto" for their sister Sophie. Lammot was commonly called "Motty," although his uncle once teased him as "Mottibus."³ As a young man, Lammot concealed some of his natural animation under a "quiet parlour face," but his good humor and natural charisma showed through in family gatherings, as at a New Year's Day party when he was disguised as a woman -- albeit a strapping, six-foot one -- and introduced to his unsuspecting cousins as "Miss Jackson."⁴ As he shed his youthful shyness, he developed a reputation for being "always happy and cheerful in his address, [appreciative of] a good joke or witty saying . . . a good story teller, always amusing and popular," and an "easy and entertaining talker."⁵

There is ample evidence in the life of Lammot du Pont for the influence of both heredity and education on the adult he would become. Certainly there was precedence for Lammot's predilection for chemistry and scientific experimentation among his ancestors. While still in France, his grandfather E. I. du Pont had studied powdermaking with the great Enlightenment chemist Antoine Lavoisier at the National Powder Works in Essonne. Although E.I.'s father, Pierre Samuel du Pont de Nemours, urged botany on his son as the most useful branch of study for the family's planned emigration to the young United States, it was E.I.'s own fascination with black powder-making that ultimately best served the family's interests in America. Like his son and grandsons after him, E. I. du Pont had an innate fascination with and belief in scientific experimentation. In a memoir preserved by Lammot, E.I. lamented the failure of previous generations to record their experiences with gunpowder for future use, "except some tracts scattered in the memoirs of the academy of sciences which have indeed been serviceable to my design." Thus left "in the same case with those who are forced to draw the whole from their own observations," he set out to "proceed methodically" and "to examine particularly" the materials, properties, and effects of gunpowder, including the processes and results of his own experiments with the compound. Enthusing that "We are arrived,

²In *Belin-du Pont-Copeland Family Papers*, Accession 1597 [hereinafter Acc. 1597], Box 4, folder 1. Unless otherwise noted, all manuscript references are to documents held in the Manuscript and Archives Collections of the Hagley Museum and Library, Wilmington, Delaware.

³See, for example, Margaretta Lammot du Pont to her daughter, Sophie du Pont, n.d.; Henry du Pont to Lammot du Pont, October 1848, in *Lammot du Pont Papers, 1850-1884*, Accession 384 [hereinafter Acc. 384], Box 48.

⁴Eleuthera du Pont Smith to Lt. Richard S. Smith, 10 August 1850, quoted in Wilkinson, *Lammot du Pont*, p. 23.

⁵Pierre S. du Pont, *Life in My Father's House* (Wilmington, De.: privately printed, 1987), p. 5.

in these latter ages, to treat abstracted subjects with such a clearness and perspicuity as they before were not thought susceptible of," E.I.'s confidence in the potential of scientific method would have won enthusiastic endorsement from his grandson Lammot.⁶

Alfred shared his father's enthusiasm for the sciences and, as a child, began a collection of minerals which would later pass to Lammot's eldest son. E. I. du Pont approved of his son's scientific bent and advocated a chemical education for Alfred as a logical investment in the future of the family enterprise. As the du Pont patriarch, Pierre S. du Pont, remarked to his wife in 1816, "Alfred has been sent to Carlisle under Dr. Cooper, the friend and principal pupil of Priestley, the greatest chemist there is in America. Alfred will not be what is called a scholar, but he will be a chemist, mathematician and mechanic. These are the most important actual sciences in our position." Pierre also lauded his grandson's "ingenuity" and "skill," and predicted that: "At the age of forty he will be a man of lofty and powerful judgement."⁷

As a student and later laboratory assistant to Thomas Cooper, the United States' most eminent chemist, Alfred was exposed to his mentor's advocacy of the application of science to industry and the need for more "chemists in this country among manufacturers" to ensure American economic independence. Studying under Cooper briefly in Carlisle and then serving as his assistant for a course of lectures at the University of Pennsylvania from 1816 to 1818, Alfred had the rare opportunity to gain hands-on laboratory experience in an era in which lecturing and rote learning dominated educational theory. His grandfather applauded the plan: "Alfred will serve as his operator; that is the best way to learn." Alfred was thus able to benefit from Cooper's dedication to "show as often as I can, in what way the most material properties of the chemical substances can be demonstrated by means of apparatus, every where to be found, and within the compass of moderate income."⁸

Alfred's education was cut short, however, by the devastating explosion of March 1818 that nearly destroyed the family business, forcing him to leave Philadelphia and return to the powder yards to help in the rebuilding. While his younger brother, Alexis Irénée, would go on to study at the University of Pennsylvania, Alfred's formal education was over when he was just twenty years old. Lacking the depth of education that his brother and, later, his sons would acquire, Alfred also faced demands on his time as head of the company that limited the time available for him to conduct scientific experimentation. Nevertheless, Alfred demonstrated to his children his belief in the importance of experimentation for the company's business and his personal passion for scientific study. He sought to enhance the quality of the Du Pont product and introduced a number of improvements in production during his tenure as head of the company. He was interested

⁶"Extract of Notes on Gunpowder by Irénée du Pont 1814," Box 33.

⁷Carroll W. Pursell, Jr., "Thomas Cooper and Alfred Victor du Pont: A Case Study in Chemical Education in the Early Nineteenth Century," research report, 1958, Hagley Museum and Library, p. 7; Norman B. Wilkinson, "The Education of Alfred Victor du Pont, Nineteenth Century Industrialist," *Pennsylvania History* XXVIII (April 1961), p. 114.

⁸Pursell, "Thomas Cooper and Alfred Victor du Pont," pp. 9, 11.

in the potential of a new explosives product, known as gun cotton, and experimented with his own formulation in order to assess its qualities and characteristics. While he concluded that the expense of its manufacture was at present too high and its performance as an explosive unproven, he intimated a belief in its future potential.⁹ His interest was prescient, as gun cotton, or nitrocellulose, would become the source of the company's most important products in the twentieth century – from smokeless powder (of which his nephew and grandson would patent the first American version in 1892) to pyroxylin plastics and lacquers. Sometime in the late 1830s, Alfred even constructed a small workshop near the family home in which to conduct his experiments. The structure may be the same one that Lammot later employed as an experimental laboratory, which was moved and reconstructed in the 1960s on the grounds of the Hagley Museum, where it stands today.

Lammot's own interest in science manifested itself early in life. As a boy, he noted in a letter to his elder brother E. I. (known, like his grandfather, as "Irénée") that "mother gave me my choice a box of instruments or to go down to cape May of corse [sic] I chose to have a box of instruments."¹⁰ For the early education of Lammot and Irénée, however, Alfred sought a broadly classical schooling, reflecting both his own wide-ranging literary interests and his perception of what a well-rounded education should consist. Lammot thus was sent to study at the Wilmington Classical Institute under the Rev. Samuel Maxwell Gayley in the early 1840s. As the Institute was located in downtown Wilmington and separated from the du Pont powder mills by some five miles of unpaved roads, Lammot attended the school as one of about twenty boarders. A newspaper advertisement for the school in 1841 noted that the Institute taught "all the branches of a complete English, Mathematical, and Classical Education." Gayley was particularly well-known for his skill in teaching the classics, and one biographer noted that "The whole literature of the Greek and Latin classics, their mythology, history, manners, and customs were at his fingers' end." Gayley also asserted that the Institute would have a positive impact on its students' characters, taking "the utmost care . . . to establish habits of industry and inculcate correct principles of morality."¹¹

By early 1845, Lammot had left the Wilmington Classical Institute and was in Philadelphia, where his brother Irénée was already attending the University of Pennsylvania. It is possible that Lammot was preparing for his entrance examination to the University during this period, as admittance was dependent upon a demonstration of competence in Ovid, Virgil, Cicero, Horace, and Homer, as well as Greek and Latin exercises, geography, English grammar, and arithmetic and basic algebra.¹² Among a group of Lammot's surviving notebooks, one which may date from this period is

⁹B. G. du Pont, *E. I. du Pont de Nemours and Company: A History, 1802-1902* (Boston and New York: Houghton Mifflin Co., 1920), pp. 68-72.

¹⁰Lammot du Pont to Irénée du Pont, [1843?], Acc. 384, Box 48.

¹¹Anne E. Mayer, "The Education of Lammot du Pont: Training for Industrial Leadership," research report, 1970, pp.10-11, Accession 1645.

¹²*Ibid.*, pp. 15-16.

“Arnold’s Greek and Latine [sic] Exercises.”¹³ His preparation ultimately proved successful, and Lammot was admitted to the University of Pennsylvania as a fourteen-year-old freshman on February 3, 1846.¹⁴

Following in the footsteps of his uncle Alexis and elder brother Irénée, Lammot was voted into membership in Penn’s Zelosophic Society at the end of his freshman year, in June 1846, and was initiated the following September – an activity which was to become a family tradition for an entire generation of du Ponts, with younger brothers Alfred and Bidermann and cousins Alfred R., Eugene, Alexis I., and Francis Gurney du Pont all joining the society over the next two decades. The younger of the University’s two literary societies, the Zelosophic Society (or “Zelo”) required from its members an ambitious program of researching and presenting declamations and compositions, preparing and participating in debates, and submitting creative essays and reviews to the society’s two papers. Irénée was an active member of the Zelo, serving as a co-editor of the *The Review* for a term and even acting in two of the society’s plays, one a satire subtitled “The Most Tragical Tragedy, ever Tragedized by a company of Tragedians.” He was elected to the position of attorney general of the society in the spring of 1848 (a duty that Lammot also sought, three times, without success). And a fellow Zelo lauded Irénée for his debate performance, including his advance preparation, his language (“good), and his “flow of words free and easy.”¹⁵

The society’s records suggest that Lammot was a less enthusiastic member of the Zelo, as the minutes document his occasional absences and lack of preparation for assigned compositions and debates. While he did present a research paper in November 1847 on the French Revolution (which probably appealed to him, given his family’s history) and the following year successfully debated the negative influence of “Prosperity and Increase of Wealth . . . upon the Manners and Morals of a People,” he failed to appear in May 1847 for a debate on the probability of universal peace and was unprepared for another debate, on the social benefits of medieval monasteries, in March 1848. In June 1847, just one year after being elected to the society, the Zelo’s archives even recorded a letter of resignation offered by Lammot du Pont – possibly in conjunction with the explosion at the du Pont mills earlier that spring – but he appeared again in its minute

¹³Acc. 1597, Box 4.

¹⁴Fourteen was the youngest age at which a student could enter the University at the time. As Lammot entered during the second term in 1845-46 and became a sophomore at the end of the third term, he may have completed his freshman coursework in less time than was usual. See Mayer, “The Education of Lammot du Pont,” pp. 16-17.

¹⁵ *Minutes of the Zelosophic Society, 1846-1848, and Zelosophic Society Review*, 21 November 1846, University of Pennsylvania Archives. Lammot’s failure to win enough votes in his first nomination for Attorney General was not surprising, given his spotty record of attendance and preparation for assigned activities in his first year of membership. Disappointment over his loss may explain his absence from three meetings in the next two months, and he was no more successful in his candidacy of June 1848, when he was one of three candidates who received just two votes to their opponent’s thirteen. He appears to have resigned his ambitions for the position after a final loss, in December 1848, by a margin of 18 votes to 1.

books by the following autumn, so must have reconsidered his withdrawal. In April 1849, shortly before his graduation, Lammot was “impeached” with several other seniors “in consequence of debt to the Society,” pleaded “Not Guilty” and declined counsel, and was acquitted by a vote of 7 to 2 at the following week’s meeting.¹⁶

Despite Lammot’s rather lackluster performance as a member of the Zelo, the Society’s activities and expectations of its members are revealing. Both the Zelo and its older counterpart at Penn, the Philomathean Society, provided arenas for lively debate on both philosophical issues and contemporary events, from the immortality of the soul and the validity of clairvoyance to the benefits of protective tariffs and justifications for the Mexican War. Debates and essays commissioned from members reflected a wide range of historical, political, and social topics, and offered a variety of formats for writing, oral presentation, discussion and debate, including both prepared and extemporaneous debates. Participation in such activities is likely to have honed Lammot’s skills in researching, developing, and presenting an argument – skills which were to serve him well throughout his career, particularly when he encountered resistance to his more innovative plans for the company. His father likely approved his sons’ activities with the Zelosophic Society. Alfred du Pont had participated in a similar society – the Belles Lettres Society of Dickinson College – during his brief stay in Carlisle in 1816 and demonstrated a similar methodical approach to presenting facts and solving problems, whether it was a tongue-in-cheek proposal for having a fox stuffed and mounted in a naturalistic pose or a serious assessment of the limitations of gun cotton.¹⁷

More directly relevant to Lammot’s future, of course, were his formal studies at the University of Pennsylvania. At mid-century, the University still required that its students study the classics during each of their four years as undergraduates, although the sciences had gained new ground since Alfred’s day. The brothers, separated by just a year, would have experienced an identical program of coursework, which included Political Economy, Ancient and Modern History, Geology, Moral Philosophy, Algebra, Geometry, and Differential and Integral Calculus. In the sciences, the Elements of the Mechanics of Chemistry were introduced in the sophomore year, while juniors studied Equilibrium, Motion, and Machinery. Seniors were exposed to Optics, Astronomy, Electricity and Magnetism, and a range of other specialized topics, including the Steam Engine. While lectures and rote learning dominated the teaching methods of the time, a chemistry course in Lammot’s junior year offered “experimental lectures,” which may have included laboratory demonstration. The professor of natural philosophy and chemistry under whom both Lammot and Irénée studied was John Fries Frazer, who was an 1830 graduate of the University. A strong proponent of the practical application of science to industry, Frazier was active in the Franklin Institute and the Academy of Natural

¹⁶*Minutes of the Zelosophic Society*, 6 Nov. 1847; 9 Dec. 1848; 28 May 1847; 11 March 1848. Also “Communications between the Society and its members,” *Archives of the Zelosophic Society*, University of Pennsylvania Archives.

