MAN, MANPOWER, AND MACHINES AT THE SPRINGFIELD
ARMORY: THE SUPERINTENDENCY OF ROSWELL LEE,
1815 - 1833

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Preface

Soon after gaining independence from Great Britain, the United States government recognized the need for American-made firearms and established two national armories, one at Harpers Ferry, Virginia, and the other at Springfield, Massachusetts. In 1798, with the nation close to war with France, Congress decided to supplement the government produced arms with guns produced by private firms under government contract. Although America avoided a declared war with France, the system of combined public and private production of military firearms continued up through the Civil War. By the end of the War of 1812, the military recognized the need for an adequate supply of weapons, capable of being repaired in the field. Thus in 1815 the Ordnance Department began a protracted drive for mass produced muskets with interchangeable parts.¹

Roswell Lee, superintendent of the Springfield Armory from 1815 until 1833, played a major role in fulfilling the Ordnance Department’s goals. Realizing that such a task was incompatible with the traditional craft production of firearms, Lee undertook vigorous steps to make the Armory an industrial mass production enterprise. Although the process of industrialization began at Springfield prior to Lee, he accelerated it and made it a workable system. He built an industrial labor force from workers ingrained with pre-industrial work habits. He also fostered machine
development and new mechanized production techniques. While Lee, by the time of his death in 1833, did not reach the goal of mass producing firearms with interchangeable parts, he did set the course so that in the next decade his successors could.

This thesis focuses upon Roswell Lee's contributions to the development of interchangeability and the mass production of firearms. After a general discussion of Lee's life, the study will turn to an analysis of his efforts to create a work culture compatible with industrial production. The last chapter will then examine several of the technological developments which Lee helped promote.
I. The Man

For a man whose government, community, fellow arm-makers, and latter day historians of technology have recognized as important, Roswell Lee remains to a large extent a shadowy figure. Information of Lee's early life is sparse.\(^1\) In the numerous official letters he penned during his eighteen year stint as superintendent of the Springfield Armory, Lee rarely revealed his personal feelings. He wrote private letters and no doubt received an equal number in return, but these items have been either lost or destroyed, making the historian's task all the more difficult.\(^2\)

On 1 September, 1820, Roswell Lee sent his superiors in Washington a list of birth information on all Armory officers. Next to his own name he simply recorded his birthdate as 14 October, 1777, at Canaan in Columbia County, New York.\(^3\) Apparently his father, who rose to the rank of ensign in Captain James Spencer's New York company during the War for Independence, was also named Roswell Lee. The identity of his mother is lost to history. Nor is anything known of Lee's experiences as he grew up in Revolutionary and Early National America.\(^4\) Sometime during this period Lee married, but darkness shrouds the details of this union as well as the fate of the wife. Lee entered his second marriage in 1804 when he exchanged vows with Phobe Potter at Hamden, Connecticut.\(^5\) In over twenty-nine
years of marriage, the Lees raised two daughters and five sons.  

From the date of Lee's second marriage until his entrance into the United States Army during the War of 1812, the veil of mystery again descends over Lee's life. In their biographies of Eli Whitney, both Constance M. Green, and Jeanette Mirsky and Allan Nevins state that Whitney employed Lee sometime between 1801 and 1807 to tend the cotton gins which Whitney rented to Southern planters. Unfortunately, even this claim is difficult to substantiate (see Appendix I). Whether true or not, Lee somewhere acquired meaningful technical experience, for upon arrival at Springfield in 1815, he quickly demonstrated a familiarity with The Emporium of Arts and Sciences, Operative Mechanic and Machinist, Rees's Cyclopaedia, and the Edinburgh Encyclopaedia. Lee corresponded with other leaders in technology who considered him something of an authority.  