¹⁷Purcell, “Thomas Cooper and Alfred Victor du Pont,” pp. 7-8. Alfred addressed his clever disquisition on the possible “attitudes” for mounting the “noble” fox to his son Irénée while at school in Philadelphia, 20 Jan. 1848, Acc. 384, Box 48, while he laid out his conclusions about gun cotton for anxious powder agents in an 1847 letter, quoted in du Pont, *E. I. du Pont de Nemours and Company*, pp. 69-72.

Sciences and was instrumental in the establishment of the School of Mines, Arts and Manufactures at Penn (later the School of Engineering and Applied Science) in 1852, just a few years after Lammot's graduation.¹⁸

While neither Lammot nor his elder brother particularly distinguished themselves in their performances at University, both graduated roughly in the middle of their respective classes.¹⁹ Lammot's grades were marginally higher than Irénée's, particularly in mathematics and the sciences, and it may be that Lammot's superiority in scientific study had already been recognized at home. Alfred, writing to Irénée to recall him for a time to the Brandywine mills after the devastating explosion of 1847, remarked that "If you think a week's absence would be of less injury to Lammot's studies than to you, you must waive your right of an elder son."²⁰ As Lammot's son Pierre later recalled, however, Lammot did not place much importance on being first in one's class, observing that "those who stand at the head of the class at school and college rarely amount to much in their after life."²¹ Certainly Lammot's performance at Penn did not hint at the extraordinary creativity and contributions which he later brought to his work for the family business.

Lammot graduated from the University of Pennsylvania in July 1849. Three years later, the University bestowed a Master of Arts degree upon him – an essentially honorary degree bestowed on all graduates "of three years standing . . . who apply for it," which did not involve further study.²² For Lammot's work for the du Pont company had already begun. His pocket diary for the period recorded that he began work in the saltpeter refinery in September 1849, just months after his graduation.²³ His early work must have proved satisfactory to Alfred, as he was assigned supervision of the refinery and began receiving a salary (or "yearly allowance" in company parlance) in April 1850. As Lammot's son Pierre later recorded, the assignment came about in a somewhat unorthodox manner. Suspecting that the refinery supervisor, Le Carpentier, was on the verge of quitting, Alfred sent his son to look in on the refinery en route to a fishing expedition. If Le Carpentier was absent, Lammot was to step in and assume supervision.

¹⁸Mayer, "The Education of Lammot du Pont," pp. 17-21 and Appendix I. Mayer appears not to have had access to Lammot's notes from his coursework at Penn when she prepared her study, but a range of papers and notebooks do indeed survive, covering topics and problems in algebra, trigonometry, differential calculus, chemistry, American constitutional history, international law, and translations of Heroditus and Demosthenes, among others. See Acc. 1597, Box 4.

¹⁹Mayer provides both an overview and detailed transcriptions of Lammot's grade records in "The Education of Lammot du Pont," pp. 23-24 and Appendix V. The originals of Irénée's and Lammot's grades are maintained in the Archives of the University of Pennsylvania.

²⁰Alfred V. du Pont to Irénée du Pont, 17 April 1847, Acc. 384, Box 38.

²¹"My Father," typescript, LMSS:10, Series B, Box 1686, Folder 7, p. 10.

²²Mayer, "The Education of Lammot du Pont," Appendix I.

²³Lammot du Pont, *Diary*, 1850, Acc. 384, Box 32

Le Carpentier was indeed missing, and Lammot's association with the company became official.²⁴

Even as Lammot's career with the company was advancing, however, his father's was coming to an end. Devastated by the deadly explosion of 1847 and increasingly stressed by production demands, Alfred had been under pressure for some time from his siblings and fellow partners to present an accounting of the company's finances. His failure to do so over a three-year period finally led his brothers to demand his retirement as head of the company – a demand that was seconded by his wife Meta, over fears for his increasingly evident ill-health. Alfred finally stepped down at the end of 1850, revealing that his scientific skills had far surpassed his financial acumen. Despite having overseen dramatic growth in markets and production during his tenure, Alfred also had managed to accumulate a half million dollars in company debt. Into his place as senior partner and head of the company stepped his younger brother Henry, who brought a very different personality and administrative style to the company's management. Trained at West Point and known as "the General" or, simply, "Boss," Henry du Pont would rule the company with an iron rod for the next thirty-nine years. Utterly lacking in his brother's interests in innovation and experimentation, Henry nevertheless brought a financial acumen and eye for detail that would serve the company well over the next four decades of growth.

It was in this atmosphere of change that Lammot spent his early years with the company. In the face of Henry du Pont's relative ignorance of the science (rather than the business) of powdermaking, Lammot quickly became indispensable, earning the title of "our 'chemist'" from his uncle almost immediately.²⁵ While Irénée also had joined the company following his graduation from Penn, it seems to have the younger brother, Lammot, who brought real passion and vision to his work at the mills. During his first five years supervising the refinery, Lammot developed a reputation for tremendous hard work. Even in his own diary, in a characteristic cataloging of "Weights of Individuals," he recorded that his weight had dropped from 180 lbs on April 1, 1850 (his starting date as supervisor) to just 149 lbs four months later.²⁶ His mother lamented that "Lammot is . . . head over ears in work," and he himself noted in 1854 that: "up to Friday night I had been up for 65 hours with four hours sleep, and spent 57 out of the 65 hours in the Refinery."²⁷ Some of Lammot's zeal may have been triggered by his father's forced retirement, leading him to attempt to redeem his father's sullied reputation through his own achievements. His pride in his father's achievements was evident in a remark he made many years later: "On the 31st of December [1850] . . . father retired from the business having entered in 1818 and having made during that time 1,283, 610 kegs, and having built every building then standing on the place or furnished the drawings of them."²⁸ But Lammot also brought training and personal skills that his father lacked to

²⁴"My Father," p. 20.

²⁵"My Father," p. 21.

²⁶*Diary*, 1850, Acc. 384, Box 32.

²⁷Quoted in Wilkinson, *Lammot du Pont*, p. 32.

²⁸Quoted in Wilkinson, *Lammot du Pont*, p. 29.

his work. While he shared his father's scientific interests and interests in innovation and improvement, he also demonstrated a practical ability to analyze and concretize the financial costs and savings of his proposals. Given Henry du Pont's iron rule over the most minute aspect of the company's production and his demand for reduced production costs, this was an indispensable skill.

Despite the frenetic pace of his work for the company in the early 1850s, Lammot did not lose his sense of humor and competitiveness. In February 1854, he and his cousin Charley du Pont began an enthusiastic chess tournament, playing no fewer than twelve games on the first day. Lammot's mother Meta described the event with amusement: "They are chess mad & Charlie here nearly every night."²⁹ Lammot recorded the competition in detail, noting the date, time of day, and results. Charley was winning the tournament eighteen games to Lammot's thirteen (with one draw) when they apparently abandoned the effort three months later.³⁰ As Meta recalled, "Tis amusing with Motty. We had never played together until this week, when he coolly informed me that I did not play as well as he by any means! So, I beat him; yesterday the same thing. 'Well, you may beat me, I grant,' said he, 'but I play the best.'"³¹

Lammot's attention to careful recording demonstrated in his documentation of the chess tournament results also displayed itself in more sober matters. The diary he kept during his first months with the company reflects the tremendous range of his interests and his involvement in all aspects of the refinery's functions, from the most mundane to the most inventive. In it, he recorded the level of the Brandywine Creek, kept statistics on the amount of willow wood on hand for charcoal, and began an "exact account of the expense of the refinery" on a weekly basis. In addition to this practical record-keeping, he speculated on the volatility of gold, kept memoranda on a range of scientific subjects, and recorded the format and results of early experiments, including his first -- an analysis "of a Dark Red stoney substance that was found on the Iron plates that are under the drying pans in the refinery."³²

The same diary reveals Lammot's interest in bringing an historical perspective to bear on the company's operations. "I have thought," he remarked in the spring of 1850, "of writing a history of the Brandywine. For that purpose I have commenced to gather all the information that I can." He walked through the Upper Yard with his father, discussing the history of the site, "and as far as I could understand him I put down the rough plat" of its historic appearance. "At present," he noted, "nothing is left of all this except a part of the road and the rapid Brandywine which roles [sic] on as it did 50 years ago without a

²⁹Margaretta Lammot du Pont to her daughter Sophie du Pont, 2 February 1854, Acc. 384, Box 48.

³⁰"Chess 100 Games," recorded on the back of a map of "Positions of Wagons at the time of the Explosion in Wilmington, Del. 1854," Acc. 384, Box 27.

³¹Mrs. Alfred V. du Pont to daughter Sophie, 2 March 1856, quoted in Wilkinson, *Lammot du Pont*, 33.

³²*Diary*, 1850, Acc. 384, Box 32.

change.”³³ A few years later he embarked on another project to document the company’s history, seeking to gather all of the extant drawings of the Du Pont mills and machines for preservation and future reference. “I think it would be time well expended to devote a few hours to it. . . . if hereafter anyone of good will wishes to arrange them I will have done no harm, and perhaps may be of some use.”³⁴

Even as Lammot documented the company’s past, important changes in its operation were occurring. In 1852, Lammot convinced his conservative uncle to permit the installation of the first steam engine in the refinery. Two years later, in May 1854, the deadly explosion of three loaded powder wagons on the streets of Wilmington forced the company to build a road from the mills to a new wharf on the Christina River outside the city. And by the fall of that year, both Russia and England were clamoring to purchase black powder from the United States, which was a neutral power in the conflict in the Crimea. The powder purchases for the Crimean War ultimately pushed the company’s sales in 1855 to their highest in its history.

But the Crimean War also had the effect of highlighting American powder manufacturers’ dependence on Britain for saltpeter, as the hostilities had threatened interruption of supply. A crucial ingredient in powder-making, saltpeter – specifically in the form of potassium nitrate – was found only in British-controlled India. While an alternative in the form of sodium nitrate was available from Peru, it had been found to be unsuitable for powder-making due to its tendency to absorb moisture. In the fall of 1855, Lammot began experimenting with sodium nitrate, in the hopes that he could hit upon a formulation of saltpeter, charcoal, and sulphur that would overcome its limitations. He shared his early results with his father Alfred, who urged an increase in the proportion of sulphur in the mix. But Alfred died in October 1856, before Lammot had succeeded in his investigations. Lammot was just 26 when he received his first patent some six months later for his “improvement in gunpowder.” In addition to establishing the necessary ratio of sodium nitrate, sulphur, and charcoal, his invention called for glazing the powder with black lead or graphite to limit moisture absorption. The resulting formula – “B” Blasting Powder – was ideal for industrial use, being cheaper, more powerful, and more readily available than the black powder traditionally used for blasting. Lammot’s invention coincided, moreover, with the growing demand for blasting powder in the mid-19th century, to blast out tunnels, river beds, and rock for canals, railroads, bridges, and gold, silver, and coal mining.

Another of Lammot’s innovations during the same period was less successful. In 1856, Lammot designed a suspension bridge to cross the Brandywine Creek and finally provide a convenient passage between the homes and mill buildings on either side. Before construction of a bridge, the only ways to cross the creek were by a small and perilous flatboat, which was ferried across the water by rope and pulley, or by way of lengthy and inconvenient overland routes. Lammot’s 1856 proposal to his Uncle Henry laid out detailed financial and engineering specifications for a chain-link structure on stone piers

³³Ibid.

³⁴“Notes on the Plans of Powdermills and Machinery of E.I. du Pont de Nemours and Company 1858”, *Francis Gurney du Pont Papers, 1844-1900*, Accession 1600 [hereinafter Acc. 1600], 8-13.

and provided a sketch of what the final structure might look like. Although the cost of Lammot's design came in some \$4,500 less than a quote proffered by a local builder to construct a covered truss bridge at the site, Henry resisted Lammot's impulse for progress. Despite the savings in time and convenience that a bridge would have represented, it was not until 1864 that the company's heightened wartime production justified the construction expense in Henry's mind, and even then, only a wooden plank bridge was erected. Its construction was lauded by the female members of the family, one of whom enthused that "we go over so pleasantly & nicely backward and forward, the distance now seeming nothing."³⁵ The disappointing experience must have been a lesson to the youthful Lammot in his dealings with his uncle – both emphasizing the importance of carefully making his case for all proposed innovations and perhaps hinting to him that the inherent differences in their characters might lead ultimately to a schism.

While the death of Lammot's father had been preceded by a decline in his health over a number of years, the death of Alfred's brother Alexis in an explosion in the Hagley Yard less than a year later, in August 1857, was much more unexpected and had an immediate impact on the company's operations. Supervisor of the Hagley Yard and a junior partner along with Lammot's brother Irénée, Alexis's sudden death necessitated a reconfiguration of the existing partnership. One result was to elevate Lammot to the position of junior partner in 1858, with a significant financial stake in the company, of three shares plus interest, or just over \$57,000 (most of which Lammot had to borrow from his mother and aunts).

1858 also witnessed another milestone in Lammot's life -- his first crossing of the Atlantic.³⁶ As he later recorded in a letter to a colleague, "I went to Europe to improve myself in the manufacture of powder by seeing what was being done abroad."³⁷ Although his brother Fred urged him while there, to "go & see everything . . . as it is not likely you will be over the pond again soon," Lammot insisted that "I do not go for pleasure. I go to collect information." Hopeful of receiving letters of introduction from President Buchanan which could help to open doors to important governmental powder works, he suggested that his journey might permit him to acquire "some information which may be useful to our Government in regard to its supplies of Gunpowder."³⁸ Despite his own practical expectations for the trip, some of his family clearly viewed the journey as a just reward for Lammot's hard work and numerous contributions to the company's success.