Yet Lee's technical knowledge apparently contributed less to his appointment to the superintendency at Springfield than did his military connections. On 3 March, 1813, he had entered the Twenty-fifth United States Infantry at the rank of major. Two months later, the army transferred him to the Thirty-seventh United States Infantry. On 21 September, 1813, his superiors made him a lieutenant colonel and stationed him at Groton, Con-
necticut. Planning to remain there, he purchased some property, only to receive orders instructing him to take command of Fort Griswold, Connecticut. He held this post for the remainder of the War of 1812. On 15 June, 1815, the army honorably discharged Lee, enabling him to go to Springfield and assume control of the Armory. 10

From at least 1813, Lee had communicated with Colonel Decius Wadsworth, the Chief of the Ordnance Department, and made known his interest in firearms production. "I am very fond of a Military life," he stated in one such letter, but he also let Wadsworth know that, "there are peculiar circumstances which render it Objectionable..." 11 In 1815 Wadsworth began to take notice of Lee's overtures, for he was having difficulties with the superintendency at Springfield. The two men who held the post during the War of 1812 resisted Wadsworth and some of his plans. Lee's immediate predecessor, Benjamin Prescott, debunked the concept of uniformity as a "rideckelis [sic] idea." 12 This attitude plus a general unsettledness about the Armory forced Wadsworth to seek a new superintendent. Aware of Lee's desire for the job and informed of his qualifications by Eli Whitney, in June 1815 Wadsworth appointed Lee superintendent of the Springfield Armory. 13

Lee's administration of the Armory over the next eighteen years won him extravagant praise. In 1971, historian M. R. Smith acclaimed that by 1825 the Spring-
field Armory under Lee's direction "had emerged as one of the most progressive manufacturing establishments in the United States." Lee's superiors in the Ordnance Department held an equally high opinion of his accomplishments, and in the winter of 1826 transferred him to the Harpers Ferry Armory. "The Armory at Springfield," they consoled when notifying Lee of the transfer:

is now so well organized that your continued service there is less essential to its prosperous management than formerly. And it is but justice, on this occasion to state that the present highly improved condition of that armory, is, by the Dept. attributed solely to the energetic zeal and fidelity with which its affairs have been administered since they have been confided to you. And it is with a well grounded hope that a like improvement of the Harpers Ferry Armory, will be effected by the measure now proposed. 15

Lee, upon receiving this news, complained to a friend that "I am ordered to Harpers Ferry to take charge of that Establishment as a reward (I presume) for the arduous services I have rendered at Springfield, and Mr. Stubblefield [the Harpers Ferry superintendent] is to be punished by taking my place in that Armory. I am quite at a loss whether to be driven from 'pillow to post,' or to quit the service and take the Agency of a Cotton Manufactory at Springfield which has been offered me." 16 Despite his protests, Lee went to Harpers Ferry where he had marginal success in instituting reforms. 17 All the while he was in Virginia, he spent considerable time directing the Spring-
field Armory through the mails. \(^{18}\) Finally in June, 1827, the Ordnance Department ordered an elated Roswell Lee to resume his post at Springfield where he remained the last six years of his life with but one interruption. \(^{19}\)

Throughout his career at Springfield, Lee was an active member of the community and cultivated the townspeople's good will. A fervent Mason, he organized Masonic meetings on Armory grounds. He was the first master and one of the most active members of the Hampden County Lodge of Free Masons in the mid-1820's. For his commitment to Masonry, in 1865 the Springfield members named a lodge in his honor. \(^{20}\) In 1830, the Hampden County Colonization Society also recognized Lee's prominence by electing him to a seat on its central committee. \(^{21}\) Other community posts held by Lee included the vice-presidency in 1827 of the Springfield Institution for Savings, chairman of the organizing committee for the golden anniversary of the Declaration of Independence, and chairman of the committee on arrangements for the celebration of George Washington's one hundredth birthday. \(^{22}\)

Lee was also active in Springfield's political life. As a cautious anti-Jacksonian, he frequently chaired politically oriented celebrations, and in 1817 used his influence in Washington successfully to persuade President James Madison to visit the community. \(^{23}\) The election of Jackson to the presidency in 1827 caused Lee some concern
over—as he wrote one friend—"how soon I may be reformed..."24 Perhaps to protect his position at the Armory, Lee agreed to preside over the town's celebration of Jackson's inauguration.25 Jackson's performance once he was in office mellowed Lee's view of the president. "I have been three times to the 'Great Wigwam' [White House] since the present Worthy Chief has occupied it," he wrote to a friend in 1829. "I was much pleased with what I saw...I think the changes have been necessary and judicious..."26 Apparently Jackson also came to respect Lee's management of the Armory, for Lee remained as superintendent until his death on 25 August, 1833.27
Notes, Chapter One