³⁵For an account of the bridge and its construction, see Wilkinson, 110-113, and Michelle Ferrari, *Du Pont: 200 Years of an American Family* (New York: Winton/du Pont Films, 2000): 108-110.

³⁶While a colorful account circulated after Lammot's death that credited him with direct responsibility for a dramatic, high seas rescue of powder destined for Russia during the Crimean War, all reliable evidence denies the story. In Lammot's own travel diary of 1858, he records that this was his first crossing of the Atlantic. See Wilkinson, *Lammot du Pont*, pp. 36-37, and Lammot du Pont's European travel diary, 1858, Acc. 384, Box 37.

³⁷Lammot du Pont to Edward C. Darling, n.d., Acc. 384, Box 7.

³⁸Alfred du Pont to Lammot du Pont, 19 August 1857; Lammot du Pont, draft of letter to James Buchanan Henry, requesting a letter of introduction from President James Buchanan, both in Acc. 384, Box 37.

His Aunt Eleuthera's letter to a French relative regarding the proposed journey provides a snapshot of Lammot at the time: "I am very anxious he should go -- His life is a very arduous one & he is, I think overtaken. . . . He is 26 years of age, & a most exemplary young man -- We all love him very dearly. He understands french perfectly & reads it, but I don't know if he will have courage to speak, so you must all speak English to him."

³⁹

Lammot's own expectations for the trip clearly centered on gathering information, rather than rest and relaxation. He set for himself an ambitious itinerary of mills in England, Scotland, Belgium, France, Prussia, and Russia, and began preparation for the trip by reviewing his Uncle James Bidermann's notes from his own visits to European mills in the 1820s and 1830s. In addition to his general interest in innovative and successful production methods in use at powder mills abroad, Lammot specifically sought insights into English developments in formulating powder for the new larger bore cannons and massive mortars first used in the Crimean War. He also equipped himself with numerous letters of introduction, including the hoped-for ones from Buchanan, and four pounds of Du Pont powder that he hoped to exchange for samples from English and European mills.

Throughout his trip, Lammot kept up a trans-Atlantic correspondence with family members. His letters to his Uncle Henry, in particular, were jam-packed with information and demonstrated that Lammot was attuned to a whole range of news that might be useful back on the Brandywine. He kept Henry informed as to the state of international powder markets and prices, business arrangements within mills and between mills and powder agents, the reputation of Du Pont powder abroad, and interesting innovations, devices, and production methods that he witnessed at various powder works. Of these last, he noted that "I am a poor hand at discribing, but I have taken notes of all I have seen as yet, and can explain it when I return." And, indeed, in addition to his newsy letters, Lammot maintained a detailed 104-page travel journal of his experiences, complete with rough sketches of mills and equipment which he would later turn into large-scale, skillfully rendered drawings.⁴⁰

Ultimately, Lammot succeeded in visiting mills in all of the countries he had hoped to, except Russia, during the two-months that he was abroad, from March to May 1858. He also managed to squeeze in a trip to an Irish powder works of which he had learned while in London. He had taken the opportunity of his stay in England to obtain copies of English patents relating to gunpowder, having learned that the patents, "with specifications and drawings can be had for an average of one shilling each. . . . Although they may be of no use, yet there are some curious ideas patented."⁴¹ And he had successfully obtained a large number of powder samples from mills across Europe,

³⁹Eleuthera du Pont Smith to Lilia Bienaymé, 6 July 1857, Acc. 521, No. 19.

⁴⁰Lammot du Pont to Henry du Pont, 16 March 1858; Lammot du Pont, *European travel journal*, 1858, both in Acc. 384, Box 37.

⁴¹Lammot du Pont to Henry du Pont, 21 March 1858, Acc. 384, Box 37.

although suspicious French customs officials nearly forced him to leave them behind in Paris. In Paris, he purchased laboratory equipment and ordered other devices to be shipped back to Delaware, including a device to measure the specific gravity of gunpowder.⁴² He returned, above all, with a vast mental store of ideas and images of innovative equipment, useful conveniences, effective safety devices, and thought-provoking production methods to spur his creative vision for the future of the family business.

Lammot also returned from his journey a more mature and polished man. In addition to his eight-week dash through some of Europe's most sophisticated manufactories, he had followed his brother's advice and taken the opportunity to view its most renowned cultural offerings, from the Crystal Palace in London to the Louvre in Paris, although he was not consistently impressed. Perhaps most valuable, however, was the experience he gained in his dealings with people. As he wheedled and finegled his way into some of the most sensitive, secure, and competitive manufacturing sites of Europe, he quickly learned the importance of discretion, tact, and diplomacy, as well as the occasional well-placed *douceur*. As he remarked to his Uncle Henry of the mills, "They are very jealous [sic] of each other and I cannot of course mention at one set anything about another or else I would see nothing." He recognized, too, the subtle power of adopting a humble tone in the search for information and access. In a petition to obtain a pass to England's most secure government mills, he asserted that his goal was "to examine in what respects, we are behind the European nations," while he cheerfully proclaimed himself a "barbarian from the States" to authorities of the Woolwich Arsenal.⁴³ His diplomacy paid off -- his Aunt Eleuthera enthused on his return that "in the three months he was absent, he has contrived to see more than I had ventured to hope, besides accomplishing successfully the object of his journey."⁴⁴ The same skills would serve him time and again in the future.

Upon Lammot's return from Europe in May 1858, it was becoming increasingly apparent that the demands for blasting powder in deep-pit coal mining were on the rise. As mining in the anthracite coal region of Pennsylvania expanded, the Du Pont company found itself in competition with other powder companies for the business in blasting powder. In order to be more competitive, the partners decided to take the plunge and establish a powder mill near the coal mines -- thus branching out from the Brandywine for the first time in the company's six-decade history. In the spring of 1859, Du Pont purchased a bankrupt powder mill along the Wapwallopen Creek, south of Wilkes-Barre, Pennsylvania, and Lammot was sent to the facility during the summer to oversee the rebuilding and refurbishing of the structures and machinery on-site. He succeeded in getting production up and running by the fall, at the same time training the newly-appointed plant manager, Charles A. Belin.⁴⁵ While Lammot's time and energies were drawn off in other directions

⁴²Wilkinson, *Lammot du Pont*, pp. 52, 61.

⁴³Lammot du Pont to Henry du Pont, 16 March 1858; Lammot du Pont to Geo. M. Dallas, 27 April 1858, both in Acc. 384, Box 37; quotation from Wilkinson, *Lammot du Pont*, p. 48.

⁴⁴Eleuthera du Pont Smith to Lilia Bienaymé, 26 May 1858, Acc. 521, no. 22.

⁴⁵A 1961 research report for Hagley Museum and Library by Lynn Brubaker, entitled "The Wapwallopen Mills 1859-1865," Acc. 1645, provides a thorough overview of first years of the Du Pont enterprise at

after the first intensive period of involvement with Wapwallopen, the mill continued to be a project near to his heart, and he made numerous visits to the site and maintained an active correspondence with Belin for many years thereafter.

By the late 1850s, Lammot had established a reputation among his relatives and colleagues as the expert not only in powder-making, but in all things scientific. Shortly after returning from Europe, his uncle placed Lammot in charge of technical, chemical, and construction affairs at the Brandywine mills, revealing the conservative Henry's confidence in both his nephew's skills and judgement.⁴⁶ Other family members were equally convinced. Lammot's younger brother brother Bidermann, who had attended the University of Pennsylvania between 1854 and 1856 and was now running a paper mill in Louisville, Kentucky with brother Fred, turned to Lammot for advice in 1859 on "an apparatus to reduce the pressure in our new rotaries." Providing Lammot with a diagram and description of the proposed device, he demanded his brother's counsel: "What suggestions can you make? will it wear out too fast? will it work in short? Please give me your ideas."⁴⁷

Lammot himself was eagerly embarking on new avenues of research and innovation in powder-making at the end of the decade. One of his first areas of interest was to follow up on his findings on English developments in powder for large-bore ordnance, in which ordinary black powder burned too quickly. In collaboration with Captain Thomas J. Rodman of the Ordnance Bureau, he began development of a large-grained variant that eventually came to be known as "Mammoth" powder. But their progress was interrupted by a more immediate crisis -- the firing on Fort Sumter in April 1861. The Civil War ultimately would represent both enormous opportunities and enormous challenges for the powder makers along the Brandywine.

As the nation's primary powder producer, the Du Pont Company immediately made its allegiance to the Union apparent, refusing sales of powder to any Southern states or to any buyer who might redirect it to the Confederacy. Individual family members also took on prominent roles in the conflict. West Point-trained Henry du Pont was commissioned as major-general in command of all of Delaware's troops, while his eldest son Henry Algernon du Pont, also a West Point graduate, was commissioned as a first lieutenant of the artillery. Lammot, who had turned thirty on the day of Fort Sumter's surrender, was named captain of one of two companies of Brandywine Home Guards. His primary responsibility was to secure the region's powder mills and other industrial facilities from sabotage or destruction by Confederate troops and sympathizers -- a genuine threat in a state in which loyalties were significantly divided. Almost immediately a false alarm that the company's Edgemoor magazine was being targeted by a group of Maryland secessionists forced Henry, Irénée, Lammot, and two du Pont cousins to lead an armed expedition to the magazine to retrieve the powder stored there. To ensure that the Home Guards were prepared in case of a genuine threat, drills were conducted twice weekly

Wapwallopen.

⁴⁶Wilkinson, *Lammot du Pont*, p. 65.

⁴⁷Bidermann du Pont to Lammot du Pont, 22 March 1859, in Acc. 384, Box 47.

under Lammot's leadership. Although he questioned his own preparedness for the job, his Company A won a competition in drilling against Company B of the Guards, and his cousin Ellen remarked that his Company looked "mighty well in ranks, and drill infinitely better."⁴⁸

The Civil War years were to confirm Lammot's skills as a diplomat and negotiator. When the nation's dwindling reserve of saltpeter supplies reached dangerously low levels in the fall of 1861, U.S. Secretary of State Seward and Secretary of War Cameron called Henry du Pont to Washington to confer and seek a solution. The outcome of the meeting was a decision to send a confidential agent, in the person of Lammot du Pont, across the Atlantic to purchase all of the saltpeter then in and en route to England. The mission was to be a secret one, as the agent was to be seen making a private purchase on behalf of E. I. du Pont de Nemours and Company, rather than for the U.S. government. Lammot was the logical choice for the mission: he had the necessary contacts in England from his previous trip, the requisite experience to conduct a knowledgeable purchase, and the essential genius for negotiation and tact. All of these qualities, as it turned out, would be called upon to bring the mission off.

Lammot arrived in England on November 19, 1861, and within days had purchased or contracted for over three million pounds of saltpeter in and en route to the country. A delay in the arrival of State Department funds to pay for his purchases forced him to scramble for a multi-million dollar loan, but success on this front led him to begin arrangements for transportation of the saltpeter back to New York. Even as the first ship was being loaded, however, a diplomatic storm arose between the English and U.S. governments in the form of the Trent affair. The crisis had begun on November 8, when the U.S.S. *San Jacinto* halted the British mail packet, the *Trent*, and proceeded to seize and imprison two Confederate agents, James Mason and John Slidell, who were on board. As Britain was a neutral power in the American conflict, this act was both illegal by the laws of the sea and highly inflammatory to British public sentiment. The British cabinet responded on November 30th with a decision to ban all exports of saltpeter to the U.S., including the three million pounds of saltpeter already sitting on the docks, inspiring Lammot to write his uncle Henry that "The Devil is to pay!" His efforts to evade the ban by shipping the saltpeter first to France and then to the U.S. were foiled by a second ban on exports to any place outside Britain. In the face of this impasse and the threat of even more dire consequences, including the possibility that Britain would declare war on the U.S. federal government, Lammot returned to the United States. The exact nature of the negotiations that followed thereafter were never recorded, but Lammot did meet with Secretary of State Seward on the same day that the Secretary attended a cabinet meeting in which it was agreed to proffer an apology to the British government, suggesting that Lammot may have helped to convince the U.S. to back down. He sailed back to London on January 1, 1862, (coincidentally traveling on the same ship with the released Confederates, Mason and Slidell) to continue his efforts to have the saltpeter released. A "confidentially" dropped hint that he might soon have to cut the company's losses and "throw all the saltpeter on the market & take what he could get" may well have helped to turn the tide in his favor.⁴⁹ Other saltpeter brokers feared the depression in prices that

⁴⁸Wilkinson, *Lammot du Pont*, pp. 74-75.

⁴⁹Mrs. Samuel Francis du Pont to Samuel Francis du Pont, 1 May 1862, WMSS:9, Box 61.

would result from the glut of saltpeter and began lobbying for the lifting of the embargo. The *Times* newspaper similarly wrote a series of articles to the same effect, and, possibly in response, the ban was finally lifted on January 18th. Lammot finalized the shipping arrangements for the saltpeter, and sailed for America on February 1st.⁵⁰

While Lammot would never receive official commendation for his actions in the secret affair, his performance in this crisis was ever-after lauded by his family and colleagues. On the eve of Lammot's triumphant return with the saltpeter in January 1862, his Aunt Sophie asserted "Lammot has shewn great ability & character in his transactions abroad." She later wrote in detail to her husband about the mission, including Lammot's opportunity to see the powder works and docks again: "It is a great improvement to a man like Lammot to have these opportunities - his amiable temper, originality, & intelligence, evidently make him find favour with those he meets, for he has great success in obtaining information." She recounted his efforts to remove the embargo "in a very politic way," and put down his success to his "naive, good nature tone & manner," speculating that the English with whom he dealt must "have set him down as one of the 'cutest' of the Yankee genus, as well as the most amiable & upright." She also made mention of another opportunity that came Lammot's way in the course of the affair -- that of meeting Lincoln and Seward. "He never saw," she recorded, "two more worn down, haggard, worried looking men."⁵¹

The reputation that Lammot was developing as a skilled and knowledgeable negotiator would follow him for the rest of his life and not only within the family. As an 1871 letter preserved in the Naval Ordnance Records in the National Archives remarked: "Lammot is pointed to by the other members of the firm as the man who knows everything and who always has charge of all government work."⁵² And in 1882 his cousin Eugene beseeched Lammot to serve as the primary go-between in a crucial negotiation: "I can not see how any one can handle Judson in these arrangements, nearly as well as you. You have had interviews with him, and he knows what he has to expect from you, a man noted in all explosive matters better than he is himself. . . . You can judge how he feels at present, and how far it will be safe to go with him, better than any one else."⁵³

Following the conclusion of the saltpeter affair, Lammot returned to his work at the refinery, and all witnesses commented on the relentless pace of work required to meet the production demand. His cousin Sallie recounted the scene to her brother Henry Algernon, serving in the Union Army: "They have night work, all the time now, in the Refinery; and as it is all lighted up with kerosene-lamps, the illumination is quite splendid all night,

⁵⁰The most authoritative account of this affair is Harold B. Hancock and Norman Wilkinson, "'The Devil to Pay!': Saltpeter and the Trent Affair," in *Civil War History* 10:1 (March 1964): 20-32.