1. Roswell Lee's name, for example, does not appear in Appleton's Cyclopaedia of American Biography, The Dictionary of American Biography, The National Cyclopaedia of American Biography, or Webster's Biographical Dictionary. While local histories of Springfield and Hampden County do provide some biographical information, nearly all of it deals with the period after Lee came to the Armory. See, for example, Moses King, ed., King's Handbook of Springfield, Massachusetts (Springfield: James D. Gill, 1884) and Charles W. Chapin, Sketches of the Old Inhabitants and Other Citizens of Old Springfield (Springfield: Springfield Printing and Binding Co., 1893).


3. Lee to Colonel George Bomford, 1 September, 1820, Letters Sent, RG 156, SAR.


6. Ibid., p. 251.


8. Abraham Rees, ed., The Cyclopaedia or Universal Dictionary of Arts, Sciences, and Literature (Philadelphia: Samuel F. Bradford, and Murray, Fairman and Co., n.d.)[1824]; The Emporium of Arts and Sciences (Philadelphia: J. Delaplaine, 1818-1813, and Kimber and Richardson, 1813-1814). Rees's Cyclopaedia, a forty-one volume work first printed in England and later in the United States, covered a wide range of technical matter. The Emporium was a technical magazine whose subject material ranged from the proper construction of beds to discussions on the best grapes for champagne. This short-lived journal had some original articles and also reprinted material from such journals as Philosophical Transactions of the Royal Society and Journal de Physique.
9. See, for example, Lee to Bomford, 15 September, 1821, Letters Sent, RG 156, SAR; Lee to John Symington, ibid.


11. Lee to Colonel Decius Wadsworth, 7 March, 1813, Letters Received, Record Group 156, Records of the Office of the Chief of Ordnance, National Archives, Washington, D. C.


16. Lee to George Talcott, 20 March, 1826, Letters Sent, RG 156, SAR.


18. See, for example, James Weatherhead to Lee, 12 December, 1826, Letters Sent, RG 156, SAR.


22. King, King's Handbook, p. 303; Springfield Republican, 29 June, 1825; 18 February, 1832, ibid.; 25 February, 1832, ibid.

23. Lee to James Madison, 14 June, 1817, Letters Sent, RG 156, SAR; Lee to James Prince, 14 June, 1817, ibid.; Lee to General Joseph Gurniff, 21 May, 1817, ibid.

24. Lee to James Carrington, 7 August, 1829, ibid.


26. Lee to Carrington, 7 August, 1829, Letters Sent, RG 156, SAR.

27. Springfield Republican, 11 September, 1833.
II. The Manpower

When Lee arrived at the Springfield Armory in 1815, he met a labor force steeped in pre-industrial work culture. The prevailing and limited technology, transportation, market demands, and capital investments fostered loosely structured work habits characterized by the intermixing of labor and leisure throughout the day. The armorers enjoyed latitude in determining the hour they commenced work, with the duration of their toil dictated more by the task to be done than by a clock's movement. At periods throughout the day, groups of armorers would break from their work for some conversation, sport, gambling, and the pleasures of an always present pint of spirits. Roughhousing and practical jokes further broke up the monotony of the workers' chores, while numerous holidays—most notably the Fourth of July and Election Day—provided the armorers an excuse to shut the shops and engage in festivities.²

The drinking, riotous amusements, and general libertine spirit of the armorers, while characteristic of laborers in manufacturing firms elsewhere, disturbed many of Springfield's leading citizens. Products of agrarian and commercial cultures, the majority of townspeople viewed those involved with the manufacturing of guns suspiciously, particularly since the armorers tended to come from outside the community.³ In fact, many local residents had opposed locating the Armory at
Springfield and projected "visions of robbed hen-roosts, ravaged gardens, [and] depredations committed on Sundays." 4 They also feared that soldiers, whom they considered little better than the criminal class, would be stationed at the Armory. 5

The workers treated any action by the community or Armory officials to check their excesses as a threat to their rights as men. One Spring day in 1816, Lee discovered the work in one of the shops disrupted as the men cheered on two of their co-workers engaged in a wrestling match. Angered, Lee discharged the two contestants on the spot and then returned to his office. The fired grapplers, as custom dictated, obtained some rum and invited their compatriots to lay down their tools and gather at the Armory's liberty pole for their farewell celebration. Around this symbol of freedom, the men criticized Lee's action. Feeling that they were little more than slaves, the workers viewed the liberty pole as a sham. Fired by emotion and drink, several workers grabbed axes and began to chop the pole down. The men violently refused to obey orders to disperse issued by both a clerk and the master armorer. Finally, Lee personally confronted the workmen, explained the reasons for his actions, and threatened them with prosecution if they did not cease. When Lee finished, the men dispersed with the mutilated liberty pole still standing. 6
Lee had to check some aspects of the armorer's pre-industrial work habits in order to successfully mechanize the Armory further and promote interchangeability. Power machinery required the undivided attention of the operators, for even the slightest absent-mindedness could result in serious injury to both machine and worker. Drunk or prankish armorers constituted a danger to themselves and their shopmates, and Lee quickly recognized that "scuffling, playing of Ball or other proceedings" in the workshops had "a tendency to impede the regular advancement and progress of the work..." In addition to eliminating such extra-curricular activities, Lee needed to regularize the Armory work hours. Occupational specialization, which by 1815 totaled thirty-four classifications, expanded to eighty-six classifications by 1820 under Lee's direction. This increased division of labor meant that a slowdown or disruption in one operation created impasses in other areas of the Armory. In order to plan production and meet the government's demands for firearms, Lee needed sober, disciplined workers tending the machines during coordinated hours.

In order to impose such a system, Lee knew that he must be the sole authority at Springfield. The 1794 act establishing the Armory, however, had created a system of divided authority by providing for three officers, a super-
intendent, master armorer, and paymaster, each position to be filled by presidential appointment. Congress further designated the respective monthly wage for each officer as $70, $50, and $125, apparently indicating that the paymaster would have greatest responsibility and authority. In another provision of the act, however, Congress charged the superintendent with purchasing all raw materials while making the paymaster responsible for paying for them. This set-up, intended to prevent kick-backs and other types of corruption, created tensions between the two officers. In 1801, for instance, Superintendent David Ames and Paymaster Joseph Williams struggled for Armory supremacy. Early in the year the Armory exhausted its coal supply because neither official recognized the other's role in purchasing the needed fuel. Finally, Washington officials had to intervene to secure the coal. Superintendent Ames, unable to gain the authority he desired, resigned in a fit of rage. Although the Ames-Williams affair was the most rancorous case of conflicting wills, the possibility of conflict between officers always existed.

In the summer of 1815, Colonels Wadsworth and Bomford drafted a new set of regulations governing the Armory which designated the superintendent the senior officer responsible for all operations. Under the new regulations, the superintendent purchased all supplies and oversaw the paymaster, who kept the books and disbursed the funds. The
new regulations were to become effective around 1 January, 1816, so that Lee had only to wait six months from his arrival for greater authority.\textsuperscript{11}

Even before the new regulations became effective, however, Lee maneuvered to consolidate his position. Viewing his duties as "far more arduous and difficult than the Commander of a Regiment, even in time of war," he pressured the Ordnance Department for a statement on the permanency of his position. He also recognized that the changes he planned to make would generate criticism and thus sought a promise from the government "to protect and defend" him in the execution of his duties.\textsuperscript{12} Additionally, Lee sought to retain his military rank which, he told Ordnance officials, "would greatly assist me in performing the duties of the Superintendency."\textsuperscript{13} By using his military title, colonel, instead of his civilian title, superintendent, Lee would disassociate himself from his civilian predecessors and promote his status in the community with a prestigious title. Perhaps Lee also saw little difference between supervising a government-owned arms plant and commanding an army regiment. Even though the Ordnance Department did not grant this request, he was addressed by everyone as Colonel Lee.\textsuperscript{14}