⁵¹Mrs. Samuel Francis du Pont to Samuel Francis du Pont, 15 January, 3 January, 12 January, and 29 April 1862, WMSS: 9, Box 61.

⁵²Quoted in Mayer, *The Education of Lammot du Pont*, p. 25.

⁵³Eugene du Pont to Lammot du Pont, 31 March 1882, Acc. 348, Box 48.

from the back windows. Cousin Lammot and Gene work there, night bout; and are both there all day, so are never visible." His Aunt Sophie agreed: "Lammot is killing himself in the refinery, working day & night; & Eugene the same -- Lammot's time . . . is all engaged with innumerable cares -- for Lammot plans all new inventions, overlooks buildings &c &c indeed is the life of the business." The pace of production had even forced the purchase of refined saltpeter, "because with all the increase of the refinery, & Lammot's clever inventions to simplify work, & working night as well a day, they could not refine it fast enough." Lammot's mother was increasingly concerned about her son, "who she thinks over taxes his physical powers so much that the results must be serious sooner or later."⁵⁴

Following his return from England, Lammot had considered volunteering for the Union army, which his Aunt Sophie condemned as a wasteful plan. "Lammot, it seems, has been wanting to go for a good while, but the consciousness that he was absolutely needed here withheld him from volunteering. It is perfectly absurd, for he serves his country far more usefully here. . . . there is not one man in a thousand with Lammot's scientific genius and knowledge, and his acute mind. Lammot is a man calculated for eminent usefulness, if he is spared and given grace to use the talents entrusted to him." Lammot continued to serve as Captain of the one of the companies of Brandywine Home Guard, which were reorganized in the fall of 1862 as part of the Fifth Regiment of Delaware Volunteers upon rumor of an imminent Confederate cavalry raid against the powder mills. In addition to more frequent drills, the change forced Lammot to don a regulation Union officer's uniform -- a requirement against which he chafed. As his cousin Ellen recorded, Lammot proclaimed "uniforms . . . humbugs, and officers . . . nonsense."⁵⁵ His impatience with military hierarchy was yet another way in which he and his uncle differed in character.

The Fifth Regiment of Delaware Volunteers was ordered to Fort Delaware on Pea Patch Island in June 1863, to help guard against a prison break by Confederate prisoners held at the fort. As Captain, Lammot was placed in full command of the regiment for several twenty-four hour intervals. Except for a brief return to the mills in early July to guard them in case of a Confederate victory at Gettysburg, Lammot and the Brandywine companies remained at Fort Delaware for nearly a month. On their return in mid-July, typhoid fever accompanied them. Lammot himself fell ill in August with a nearly fatal bout of typhoid which left him "42 days delirious without intermission," as he later recalled.⁵⁶ Even after the danger passed, his illness left him weak, with inflamed eyes and a sore back, and a recurrence of the fever the following summer forced him once more into his sickbed.

In January 1865, having finally recovered his health, Lammot laid out for himself "Notes of Jobs on Hand." Like the diary he kept as a 19-year-old, this more mature document

⁵⁴Sallie du Pont to Henry A. du Pont, 20 April 1862, WMSS:8, Box11; Mrs. Samuel F. du Pont to Samuel F. du Pont, 4 June 1862, WMSS:9, Box 61.

⁵⁵Quoted in Wilkinson, *Lammot du Pont*, pp. 90, 94.

⁵⁶Quoted in Wilkinson, *Lammot du Pont*, p. 104.

presented the range of his vision for the Du Pont company, from the most mundane of production details to dramatic proposals for change. Among the forty-four tasks he enumerated were fixing the lock on the gunhouse, boxing in a lead pipe in the coalhouse to keep it from freezing, and raising the coalhouse floor by 18 inches to do away with the existing steps and to raise the acid tank. More experimental were planned investigations into the possibility of bleaching acetate of soda with chloride of lime, finding the best way to make white acetate of soda from pyroligneous acid, and assessing the effectiveness of using crystallized carbonate of soda to prevent the action of naphtha on hydraulic presses. The biggest challenges he enumerated were constructing a railroad bridge across the race at the Hagley glazing mill and getting his partners to “agree to use our influence to get the [Brandywine railroad] located so as to be usefull [sic] to us” and to permit installation of a vacuum boiler at the lower coalhouse.⁵⁷ In all, the list demonstrated not only Lammot’s sense of responsibility for both day-to-day and long-term operations, but also his growing sense of his particular role within the company -- a role that increasingly centered on defining and shepherding change and progress.

Lammot’s hands-on involvement in even minute aspects of the refinery’s operations was confirmed by one of the powder men, Pierre Gentieu, who later recalled his decades with the company. As a young man, having had “a little of landscape drawing at school,” Gentieu had begun to sketch “the romantic view at the Lower Yard.” Fellow workers warned him that he would be fired if Lammot found out, but Lammot explained that a sketch of the landscape was not the same as drawings of the mills, which were forbidden due to their potential to be used against the company’s interests, either for industrial espionage or sabotage. (Lammot’s own detailed drawings from his travels to European mills must surely have heightened his awareness of the threat!) Lammot even borrowed Gentieu’s Brandywine sketch and had it reproduced photographically, paying Gentieu “handsomely” for the copies. Lammot recalled Gentieu’s artistic capacity when the delicate job of punching shoes or sieves to separate powder grains opened up at the Hagley Yard. As Gentieu recorded, Lammot himself trained the young man in the job, “showing me how to rule the spaces for guide, how to give an even stroke of the mallet so as to have all holes of the same size and to accomplish this to try the needle gauge often so as not to get astray.” When Lammot noted the inexperienced worker’s nervousness, he left him alone to practice until the next day. Gentieu began to master the task, but worried about the slow pace of his work. But when Lammot returned to inspect the results, Gentieu remembered that he “relieved my mind very quick, saying, ‘Never mind that, what we want in this line is quality not quantity. . . .take your time and let what is done be right, the speed will come naturally by practice.’”⁵⁸

By the end of the Civil War, Lammot, now approaching his mid-thirties, was considered to be a confirmed bachelor, his life dedicated to the family business. It came as a great surprise to family members in the summer of 1865 when he announced his engagement to Mary Belin, whose grandfather, father, and brother had been the company’s head bookkeepers for over thirty years, and whose uncle Charles was superintendent of the Wapwallopen Mills. Like Lammot, Mary had grown up around the du Pont mills along

⁵⁷“Notes on Jobs on Hand 1/2/1865,” Acc. 384, Box 30.

⁵⁸“Reminiscences of one of du Pont’s employees,” typescript, n.d., Acc. 207, pp. 3-5.

the Brandywine, in a company house not far from Nemours, and she and her brother Harry had socialized frequently with the du Ponts. Lammot's sister Sophie, for example, sent notes to Mary to request a recipe and to invite Mary and her brother to spend "a usual Christmas gathering" with them. Lammot's cousin Irene du Pont similarly urged Mary to join in a game of croquet, noting that if she couldn't come, "I shall come myself & drag you up by the hairs of the head if necessary." In other correspondence, Irene thanked Mary for a gift of farina and begged for the loan of a book and some sheet music. The comfortable nature of their sociability was evident in a note in which she alerted Mary that a mutual friend was to visit soon, "to stay with you on Friday night, & with me the next night."⁵⁹ Irene later served as a member of Lammot and Mary's wedding party and joined them, with the rest of the party, on their honeymoon to Niagara Falls.

At the time of their engagement, however, Mary was in delicate health, after a strenuous period of nursing an ill family member. Constant bouts of coughing and spitting blood alarmed Lammot's relatives with fears that she was too fragile for an enduring marriage, and his mother Meta lamented that "[Mary] is very delicate & certainly will go into a consumption. . . . But tis done & we must only hope for the best." Meta, along with Lammot's aunt Sophie and cousins, claimed to have been surprised, rather than dismayed by his choice. As Meta wrote to Lammot's brother Bidermann, "I have a piece of news to communicate. Lammot is engaged to be married. Now guess & guess again. No one had the least idea -- not a single individual & the lady, I think, was as much surprized as anyone. Even sharp sighted Polly had no notion of it." Cousin Lina too was stunned by the match, noting that "Few ever thought he would ever marry, still less the lady he has chosen!" She went on, however, to remark on the tendency of the du Ponts to keep their relationships within the familiar circle of family and friends with whom they had grown up: "It is like the squirrel in the cage -- we go round and round but never out of the circle." She concluded that "Lammot seems very happy and well pleased, and so might all his friends be also." Uncle Henry's wife, Louisa, likewise was reconciled quickly: "It seems so natural to see Mary Belin everywhere, that one does not think of her as [Lammot's] wife."⁶⁰ Lammot's brother Bidermann was unreservedly pleased for both parties: he praised Mary's domestic nature, teased his brother for waiting so long to make his feelings known, and told Lammot to pass along his congratulations to Mary for winning the heart of "the noblest man I ever met."⁶¹ The Belins were equally pleased by the match, and Mary received her aunt's congratulations on her intended: "From all that I have heard . . . I should think he is all your dear Father could desire." Her friend C. B. Wales, agreed: "I am sure that you . . . have a good right to be happy in your choice, for I have never heard anything but what is pleasant of Lammot du Pont."⁶²

⁵⁹Mary Sophie du Pont to Mary Belin, n.d., Acc. 1597, Box 5; and Irene Sophie du Pont Dimmick to Mary Belin, n.d. , Acc. 1597, Box 4.

⁶⁰Margaretta Lammot du Pont to [Bidermann du Pont?], 3 July 1865; Lina du Pont to Henry A. du Pont, 3 July 1865; Mrs. Henry du Pont to Henry du Pont, 31 October 1865; all quoted in Wilkinson, *Lammot du Pont*, pp.126-127, 129.

⁶¹Bidermann du Pont to Lammot du Pont, 3 August 1865, Acc. 384, Box 47.

⁶²E. Wright to Mary Belin, 11 July 1865, and C. B. Wales to Mary Belin, 4 July 1865, both in Acc. 1597, Box 4.

There has been speculation, however, that Lammot's mother had a more deep-seated objection to the match than Mary's health. Following Lammot and Mary's honeymoon trip to Niagara Falls, they moved into Nemours, where Lammot had grown up and where he had lived with his mother and sister since graduating from Penn. This living arrangement continued only until 1868, when Meta and her daughter moved away from Nemours shortly after the birth of the Lammot and Mary's second child, to another company-owned house, Green Hill (re-named Goodstay), some three miles away.⁶³ Some years later, in a letter to her younger son Fred, Meta hinted at a rift with Lammot occurring around the time of his marriage, lamenting that "Lammot came home some days ago, but I have not seen him. . . . How little he cares for me—'tis hard to have lived & loved him till 35 years, & see how indifferent he is."⁶⁴ Meta did not commit to paper any deeper objections to her son's match, but some biographers of the du Pont family have speculated that a quarrel may have been sparked by Mary's less exalted social status or by her distant Jewish antecedents, as great-granddaughter of Moses Homberg, a prominent Jewish merchant in Philadelphia. Such suggestions remain highly speculative in the absence of written evidence, however, while the existence of an easy social relationship between the Belins and du Ponts as young men and women can be well-documented. It is possible that Meta simply was feeling neglected in the face of Lammot's devoted relationship with his wife and children. Certainly no signs of hostility appear in a letter signed "Your loving Ma" from Meta to her daughter-in-law in 1882, in which she congratulated Mary on the birth of her new daughter, offered a facetious suggestion for the baby's name, and advised her how the infant's siblings whom she was watching over were faring.⁶⁵ In fact, Lammot and Mary named their youngest child after Margareta Lammot, suggesting that any rift that may once have existed was long healed.

Not long after his return from his honeymoon, Lammot began considering yet another new venture. His regular visits to Wapwallopen Mills, which served the powder needs of the anthracite coal mining region of Pennsylvania, led him to propose a venture into the profitable coal mining industry in the fall of 1865. Confident in the Du Pont company's financial outlook due to profits earned during the war years, Uncle Henry demonstrated an uncharacteristic willingness to gamble on a new project, and the Mocanaqua Coal Company, just seven miles from the Wapwallopen mills, was organized in 1866 with Du

⁶³There is some question as to the date of this move. Lammot's biographer Norman Wilkinson cites 1868, while the biographers of Lammot's son Pierre claim that Meta du Pont was packing even as the wedding plans were being made. See Alfred D. Chandler, Jr. and Stephen Salisbury, *Pierre S. Du Pont and the Making of the Modern Corporation* (New York: Harper & Row, Publishers, 1971), p. 7. As neither source cites an original document for his information, additional research would be necessary to confirm the date of the move. In the absence of firm documentation, I have opted to cite Wilkinson's assertion, given the depth of his research into the details of Lammot's life.