Lee also consolidated his power by recruiting allies as subordinate officers. He could appoint shop foremen and lesser personnel, but he had no authority over the naming of the master armorer and paymaster. Yet, during his first
months in office he successfully urged Bomford to appoint Adonijah Foot master armorer.\textsuperscript{15} Since the new Ordnance regulations decreased the paymaster's authority, Lee urged the Secretary of War to reduce the paymaster's salary and increase the compensation of the master armorer.\textsuperscript{16} By making Foot's salary greater than the paymaster's, the master armorer became the second in command and also became indebted to Lee for his greater prosperity. Foot and his successor James Weatherhead worked well with Lee and the superintendent developed a close friendship with both his master armurers. Whenever the superintendent was absent from Springfield, the master armorer assumed command of the Armory.\textsuperscript{17}

During his first year of duty, Lee also subtly used his communications with the Ordnance Department as another means of increasing his power. In a stream of correspondence to Washington, he requested permission to buy minor items, to establish fire watches, and to carry out a myriad of day-to-day tasks. "When the duties of the Superintendent at this place are defined or [the] Establishment systematized," he wrote Bomford in one such letter, "I shall not have occasion to trouble you so frequently; til then I hope you will bear with me patiently."\textsuperscript{18} By such pestering of officials, Lee sought not only a definition, but also an increase of his power.
Like all good bureaucrats, Lee used the threat of leaving government service as another means to enhance his authority. On 12 September, 1816, he submitted an arms-making contract to Bomford in which he proposed to manufacture privately 10,000 muskets. He stated that he sought the contract "for many reasons" and that he would remain at the Armory until Bomford found a replacement. Three days later, he advised James Stubblefield, superintendent of the Harpers Ferry Armory, of his proposal and urged him to submit a similar one. Apparently Lee allowed the situation to ferment for one month, and then on 12 October he wrote directly to Chief of Ordnance Wadsworth. Again Lee presented his plan to obtain a government contract to manufacture guns privately. At the end of the letter, he informed Wadsworth that "[I] shall not object to remaining here, if you prefer it to giving the Contract. But in that case I shall beg leave to recommend some radical changes, without which this Establishment cannot prosper." 

Lee wanted changes in Armory regulations and perhaps felt that by threatening to leave Springfield, with Stubblefield threatening to leave Harpers Ferry, he might force the Ordnance Department to acquiesce to his demands. It is interesting to note that Lee informed Stubblefield of the proposed "partnership" only after he wrote to Bomford. Perhaps he felt that Stubblefield's contract proposal would convince Ordnance officials that both superintendents found govern-
ment service too arduous. On 10 November, Lee finally
told Wadsworth that he would remain at his post and would
"endeavour to perform faithfully." Yet, Lee failed to
inform Stubblefield of his decision in the official corres-
pondence, again casting doubt on the seriousness of the pro-
posed partnership.

Two days after he committed himself to remain at the
Armory, Lee forwarded to Wadsworth a list of additional
regulations which he wanted added to those already in effect.
He requested that he as superintendent:

1. Be given the authority to suspend the master
armorer or paymaster whenever he saw fit.
2. Be allowed to enter any building on Armory
property at his discretion.
3. Be permitted to evict any person living in
government owned housing.
4. Be given the authority to summon a board of
Armory officers to try any offenders for
violations of Armory rules and regulations. Of these proposed regulations, Lee felt strongest about
the second. "It is very unpleasant when visiting the works
with persons of the first respectability to be refused ad-
mittance into the Stores and Ordnance Yard," he informed
Wadsworth. "I certainly think the Superintendent ought to
enter any building on the public land here when he thinks
[it] proper." Since the stores and ordnance yard came
under the jurisdiction of the paymaster, Lee's proposal represented his last move to drain power from this now subordinate officer. With the new regulations approved and other assurances from the Ordnance Department, Lee had the authority to execute his will over the Armory.