⁶⁴Margareta du Pont to Fred du Pont, 5 May 1873, quoted in Joseph Frazier Wall, *Alfred I. du Pont: The Man and his Family*, New York and Oxford: Oxford University Press, 1990, p. 104.

⁶⁵Margareta Lammot du Pont to Mary Belin du Pont, [ca. 1882], Acc. 1597, Box 5. The letter refers to the baby as "Decimus," suggesting that this was Mary's tenth child, Isabella, born in 1882.

Pont capital. Lammot was named president and given primary control over its operations and finances, although most of his oversight was done from a distance, in Delaware. Unlike most of Lammot's endeavors, however, this one was beset by problems almost from the beginning. Coal prices dropped steeply in the immediate post-war years, and miners' wages dropped in concert, triggering labor unrest in the industry -- a situation with which Lammot had little familiarity, given the paternalistic environment of the Brandywine powder mills. Although coal prices began to rebound by the end of the decade, the profitability of the industry was severely diminished by the exorbitant rates demanded by the railroads and canal companies who transported the coal, and Lammot determined by the fall of 1869 to cut Du Pont's losses and sell out. Sale of Mocanaqua proved difficult, however, particularly in the face of the economic depressions of the 1870s. By 1873, the company's operations were shut down, under pressure from increasingly extortionist transportation costs. But it was not until 1876 that success was achieved in leasing the company and still later -- 1881 -- before it was finally sold.

Just two years after operations at Mocanaqua shut down, Lammot began to explore another venture, although one that was much further afield. Like Lammot's early investigation into the substitution of sodium nitrate for potassium nitrate in saltpeter, the new enterprise centered around finding better sources for the chemical components of black powder -- in this case, carbonate of soda, which could be treated with nitric acid to form sodium nitrate. Lured by the western explorations of a physician-turned-prospecter, George Graeff, Lammot purchased Graeff's rights to five soda lakes in Carbon County, Wyoming which promised a significant output of soda, with value to a variety of industries. Eager to collect samples and confirm the potential of the venture, Lammot determined to travel to Wyoming Territory himself in the spring of 1876. Due to Indian unrest in the region, however, it was not until the fall of that year that he made the trip. It was one that must have suited his adventurous side -- although no Indians appeared, he recounted to Mary an exciting, but painful, 17-mile elk chase on horseback. The soda lakes, however, remained undeveloped during Lammot's lifetime. Plans to capitalize on them and other Wyoming resources were later proposed under the Natrona Alkali Company, headed by son Pierre, but the properties ultimately were sold, undeveloped, by Lammot's heirs just over a century after their grandfather's western adventure.

Two uncharacteristic failures for Lammot, the Mocanaqua and Wyoming experiences nevertheless are important illustrations of his willingness to take considered risks into new endeavors that promised significant benefits. Unfavorable economic circumstances and practical difficulties, coupled with Lammot's relative inexperience in the coal and soda industries and physical distance from the sites, ultimately doomed both projects.⁶⁶ But in both he displayed the same forward-looking impulse that would lead him into the manufacture of high explosives a few years later.

Lammot's coal mining and soda lake ventures also were compromised by the continued high level of activity required from him by the company's black powder business in the post-war era. The return to normal production levels after the war permitted a return, as well, to the laboratory. Among his immediate achievements was the successful design of

⁶⁶Wilkinson, *Lammot du Pont*, Chapter VII, treats these ventures in detail.

an improved powder press, which was patented in October 1865. He also had the opportunity to finally put into place some of the innovations and equipment that he had observed on his first trip to Europe.⁶⁷ Then, in 1871, there was new impetus from the U. S. government to improve the Mammoth powder for large ordnance which Lammot and Captain Rodman had developed before the war. As Rodman had died, Lammot began work with a new ordnance inspector, Lieutenant Commander Marvin, and his younger cousins, Eugene and Francis Gurney (Frank) du Pont. Over the next several years, Lammot worked doggedly to achieve a formulation that would provide consistently uniform results in each firing. His efforts yielded yet another patent, in December 1872, for a press plate that created hexagonally-shaped powder grains, but discovering the right glazing and drying techniques required additional experimentation. Finally, in 1876, Navy Ordnance Bureau congratulated Du Pont on the success of its G. G. Hexagonal powder -- a product that the government would rely on for decades for its use in its larger ordnance.⁶⁸

The end of the Civil War also had presented the Du Pont company with new challenges. The glut of surplus gun powder on the market had driven prices down steeply after 1865, while new manufacturers had emerged during the war, particularly to supply the blasting powder needs of the coal mines of the Pennsylvania's anthracite region. These smaller rural mills, with none of the transportation or overhead costs of the major manufacturers, threatened to undercut the business of their larger and more established competitors, including Du Pont. The solution proposed was characteristic of the time period: consolidation. In April 1872, all of the major black powder producers east of the Rocky Mountains met and formed the Gunpowder Trade Association of the United States, also known as the "Powder Trust." The Trust, whose initial membership included the three largest American producers -- Du Pont, Laflin & Rand, and Hazard -- and four smaller companies, was designed to maximize the influence that each company could wield singly and to eliminate internal competition and price-cutting. Lammot, having developed a reputation for both the science and the business of the black powder industry, was named president. He had, in fact, suggested creation of such an association four years earlier, and his suggestions for its structure at that time probably helped to shape the final form of the G.T.A.⁶⁹ In characteristic analytical fashion, Lammot took the opportunity of addressing the Trust after its first quarter of operation to take "a broad view of its advantages and difficulties as far as they have shown themselves," and concluded that, "on the whole . . . the association has worked well, very well."⁷⁰ In addition to establishing production quotas and minimum prices, the powerful Trust could use its leverage to pressure other powder companies to comply or force them out of business. In the years following the Trust's founding, the Du Pont Company gained increasing dominance, as Henry du Pont, by Lammot's recommendations, took advantage of the disarray in the powder business

⁶⁷Ibid., pp. 63-64.

⁶⁸Ibid., pp. 174-83.

⁶⁹Ibid., pp. 204-205.

⁷⁰Lammot du Pont, untitled address to the Gunpowder Trade Association [1872], Acc. 384, Box 30.

during the financial crises of the 1870s to purchase controlling interests in a number of other producers, including mills in California, Tennessee, Ohio, Maine, and Michigan.⁷¹ In 1876, Henry even secretly purchased the Hazard Powder Company of Connecticut, leaving Du Pont with just one major competitor. By the end of the decade, Lammot admitted that “the G.T.A. is only another name for Du Pont and Co., and if abandoned I think it would be well to hold monthly meetings of Du Pont and Co.’s principal agents and parties when trade could be arranged as well as now. Whatever is Du Pont’s interest will be done even if the G. T. A. dissolves.”⁷²

By the early 1870s, Lammot appears to have had a clear perception of his role within the company. This role involved documenting, analyzing, and improving – always demonstrating himself to be a forward thinker, but one whose innovations were underpinned by a strong historical perspective. He was well aware that he would often fight an uphill battle in proposing changes and improvements, particularly given his Uncle Henry’s strongly conservative approach to technology. Lammot thus girded his arguments with carefully documented statistics and simply stated positions and alternatives. From the 1850s to the 1870s, he maintained a series of notebooks and papers documenting various aspects of the family business. Like his first pocket diary from 1850, they reflect the vast range of his interests: the water levels of the Brandywine, the amount of powder made by Du Pont since the company’s founding, documentation and analyses of fifty years of rolling mill explosions, the cost of manufacturing a keg of powder -- all of these subjects, and more, drew his attention. The notebooks proved that he was equally skilled in both analysis and synthesis and reflected his ability to turn raw facts into broad concepts and “action items.” They are both organized and intuitive in character and illustrate, with sketches, diagrams, charts, and maps, Lammot’s capacity for visualizing the issues he was exploring.⁷³

One of the most detailed studies Lammot carried out during these years was that of transportation and labor performed in the Hagley Yard in 1872. This effort entailed compiling detailed calculations of the distances traveled and weight of materials transported in the process of making 10,000 pounds of soda powder as the mill was currently structured. The analysis required documenting 112 separate operations and a breakdown of eight different transportation processes, from hauling materials in a wheel barrow to transporting them in a wheeled car on a rail, with the ultimate goal of determining the level of productivity of the yards and of individual workmen in the powder-making process. What is perhaps most surprising about Lammot’s study is its anticipation of Frederick W. Taylor’s revolutionary studies of time, motion, and industrial

⁷¹William S. Dutton, *Du Pont: One Hundred and Forty Years* (New York: Charles Scribner’s Sons, 1949), pp. 121-123.

⁷²Quoted in Wilkinson, *Lammot du Pont*, p. 227. Also see Wilkinson, p. 228, regarding Lammot’s influence on Henry du Pont in fostering the company’s expansion.

⁷³See, for example, his compilation of statistics on the powder made by Du Pont since 1803, breakdown of the cost of a keg of soda powder in 1870, calculations of the maximum amount of powder that the Du Pont mills could potentially make per day; and experiments relative to the water power of the Brandywine, all in Acc. 384, Box 33.

efficiency by nearly two decades. While Lammot's calculations did not have the exactitude of Taylor's time-and-motion studies, they shared Taylor's overall goal of attempting to analyze and systematize production in order to maximize productivity and reduce costs.⁷⁴

Lammot's records of projects and experiments in the 1860s and 70s also reflected his interest in recovering by-products of powder-making that might have commercial value in other industries, with renovation of the charcoal house to produce naphtha and the construction of an "Acid Factory." The same goal would guide his work with nitroglycerine at the Repauno factory in the 1880s. These activities stand in dramatic contrast to his Uncle Henry's rigid adherence to the traditional methods and goals of powder production. Lammot's innovative outlook, undergirded by rigorous scientific experimentation and documentation, presented the younger generation of du Ponts with a new model, challenging them to consider new opportunities and approaches, and setting the stage for the company's diversification into chemical and consumer products under his son Pierre and nephews Coleman and A.I. du Pont in the early twentieth century.⁷⁵

During these same dynamic decades, Lammot began with Mary to recreate the affectionate family environment of Nemours in which he had been raised. Despite her apparent fragility, Mary bore Lammot eleven children in eighteen years of marriage, all but one of whom lived to adulthood. Their eldest son Pierre later recalled his parents' relationship as being "in complete harmony," noting that he "never heard an unkind remark or an altercation of any kind" between the two. The couple wrote chatty and affectionate letters to each other during Lammot's frequent absences on company business.⁷⁶ In 1868, writing to Lammot before breakfast, Mary remarked that "when I have no dear husband to kiss and hug there is not much temptation to lie in bed," and she lamented that she was "so dreadfully lonely" without him.⁷⁷ In 1871, he teased her about a mistake in her packing for his trip: "you know my dislike to shirts with the collars not sewed on them. Well it is confirmed, for when one's dear kind Wf packs a bag of shirts and forgets the collars they become not very becoming." In another letter, he instructed Mary to "Give kisses to the children, and would like to give you the same." Their mutual affection still was evident after fifteen years of marriage, when, in 1880, Lammot sent "a kiss to the little ones and a big one for you, & love to all." In return, she noted that "chicks all send love and kisses." She admitted that "I can't help wishing myself with you

⁷⁴Lammot du Pont, "Labor performed in Hagley as organized January 1872," and "Transportation In Hagley Yard," Acc. 384, Boxes 30 and 33; see also Norman B. Wilkinson, "In Anticipation of Frederick W. Taylor: A Study of Work by Lammot du Pont, 1872," in *Technology and Culture* 6:2 (Spring 1965): 208-221.

⁷⁵Wilkinson, *Lammot du Pont*, pp. 121-122, 290.

⁷⁶Between 1873 and 1876, Lammot calculated that he traveled an astonishing average of 32,000 miles per year. Wilkinson, *Lammot du Pont*, p. 235.

⁷⁷Mary Belin du Pont to Lammot du Pont, 13 Sept. 1868, Acc. 384, Box 48.

all the time,” and he agreed, lamenting that he was not “at home (instead of here) with you.”⁷⁸

Due to Lammot's early death, only the eldest children got to know their father well before the accident that took his life; indeed, their youngest child was born some six weeks after her father's death. But in the recollections of his eldest son Pierre Samuel du Pont, some of the most personal and intimate images of Lammot were captured. Pierre considered Lammot to be the “ideal father,” “always kind and considerate” with his wife and children, and never a “strict disciplinarian.” Although Pierre admitted that he and his siblings occasionally were prone to tantrums and fights, Lammot's criticism was limited to a soft-spoken remark: “Let dogs delight to bark and bite but little children should never fight.” Although relatives worried that the soft-spoken couple were spoiling their children and advocated stricter discipline, Pierre noted that his mother “had the pleasure of knowing that her methods gave good result” and that his father was “tolerant in the ordinary affairs of life but strict in matters of proper moral conduct.”⁷⁹

Pierre drew a picture of a modest household at Nemours, characterizing it as one of “‘respectable gentility’ not rich but comfortable without financial embarrassment.” The family maintained just one carriage and two horses, and Mary had the help of an “untrained Irish girl” to help with the children, as well as a cook, waitress, and chambermaid. Pierre recalled that he and his eldest sister were given a few cents for sweeping their room and making the bed, but he doubted “that the money was actually earned by any continuous work on our part.” Still, he considered the early development of a sense of financial responsibility to be a fundamental tenet of his upbringing. Evening entertainments were modest, and often centered around his mother at the parlor piano.⁸⁰ While Mary was a talented musician and had played organ and sung in the church choir as a young woman, Lammot's musicality was questionable. Early in their courtship, Lammot had asked Mary to sell him just half a ticket to a musical entertainment, as “that amount would fully represent my musical talent.”⁸¹ Still, he later purchased a music box for his wife, which eventually was preserved at Pierre's home at Longwood. Pierre recorded that his father “actually disliked music,” claiming that “no man could amount to anything if he smoked cigarettes, wore eye-glasses . . . , or played on the piano.” (As Lammot both smoked “cegars” and wore glasses, the assertion must have been at least partly tongue in cheek.)⁸²

⁷⁸Lammot du Pont to Mary Belin du Pont, 26 Aug. 1871, 14 September 1874, February 1880, and 23 August 1880, Acc. 1597, Box 4; Mary Belin du Pont to Lammot du Pont, 19 February and 22 February, 1880, Acc. 384, Box 48.

⁷⁹“My Father,” p. 3.

⁸⁰“Life in My Father's House,” pp.10, 14, 21-23.

⁸¹Lammot du Pont to Mary Belin, 20 May 1864, Acc. 1597.

⁸²“Life in My Father's House,” p. 22.

If music did not appeal to Lammot, however, athletics did. Lammot was particularly fond of croquet, and had a croquet court installed at Nemours for family games. Pierre recalled his father, who enjoyed “all forms of athletics, running, jumping, pole vaulting, etc,” attempting to interest him in a variety of sports, but “he did not insist and did not succeed.”⁸³ A dominating figure, at over six feet and some two hundred pounds, Lammot had a commanding presence and was known as “Uncle Big Man” to his younger relatives, amongst whom he was a popular character. Pierre himself was disappointed upon finding out that his father was not the “tallest man alive.”⁸⁴ One family habit was to record the heights of family members and friends upon the porch columns at Nemours. Upon the columns being repainted in 1870 and again in 1877, Lammot painstakingly copied the names and heights for posterity.⁸⁵ As a young man, he had engaged in a similar exercise, recording the weights of family and friends in his pocket diary, just as he had recorded the results of his chess tournament with Charlie du Pont.⁸⁶ The same collecting impulse, of both information and things, displayed itself in other arenas. He maintained a collection of gun powder labels, to which brother Fred offered this contribution: “If the enclosed powder label (in rather a dilapidated state) is deemed worthy, you can add it to your Collection.”⁸⁷ Lammot also had begun a collection of Indian artifacts as a boy and continued it throughout adulthood. While the collection began with the arrowheads and spear points of the local Lenni Lenape and Delaware tribes, Lammot later acquired artifacts from farther afield, eventually amassing a vast collection of tools, pipes, arrowheads, flints, darts, and more, from a dozen states. Pierre remembered a German governess who helped Lammot in “‘sewing’ his American Indian relics on boards with copper wire.”⁸⁸ To this hobby, as to his scientific studies, he brought an historical perspective, analytical skills, and a spirit of inquiry. Lammot kept a careful inventory of the contents of each numbered board, recording the type of artifact, its comparative rarity, where it was found (including stratigraphy), and its historical background. For example, on Board No. 107, he noted that “No. 3 has the spiral form which is not uncomon [sic] in this locality.” In an essay on the ceremony of the “Burial of the Axe,” he described how the artifacts were used in their original culture and attempted to deduce the age of the burial based on the size of the axes.⁸⁹ Collecting was an impulse that seems to have run in the family. His uncle Henry also had a set of Indian axes, which had been found near

⁸³“My Father,” pp. 8-9.

⁸⁴Wilkinson, *Lammot du Pont*, pp. 109-110; “My Father,” p. 1.

⁸⁵“Hights [sic] of various persons taken from the pillar on our portch [sic] prior to painting 1870,” and “Heights of Persons taken from pillar of our porch before painting, June 10th, 1877,” Acc. 384.

⁸⁶See notes 26 and 30, above.

⁸⁷Alfred du Pont to Lammot du Pont, 19 August 1857, Acc. 384, Box 37; some of the label collection is preserved in Acc. 384, Box 27.

⁸⁸“Life in My Father’s House,” p. 26.

⁸⁹These inventories, as well as Lammot’s correspondence with a dealer of Indian artifacts, are in Acc. 384, Box 32. According to Wilkinson, p. 109, Lammot’s collection of artifacts was later donated to the University of Delaware.

Charlie du Pont's house, while his father Alfred's collection of minerals, kept in a cabinet in the front hall at Nemours, was given to Pierre as an adolescent, in consolation for the family's move to Philadelphia in 1881.⁹⁰

While Lammot's mother and maternal grandfather had helped to organize the Swedenborgian church in Delaware, and his wife Mary was an active member of Christ Episcopal Church near the Brandywine mills, Lammot himself was not a church-goer. Pierre recalled that his father rejected the notion of the virgin birth of Christ and speculated that Lammot "did not give much credence to Biblical stories through he approved and practiced their teachings of moral conduct." As a bachelor, Lammot's preferred activity on a Sunday morning was a game of croquet, "while the seven aunts, who were the self appointed dragons and religious guardians, were at Church."⁹¹ Lammot came by his religious skepticism fairly -- although his Aunt Victorine and other members of the family succumbed to the evangelical fervor of the Second Great Awakening in the 1830s, both his father Alfred and grandfather had upheld the Enlightenment deist tradition of the family patriarch, Pierre S. du Pont.

Lammot's son noted, however, that his father was not without religious feeling. "His great commandment was -- do unto others, not 'as ye would they should do unto you' but as they should do unto you." Pierre recalled that his father's moral values were highly developed, particularly his belief in personal responsibility. Even as a student, Lammot had written an essay in which he remarked that "all we enjoy, and a great part of what we suffer is in our own power." As a parent, Pierre recalled, Lammot "strove to develop self-reliance under the guidance of good example." While Lammot was determined to give his sons "the advantages of a good education," he insisted that their success thereafter would rely on self-reliance and self-determination or, as Lammot remarked, "it will be root hog or die for them."⁹²

His son's admittedly fond appraisal of his father's mature character was confirmed by less biased sources, including Du Pont employee Pierre Gentieu. Of Lammot, Gentieu recalled that he "took his place in Superintending the work of the Yard, building new mills, etc., always ready to cheer us over the bad jobs and ever willing to lend his help at any heavy lifting, he was a powerful man and wherever he put his hands on a piece, the man next to him found that he was in earnest and as we felt that he knew what hard work was he could always command respect and cheerfulness." Gentieu recalled working in the pouring rain to finish building new rolling mill, while Lammot "stood with us without any umbrella or rain coat, taking the wetting as we did."⁹³

⁹⁰"Life in My Father's House," p. 37.

⁹¹"My Father," pp. 4,9.

⁹²"My Father," pp. 4, 6; Lammot du Pont, undated school essay, Acc. 1597, Box 4.

⁹³"Reminiscences of one of Du Pont's employees," p. 1.

Lammot earned the respect of other employees, as well, including George H. Kerr, who served as Lammot's private secretary from 1882 until his death. Like the young Pierre, Kerr was profoundly struck by Lammot's physical presence, which Kerr termed "Lincolnesque." Lammot shared, moreover, other heroic qualities with Lincoln, according to Kerr, including "an unflinching sense of humor" that "often dispersed the clouds of irritation over groups and individuals, and converted a tense situation into one of convulsed merriment." Kerr considered this "spontaneous good humor" to be Lammot's "greatest gift of grace." But the secretary also credited du Pont with more serious characteristics, being "industrious but calm, circumspect but daring, shrewd but fair." He noted that Lammot rewarded both effort and success, "his only impatience [being] with the inefficient laggard," and he remarked on Lammot's ability to identify and hire outstanding individuals. Although Kerr knew that some might dismiss Lammot's candor and lack of affectation as being the product of "backwoods naiveté," Kerr recognized that this homespun exterior concealed an innate sophistication. Kerr did not stint in his assessment of Lammot, citing that "His was a born understanding of men and affairs, supplemented by a great store of knowledge gleaned from an intelligent application of his surpassing abilities to every problem."⁹⁴

In his three decades with the Du Pont company, Lammot du Pont demonstrated a clear sense of the family's legacy, including an awareness of both the strengths and weaknesses that being an established company brought to the firm. He demonstrated pride in the company's continuity, with three generations and more than half century's success in a single business, "which has, at least, in the United States never occurred before." With this longevity came at least one tremendous asset for the company. "Reputation and credit," he noted, "can be acquired by energy and honesty in a few years in this country; but Experience cannot, it is the only and great advantage we have."⁹⁵

At the same time, Lammot had a keen awareness of the limitations of tradition. Regarding the family company, he noted that "We the present proprietors inherit in our business, all the good done by our fathers, as well as those things done badly; and with the march of improvement, one family in a business is more apt to fall behind the world, than to be able to keep in the advance."⁹⁶ He recognized, in particular, the dangers inherent in resting on one's laurels in the world of enterprise and science. He suggested, for example, that the rapid ascendancy of England's Waltham Abbey powderworks after its acquisition by the Crown in the late 18th century actually had the effect of retarding English progress in powder manufacture, as "all manufacturers were furnished with samples of W Abbey powder and ordered to make like that, W Abbey being considered the standard and of course the best, this caused an end to improvements, and . . . every thing moved along in

⁹⁴George H. Kerr, *Du Pont Romance: A Reminiscent Narrative of E. I. du Pont de Nemours and Company* (Wilmington, De.: E. I. du Pont de Nemours & Co., 1938), pp. 79-87.

⁹⁵ Lammot du Pont, "Accidents," n.d., p. 2, Acc. 384, Box 27.

⁹⁶*Ibid.*, p. 1.

the old rule.” By contrast, he noted, French developments in the industry proceeded much more rapidly during the same half century.⁹⁷

While many of Lammot’s proposals and activities demonstrate his innovative and forward-thinking approach to subjects, just as many illustrate the well-developed historical perspective that informed his thinking. His study of accidents at the company mills is a case in point. Like all of the du Ponts who lived near the powder mills, Lammot grew up with an intimate knowledge of the dangers of the family business. As an adolescent he wrote his brother an account of one disaster, capturing the spectacular nature of the event: "This morning just as I got out of bed I saw a flash of light and then a loud explosion. I dressed as soon as I could and ran down to the refinery. . . . There were two men killed, entirely blown to pieces, there were 4200 lbs of powder in the mill, all finished ready to pack, so you may know it made a pretty good crack, it shook Uncle Bidermann's house, . . . Every window or door that was shut was burst open in our house and Aunt Victorine's, there were 30 panes broken in each house."⁹⁸ He later recalled an even earlier explosion, which had occurred when he was just three years old: "I was looking up at the window over the door when, before I heard the noise, I recollect distinctly seeing the whole glass fly out of the window, each pane apparently whole, then break and fall on the piazza. . . . I jumped up and ran crying into Polly Simmon's."⁹⁹

In April 1847, Lammot and Irénée, then studying at the University of Pennsylvania, learned of one of the company’s most devastating explosions from their mother Meta, who wrote to recount the dramatic details of "our dreadful explosion, the worst since 1818." She exclaimed that "18 men were killed! . . . Poor Willie Green is gone! all the upper yard men. . . . Our house is terribly spoiled. . . . The bodies or what was found, were all buried this afternoon & there are 16 widows." Their father, in a postscript, tried to play down his wife's tales of woe, noting that "Your Mother sees things in a bad light, 18 Men are lost, it is true, but thank God, many of the Upper Yd men are safe; the injury to our house & other building is of no consequence."¹⁰⁰

Explosions were an expected, if unwelcome, aspect of powder-making. The first documented explosion at the du Pont mills occurred in 1805., and the disaster of 1818 that forced Lammot’s father’s early departure from his studies with Thomas Cooper had killed 32. Even Lammot conceded that “I do not think it possible [sic] to manufacture powder without occasionally meeting [sic] losses.”¹⁰¹ From the beginning, however, the du Ponts demonstrated a awareness of personal responsibility in these catastrophes. As early as 1811, E. I. du Pont devised a list of rules for the safer operation of the mills, and, after the death of nine workers in 1815, he established a policy to ensure the compensation of the

⁹⁷Loose notes, undated, in file with “Notes on Jobs on Hand 1/2/1865,” Acc. 384, Box 30.

⁹⁸Lammot du Pont to Irénée du Pont, 25 July [184?], Acc. 348, Box 48

⁹⁹Lammot du Pont, “Notes on Accidents,” 1859, Acc. 384, Box 48.

¹⁰⁰Margaretta du Pont to Irénée and Lammot du Pont, 14 April 1847, Acc. 348, Box 48.

¹⁰¹“Notes on Accidents,” 1859.

widows and orphans of the victims of mill explosions. Such an arrangement was far from standard for the time and was not required either by custom or law.¹⁰² Given the ongoing accidents the outlay on the program was not inconsiderable, and Lammot noted that one widow drew a pension of \$100 per annum for 40 years after her husband's death.¹⁰³

Nor was it mill workers alone who suffered in these events. Family tradition called for the du Ponts to share the tremendous risks associated with powdermaking with their workers. Lammot's eldest son, Pierre, recalled years after his father's death, that: "I have heard it said that he always led his associates especially in difficult or dangerous situations which in the earlier days of gunpowder were more constant than they were today." He recounted a story told to him by Lammot's younger cousin, Francis Gurney (Frank) du Pont, about a demonstration of gunpowder testing for visitors from West Coat, notably the risky act of placing the powder & ball in the eprouvette or mortar: "In traditional manner father [Lammot] attended to this duty himself at which one of the visitors remarked, 'In California we always get a Chinaman to do that part of the work.' Father turned and said, with some heat, 'In the East we attend to the dangerous jobs ourselves.'"¹⁰⁴ One longtime powder man in the mills corroborated these tales, recalling that "One thing I soon found out was that if there was any risk to run in starting new mills the du Ponts were there first and no man allowed to run them until they had proved to their own satisfaction that everything was safe, if there should be an explosion they were the first to take the risk."¹⁰⁵

Taking these risks took their inevitable toll on the du Pont family. As the accounts reveal, the family was intimately acquainted with the damage to life and property that such an event could entail. Shattered windows, flying bricks, and cracked looking glasses were distressing, but the realities of mangled bodies and severed limbs scattering the powder yards likely never became routine. Even the death of Lammot's great-grandfather, Pierre Samuel du Pont de Nemours, was believed to have been hastened by his exertions, when, as an ailing seventy-seven year-old, he helped to extinguish a dangerous blaze that threatened to ignite the powder in the yards in 1817. One cousin recalled of the devastation of 1847 that "Human heads, arms, and feet were found on that peaceful-looking bank of the Brandywine."¹⁰⁶ In February 1850, Lammot's brother Irénée carried a gravely injured worker out from the ruins of a coal mill which had just exploded, and Uncle Alexis "bled him but it was of no use."¹⁰⁷ Irénée himself briefly was thought to

¹⁰²Peter B. Petersen, *Effective Safety Management at Du Pont. A Historical Perspective (1802-1914)*, pp. 5-6, Acc. 1645.

¹⁰³ "Accidents," p. 10.

¹⁰⁴ "My Father," p. 7.

¹⁰⁵ "Reminiscences of one of Du Pont's employees," pp. 2-3.

¹⁰⁶ Quoted in William H. A. Carr, *The du Ponts of Delaware* (New York: Dodd, Mead & Co., 1964), p. 150.

¹⁰⁷ "Notes on the Plans of Powdermills and Machinery of E.I. du Pont de Nemours and Company 1858," Acc. 1600.

have been killed in an explosion of a pack house in Hagley Yard in 1863, but fortunately had been delayed in his plans to return there following a lunch break. Still, thirteen men were killed in the incident.¹⁰⁸

Certainly the danger was enough to justify Mary Belin's remark to her then fiancée in 1865: "Uncle has talked so much about the danger of Powder making and the risk that you run, that he has made me quite nervous about you. . . . My only hope is, that even if you do not care for yourself, for my sake you will not expose yourself needlessly."¹⁰⁹ Despite her anxieties, family habit was such that Lammot later instructed his eldest son, Pierre, "in the orderly arrangement of the clothing when undressing at night 'in order to be ready for a quick response in case of accidental call.' . . . He himself always placed at his bedside the three essentials -- his boots, his trousers and his spectacles."¹¹⁰ On the afternoon of Alfred Victor du Pont's funeral in October 1856, a fire in the Hagley Yard required the efforts of all of the du Pont men to contain it, prompting Sophie du Pont to note that "Explosions might very conceivably have wiped out the entire clan."¹¹¹ The du Ponts finally did lose a family member to the business just nine months later, when Lammot's uncle, Alexis I. du Pont, was mortally injured in an explosion, with two of his sons -- Lammot's cousins Eugene and Alexis-- escaping the same fate by just minutes.

Lammot may have inherited his ancestors' paternalistic concern towards the company's employees, particularly in the case of accidents and injuries, but he also brought a more scientific approach to the problem of explosions, seeing the direct relevance of worker training, behavior, and morale on the company's day-to-day operations. In fact, he introduced one study of explosions at the mills with the remark that "I do not believe in the existence of such a thing as an accident, as every occurrence [sic] is according to some Law, which although unknown to us, exists." Echoing his grandfather's words from six decades earlier about the importance of documenting experience: "although an expensive school yet having paid for it, why not avoid the rocks our fathers struck on?" "With this view," he noted, "I will record all the accidents I ever heard of on the Brandywine and at Wapwallopen, drawing my own conclusions, and leave some data for those coming after to base theirs on."¹¹² In this plan, he was consciously following in his father's footsteps. In a memorandum entitled "Remarks relative to Rolling Mill Explosions," written by Alfred and preserved by Lammot, Alfred had lamented the lack of "an accurate record . . . of each Rolling mill explosion," suggesting that "it might have been of much use, had each explosion been coolly examined."¹¹³ Lammot dedicated himself to completing his father's

¹⁰⁸Wilkinson, *Lammot du Pont*, p. 96.

¹⁰⁹Mary Belin to Lammot du Pont, 24 July 1865, Acc. 348, Box 48.

¹¹⁰"Life in my Father's House," p. 8

¹¹¹Diary of Sophie du Pont, 6 October 1856, quoted in William H. A. Carr, *The du Ponts of Delaware* (New York: Dodd, Mead & Co., 1964), p. 152.

¹¹²"Accidents," pp.1- 2.

¹¹³Alfred V. du Pont, "Remarks relative to Rolling Mill Explosions," n.d., Acc. 384, Box 27.

work, compiling a series of notebooks from the late 1850s to the late 1870s which documented the company's accidents. Sharing Lammot's interest in "all these old time matters relating to the business," cousin Frank du Pont asked to borrow Lammot's notes and eventually brought the account of accidents current to 1902.¹¹⁴

In reconstructing his accounts of the explosions at the du Pont mills over the decades, Lammot zealously researched published accounts, the recollections of family members and employees, and company records of prior disasters, including the petit ledger, time book, and office scrap book. From this information, he developed a theory of the potential cause or causes for each explosion, often correcting what he saw to be mistakes in the historical accounts he had. He commented, for example, on the unpredictability of personal memories on such dramatic occasions: "In explosions the say so of men or even your own impressions are very uncertain - for some men are so frightened that they cannot tell anything that occurred, others are so excited that they do not notice things around. The safest guide is the effects of the explosion." He thus took care to document these "effects," detailing the location of individuals, carts, and "the general position of affairs" after the disaster, often incorporating maps or drawings of the affected structures into his reports.¹¹⁵ His goal for these investigations was straightforward: "Although this account may appear to be a rigmarole yet from it others may draw correct results." And from positing possible causes, he went even further, asserting broad theories of work habits & practices, environmental conditions, manager/worker relationships and human behavior. Despite his scientific approach, however, Lammot brought humanity and a personal face to his explorations. Following a fatal accident in 1869, he recorded that fourteen of forty-six powdermen had quit, which, he mused, "shews the demoralization in Hagley at this time, and no wonder."¹¹⁶

Lammot's study of the accidents experienced over the company's first half century and beyond is perhaps the clearest evidence of his working method, which balanced an historical perspective with a rigorous investigative approach and an implicit conviction in the potential for improvement. In his efforts can be seen the clear nascence of a scientific approach to safety management that has since become the hallmark of the Du Pont company and its operations. Just as Lammot rejected the notion of "accidents," the modern company's current safety philosophy centers around the principle that "all injuries are preventable" -- a "core belief" that the company has "lived and worked with . . . for more than 150 years." Alfred and Lammot, who believed that "the superintendent and managers are answerable to a great extent for . . . want of care," would have wholeheartedly agreed with the company's statement that "management . . . is responsible

¹¹⁴Francis Gurney du Pont to Lammot du Pont, 16 Sept. 1881, Acc. 384, Box 48; Wilkinson, *Lammot du Pont*, p. 174.

¹¹⁵Lammot du Pont, "List of Accidents," [ca. 1859]. For examples of Lammot's accident diagrams, see "List of Accidents" and "Position of Wagons at the time of the Explosion in Wilmington Del. 1854." See also "On an explosion of Lower Dustmill Hagley May 19 1875," which appears to be in Frances Gurney du Pont's hand and which follows the model for accident analysis set by Lammot du Pont. All in Acc. 384, Box 27.

¹¹⁶Lammot du Pont, "Account of accidents 1829-1877," Acc. 384, Box 27.

and accountable for preventing injuries.” And Du Pont’s insistence that “employees must be trained to work safely” and that “each employee must be convinced that he or she has a responsibility for working safely” finds an echo in Lammot’s belief that it was the manager’s fault, if a careless employee was allowed to continue in employment. He lamented the need, as “I know it is a disagreeable duty to discharge men, yet it should be done without fear or regard of consequences; or trouble it may entail.”¹¹⁷ In fact, the approach towards accidents and safety that Lammot first demonstrated ultimately engendered a business that advises other major companies in safety management.

By the late 1870s, Lammot was becoming increasingly aware of the negative impact of Henry’s conservative stranglehold on the company’s progress. In one of his later essays on accidents in the mills, he remarked that “being a junior partner, my ideas have often been overruled,” but, he noted with satisfaction that “gradually we have worked in plans deduced from the experience recorded, that have thus far proved of great advantage.”¹¹⁸ It probably was around this time that he assembled a series of drawings of improvements which he had proposed over the years. Carefully numbered and labeled, the plans ranged from chemical innovations, such as a “No.1/Plan proposed to Cool Saltpetre 1851” to labor-saving devices, such as a truck to hoist boxes (No 4), and architectural and structural plans, including “No. 15/ Improvement proposed at Mud house” and “No 17/Proposed new Laboratory.” On several, including the suggested laboratory and mud house alterations, he inscribed an additional word: “rejected”. Whatever he may have thought of Henry’s vetos of so many of his improvements, Lammot was realistic about his innovations. Of his proposal for “No 18/Conical crashing machine,” also marked “rejected,” he remarked: “on good grounds as it would not work.”¹¹⁹

Sometime in the late 1870s, Lammot also compiled a listing of Du Pont mills built or acquired since the company’s founding. In addition to a list of each mill’s construction or acquisition date, he sketched a “family tree” of the mills that dramatically illustrated the company’s extensive expansion beyond its roots along the Brandywine. Finally, he sketched in each family member’s involvement in the mills year-by-year -- an exercise that emphasized the longevity of his thirty-year association with the company.¹²⁰ The combination of these two exercises suggest that Lammot was beginning to aspire to greater recognition of his value to the company and to chafe against Henry’s rigid control.

The death of his brother Irénée, from tuberculosis, in 1877, brought Lammot’s dissatisfaction to the fore. The death would necessitate the creation of a new partnership agreement, which Lammot saw as an opportunity to reconsider the traditional structure of the company, by which all real power resided in the senior partner, Henry du Pont. During the fall of 1877, Lammot composed a proposal to his uncle in which he outlined the

¹¹⁷The Du Pont Company’s Safety Philosophy is spelled out on the website of its business, Du Pont Safety Resources, at Lammot’s remarks are taken from “Accidents,” pp. 1-3.

¹¹⁸“Accidents,” p. 2.

¹¹⁹Drawings of mill buildings and machinery, Acc. 384, Box 61.

¹²⁰In Acc. 384, Box 30.

features he thought should be represented in the new partnership agreement. Prior to presenting it to his uncle in December, Lammot circulated the memorandum for comments to his brother Fred, fellow partner Eugene, and Henry's eldest son, Henry Algernon, who was about to become a partner. A key recommendation of the proposal was to share policy-making among all the partners. In a case where the junior partners were unanimously agreed and the senior partner opposed, a decision would be postponed for reconsideration. If, after three months, the support for the policy remained unanimous among the junior partners, the senior partner should yield to their decision. The memorandum also recommended better compensation for the junior partners, including reimbursement of travel expenses; delineated specific responsibilities for each partner (which would officially yield general management of all powder plants outside Delaware to Lammot); and advocated that the company, rather than an individual partner, should hold real estate purchased by the company.¹²¹

One of Lammot's primary motivations for drafting the revised agreement was the discovery that Henry du Pont had apparently (and surreptitiously) purchased Irénée's twenty-two shares of the company and added them to his original eighty. This action was in direct conflict with the 1858 partnership agreement, which had decreed that all of the partners would have equal opportunity to purchase the shares of a deceased partner. Even more disquieting was the discovery that five shares of Lammot's original twenty-two were "missing," while Henry had credited himself with an additional five. The result was to provide Henry with a grossly inflated proportion of the company's capital and, hence, its growing profits.¹²²

But Henry remained mute following receipt of Lammot's proposal. After four months of silence, Lammot offered his resignation in April 1878, with the heartfelt sentiment that "It takes no little thought . . . to leave a home, the home of your father; to leave a business, the business of my life, and one whose prestige stands 2nd to none in the country; to abandon all friends, family, wealth & position to take your wife and family of little children and leave for an uncertain and unknown future."¹²³ Over the next several months, accusatory letters shot back and forth between the two -- Henry claiming ignorance of Lammot's justification for leaving and the nephew expressing amazement at his uncle's obliviousness or deliberate obfuscation. Tempers eventually cooled, and Henry attempted to distract Lammot from his intended resignation by offering him the presidency of the Hazard Company. But the position held little interest, as it would merely formalize the authority over the company's operations that Lammot already had. In April 1879, Lammot announced that he would retire at the end of the year.¹²⁴

¹²¹Wilkinson, *Lammot du Pont*, pp. 231-235, p. 237.

¹²²*Ibid.*, pp. 235-236.

¹²³Lammot du Pont to Henry du Pont, 7 April 1878, Acc. 384, Box 48.

¹²⁴Wilkinson, *Lammot du Pont*, pp. 242-245.

One of Lammot's primary complaints with Henry du Pont's management of the company throughout the 1870s had been his reluctance to become involved in the field of high explosives. Lammot had been interested in the potential of dynamite, a patented form of nitroglycerine invented by Alfred Nobel in 1865, for several years, and had conducted experiments into the subject.¹²⁵ But Henry had declared it and all other nitroglycerin formulations "vastly more dangerous than Gunpowder," insisting that "no man's life is safe who uses them."¹²⁶ Demand for dynamite in America after its introduction in 1868 was growing rapidly, however, as it quickly proved to be the most effective means of blasting through rock for mining and excavation. Lammot recognized that the market for black powder would soon be subsumed by the new and more powerful high explosive alternatives, and he was eager to ensure that Du Pont was in the forefront of dynamite's development. The California Powder Works -- a G.T.A. member -- began producing a variant on Nobel's patent, marketed as "Hercules" powder. Du Pont had begun acquiring shares of the California Powder Works, while it was still primarily a black powder company. By 1876, Du Pont held controlling interest in the California Powder Works, and Du Pont black powder agents were eager to add "Hercules" to their sales line. A reluctant Henry du Pont entered the high explosives industry.

High explosives, however, also gave Henry the carrot he needed to lure his wayward nephew back to the fold. While Lammot had apparently begun planning in the fall of 1879 for construction of a dynamite plant not far from the existing Brandywine powder mills, he was forced to abandon the site, probably under pressure from the partners and family members living nearby. At about the same time, Uncle Henry was approached by Solomon Turck, who headed Laflin and Rand -- Du Pont's largest competitor and fellow G.T.A. member. In his letter, Turck "politely but positively" suggested that Du Pont, Hazard, and Laflin and Rand jointly enter the high explosives business together. If Du Pont and Hazard did not accept, Laflin and Rand would proceed with the enterprise alone. With little enthusiasm, Henry du Pont yielded and announced in January 1880 that "We are going into the high explosives business."¹²⁷

The company was to be owned jointly by the Big Three makers, with Lammot to be named president. As Du Pont secretly owned Hazard, however, Du Pont would actually own two-thirds of the company. Three days after Henry's announcement, construction of the new plant began. The site chosen was an isolated location in Gloucester County, New Jersey, at the juncture of the Delaware River and Repaupo Creek, directly across from Chester, Pa. The location suggested the new company's name, with a variation -- "Repauno" -- "because it sounded better," according to Lammot; and discovery of a cache of Lenape Indian artifacts on the site must have seemed to him a propitious sign.¹²⁸ Repauno was to finally give Lammot the opportunity to fully exercise the leadership skills

¹²⁵See Notebooks on acids and glycerine used in the manufacture of dynamite, Acc. 384, Box 44.

¹²⁶Correspondence of E. I. Du Pont de Nemours & Co., 14 March 1871, quoted in du Pont, *E. I. du Pont de Nemours and Company*, p. 121.

¹²⁷Dutton, *Du Pont*, p. 131; Wilkinson, *Lammot du Pont*, p. 254.

¹²⁸Kerr, *Du Pont Romance*, p. 96.

that he had been acquiring over the last thirty years. It gave him, too, the chance to pursue and implement new management and production methods without the restraints imposed by his uncle's conservative disposition. Production began at Repauno on May 30, 1880, with Lammot ceremoniously (and no doubt carefully) carrying the first bucket of nitroglycerine to the mixing house. His optimism was immense: "We have begun here, what will some day be the biggest dynamite plant in America."¹²⁹

Repauno's first product was named "Atlas," an intentional choice to offer worthy competition to the older "Hercules" brand of dynamite. But it was only a year before Repauno added "Hercules" to its own line, after purchasing the California Powder Works' Hercules plant, near Cleveland, and not long thereafter, in March 1882, the Hercules Powder Company was chartered in Delaware, with Lammot as its president, to operate the Cleveland plant. Lammot had worked closely with J. W. Willard of the Hercules plant in Cleveland in the past, and Willard provided Lammot with valuable assistance in the early days of getting production underway at Repauno. Many of Lammot's early hires at Repauno were made with Willard's recommendations, including Harry Norcross, who became the plant superintendent.¹³⁰ Lammot thus stepped out of the shadow of his uncle, who preferred to keep control of all matters of production within the family circle.

Repauno quickly expanded, as demand for its products grew rapidly in its first years in operation. New structures were erected, including worker's housing, a worker's clubhouse, and a chemical laboratory -- the facility that later became the Eastern Laboratory and the Du Pont Company's first experimental laboratory. Lammot was also eager to put Repauno in the forefront of modern business operations, installing the first powder-plant telephone system and introducing a number of safety features, including a cart designed by Lammot to transport the nitroglycerine to the mixing house, earthen bunkers around plant buildings, and mechanized operations, wherever possible.

Lammot had also continued to assist his uncle with the Du Pont company's black powder business and, during the first year of Repauno's operation, had lived at the family home of Nemours. The daily commute to Repauno from the Brandywine was a complicated one: a drive of four or five miles to Wilmington, then a train-ride to Chester, followed by a river crossing to New Jersey. In 1881, Lammot made the decision to move the family to Philadelphia, purchasing a home at 3500 Powelton Avenue in West Philadelphia and enlarging it for his growing family. In so doing, Lammot became the first member of the firm in seventy-five years to move away from the Brandywine. He later purchased the old Powell Mansion on a nearby lot and constructed a chemical laboratory on its second floor. It was there that he introduced his eldest son Pierre to chemistry and urged his first steps on the path that would lead to Pierre's future as head of the Du Pont Company.¹³¹

¹²⁹Dutton, *Du Pont*, p. 133.

¹³⁰Wilkinson, *Lammot du Pont*, pp. 256, 265.

¹³¹"Life in My Father's House," pp. 37-38.

Early in March 1882, now president of both Repauno and Hercules, Lammot determined to solidify his control over his new enterprise. He presented his Uncle Henry with an offer to purchase fifty percent of Du Pont's stock in Repauno, which would make him an equal partner with Du Pont and Laflin and Rand. The funds for the purchase, he proposed, were to come from his one-sixth share as junior partner in Du Pont, from which he was about to formally withdraw. Henry balked at the proposal, unwilling to cede Du Pont's controlling interest in the enterprise to anyone, even his nephew. Lammot drafted no fewer than three letters in response, noting that "you do not appreciate my views" and "you do not see things as I see them, hence this letter to explain my views." In some indignation, he asked, "Do you suppose my third would not be voted in your interest?" and suggested that Henry should have "sufficient confidence in my sustaining you and the Black Powder interest after 31 years trial." Henry continued to resist, and a flurry of increasingly agitated letters ensued over the next few weeks. On March 22, 1882, Lammot noted with disgust that "you do not even yet appear to understand me, so please let this letter be the last of this disagreeable matter. I will say that I am glad to be out of the Black powder business, and only wish I had retired two years ago. . . . Tomorrow . . . it becomes my duty to tell the L & R [Laflin & Rand] of my retirement from Repauno."¹³² Family members watched the dispute with worry, and Lammot's brother Fred cautioned him not to act in haste, suggesting that he "lay off for 6 Mos. or so & take a rest."¹³³

The reason for Henry's ultimate capitulation is unclear. He may have been convinced that Lammot was truly determined to go through with his threat to sever his connection with the family firm this time, or Fred may have been right in suggesting to Lammot that the real source of the objections to his proposal was not Henry, but his sons and younger partners, William and Henry A.¹³⁴ For whatever reason, during the summer of 1882, Henry agreed to allow Lammot to relinquish his one-sixth ownership, worth \$440,000, in the Du Pont Company, in return for which he would receive a portfolio including one thousand shares of stock in Repauno, making him an equal owner with Du Pont and Laflin & Rand. Lammot also received 334 shares in Hercules, as well as stocks and bonds in a number of other powder and coal companies.¹³⁵ Thus, by the end of 1882, Lammot had finally gained the independence that he had so long sought. Repauno's business was booming, and Lammot was poised to become the nation's leader in the young and promising enterprise of high explosives.

At Repauno, Lammot continued to pursue the interest in diversified production that had led him into the high explosives industry in the first place. One of the key technical concerns he faced was recovery of the waste acids produced during the process of nitrating the glycerine. These nitric and sulphuric acids were responsible for killing

¹³²Lammot du Pont to Henry du Pont, 3 March to 22 March 1882; Henry du Pont to Lammot du Pont, 3 March to 24 March 1882; all in Acc. 384, Box 8.

¹³³Alfred V. du Pont, Jr. to Lammot du Pont, 27 March 1882, Acc. 384, Box 47.

¹³⁴Ibid.

¹³⁵Wilkinson, *Lammot du Pont*, pp. 277-278.

thousands of fish in the waters below the plant and costing the company thousands of dollars in settlements to commercial fishermen. Lammot and his chemist Walter Hill believed that it was possible to instead recover and reuse the acid water, not only ending the pollution problem but economizing the plant's operations. In March 1884, they took their experiments from the laboratory to the nitroglycerine house at the Repauno plant.¹³⁶

Lammot's cousin Frank described the tragedy that followed on March 28th to his brother Alexis:

They were not running the N.G. [Nitroglycerine] house on Saturday and had drawn off the last charge of Friday and placed it in a lead lined tank over night. Saturday morning the men found it decomposing and fuming to such an extent that it seemed to be boiling. Lammot had gone to the works to see Ackerson of the L & R Co's office who had an appointment with him. He was in the laboratory when one of the men came from the N.G. house to say that something was wrong. L [ammot] & Hill went up to the N.G. house, saying to Ackerson to wait till they came back. Ackerson became tired of waiting and went towards the building, and was within 40 ft. of it when the explosion came. His neck was broken.

Lammot worked with this fuming N.G. trying to stir it into the water tank, and finally told the men to leave, and he and Hill left and got but 10 ft. from the building when the explosion came. They were buried under earth, while Norcross [the superintendent] and the two men were killed with timbers. . . had they all left but one minute sooner they would be alive now. Lammot was anxious for the result of his experiment and did not wish to give up, and so stayed later than he would had the fuming taken place in the regular course of manufacture.

None of the bodies were badly mangled. Lammot was not disfigured in the face, but was crushed in body and ribs broken. I saw his body and was pleased to see that his face looked perfectly natural and peaceful, but death gave to the features a look of unutterable sadness that I do not remember to have seen on any other dead body.

Just look at the results of this explosion. Lammot - 9 children [a tenth would be born just weeks later], Hill, wife and 3 children; Norcross to have been married on Thursday. Ackerson, a husband of one week; the two men who worked the N.G. both to be married shortly. I tell you this thing is heart-rending, all our little differences with Lammot have vanished, I can bring myself to remember only the many, many pleasant hours I have spent with him, and the assistance he gave me from his experience when I first came here. I have scarcely had another thought but of him since the accident. He was universally beloved, and many letters have poured in on us condoling in our loss. Men came from Cleveland, Canada, Cincinnati and the West, as well

¹³⁶Ibid., pp. 263, 281.

as from the North to be present at his funeral I can only think of the fearful crash that ended his life without time for thought, and . . . pray that our family may be spared any more such afflictions.

Frank had learned well from his study of Lammot's accident reports. He embellished his letter to Alexis with a drawing of the Nitroglycerine house at Repauno, and, a week later, set forth a detailed exposition of his theory on the cause of the accident.¹³⁷

Lammot and Hill had been killed instantly by the concussion of the explosion and were buried beneath one of the earthen bunkers that had been erected as a safety device. Lammot du Pont was buried a few days later, on April 1, 1884, aged fifty-two, at the family cemetery near the Brandywine mills. Despite the decades of experience with explosions and accidents, this loss, perhaps more than any other, stunned the family. Of Henry du Pont, Lammot's Aunt Sophie, remarked that she "was shocked to see how much he was changed and aged by this affliction, and how badly he looked." For herself, Sophie simply recorded "a sad, sad day for me." Lammot's wife Mary, in the last weeks of her pregnancy, wrote with feeling to Sophie: "Oh, dear Aunt, to have your dearest on earth snatched from you in the midst of life and strength! It is so hard to realize I shall never see him again. But I must try to think with thankfulness of the eighteen happy years I spent with my dear husband, during which time I can never remember one unkind word from him. I hope that my children may inherit his lovely disposition and kindness of heart."¹³⁸

After Lammot's death, the Du Pont Company repurchased two-thirds of Lammot's Repauno stock, thus ensuring Du Pont's control of the company, while Lammot's wife retained one-third. After a brief pro tem presidency, William du Pont, who had been working for Lammot, stepped into his cousin's shoes as president. Despite his financial acumen, Lammot had left no will, but died with an estate worth over one million dollars, mostly in investments in high explosives and powder firms, thus ensuring the security of his wife and children. Lammot's brother Fred became the children's guardian -- a choice that Lammot would almost certainly have approved. As his son Pierre recalled of his father and Uncle Fred, "they both had an agreeable presence, were kindly and considerate in their manners, did not speak harsh words. I never saw either of them show anger or heard them utter critical or cutting words. Nevertheless they were both firm in their convictions and very determined in their actions."¹³⁹ Pierre himself, aged just 14 at his father's death, stepped into the role of father for his many younger siblings, who came to know him as "Dad." Eighteen years later, in 1902, he and his cousins A.I. and T. Coleman du Pont, stepped into the leadership of the Du Pont Company and led it to new heights of innovation and success.

In his fifty-two years, Lammot du Pont proved himself to be a leader and innovator of uncommon stature. Possessed of a brilliant scientific intellect, he was also an astute

¹³⁷Francis G. du Pont to Alexis I. du Pont, 1 April and & April 1884, typescript copy, Acc. 1597, Box 4.

¹³⁸Mrs. S. F. du Pont, *Diary*, 12 April and 19 April 1884; Mary Belin du Pont to Mrs. S. F. du Pont, 15 April 1884, quoted in Wilkinson, *Lammot du Pont*, pp. 284-285.

¹³⁹"My Father," p. 2.

businessman, who drew upon his innate charisma, profound determination, and clear sense of direction to achieve his goals. As a partner in the Du Pont Company and a direct descendant of its founder, he developed a vision that respected the company's achievements, while urging it to new levels of accomplishment and innovation. His efforts occurred at a critical period of its transition from small family firm to multinational corporation -- a culmination which he did not live to see, but which occurred under his son's careful guidance. Lammot's lifelong dedication to experimentation helped to spur the company's commitment to scientific exploration at the Eastern Laboratory at Repauno and, later, the Experimental Station. His careful attention to the causes and effects of accidents at the mills heralded a new and more scientific approach to safety management -- a field in which Du Pont would become an international leader. And in his never-ceasing search for more innovative and effective means and materials, he opened the door to the diversification that would be the hallmark of the Du Pont Company in its second century.