III

Lee sought to impose discipline and structure on the Armory's work force primarily to rationalize the production process in order to manufacture more uniform muskets. While he sincerely respected the workers' skill, he rejected the excesses of their pre-industrial work habits for thwarting mechanization. As a by-product of structuring arms production, Lee hoped to produce a better worker. By instilling workers with industrial discipline--respect for authority, punctuality, thrift, sobriety, and hard work--Lee felt that they would be uplifted to the level of respected citizenry. While manufacturers at Lynn, Lowell, and other emerging industrial centers initially shared a similar paternalism and belief that their reform efforts would benefit their workers, the overriding impetus at Springfield was precision rather than profit. This, in the end, prevented the Armory discipline from becoming purely exploitative.25

In April, 1816--with the Ordnance Department's new regulations now in effect and less than a month since the liberty pole episode--Lee confronted Armory workers with a
set of rules to govern their conduct. To prevent accidental
damage to machines, buildings, and other government property,
Lee forbade roughhousing on Armory grounds. Interestingly,
he did not explicitly forbid the workers from playing ball
during the day, but simply enjoined them from playing within
thirty rods of the workshops. Workers maliciously or care-
lessly destroying public property faced a dock in pay in the
amount of the damage they incurred. In order to make enforce-
ment of these rules easier, Lee banned "Rum, Gin, Brandy,
Whiskey, or ardent Spirits of any kind" from the Armory.
Perhaps because he viewed noise as disruptive, and perhaps
because he wished the workers to be gentlemen, Lee commanded
that "no indecent or unnecessary noise will be suffered in or
about the shops." 26

The rules also dealt with obedience and the chain of
command. They clearly stated that any worker engaged in
"mutinous, riotous, or seditious, conduct against the reg-
lations of the Armory, or shall oppose the officers, when
in the execution of their duty, or shall willfully refuse to
observe the Lawful directions of the Officers of the Armory
will be prosecuted before the United States Court and dis-
missed from the Armory." Finally, to make clear the chain of
command to the workers, Lee designated that the master armorer
would be in charge during his absence. 27

Another area of the rules suggests the problem Lee
faced as he tried to impose discipline upon a group of
valuable skilled mechanics. He both threatened and, as will be further shown later, entreated the armorers. He revealed his dependency on experienced workers by promising them that they would be given thirty days notice prior to dismissal, unless they engaged in improper conduct. Even more significantly, manpower requirements compelled him to threaten to punish those workers involved in "combinations," not with the improper conduct penalty of immediate dismissal, but merely with a wage reduction. Lee also demanded the workers give thirty days notice before leaving Armory employment. However, wanting only dependable workers, Lee threatened to dismiss any man who was absent "for more than two days in succession or for more than four days in a month" without official approval.  

Lee's work rules seem to have had the temporizing effect he desired. Before their issuance, he had found it necessary to discharge six stockers, three lock filers, and three finishers in his struggle to gain control of the Armory.  

A month after issuing the new orders, however, Lee was able to report to Wadsworth that "the difficulties have entirely subsided and every workman is quiet and apparently satisfied; And the business of the Armory progresses in a regular and successful manner...I feel no apprehension of serious difficulties in the future." Minor problems did arise, however, and in October, 1816, Lee had to admonish one foreman for not keeping a closer watch and firmer hand
on the shop entrusted to his supervision.\textsuperscript{31} Lee continued to worry about labor unrest, and in August, 1819, he urged Wadsworth to visit the Armory to help contain "that spirit of faction which often raises her hideous head, but as yet has not opened her mouth except in distant grumblings and envious murmurings, but which will break out whenever circumstances favor the explosion."\textsuperscript{32}

To build a shelter against such a calamity as well as to retain valuable workers, Lee in 1816 entered into an agreement with all other major private and public gun manufacturers "not to employ each others [sic] workmen, without a recommendation from the person who last employed them."\textsuperscript{33} This agreement clearly portended a blacklist. However, it also provided a means of certifying the quality of workers seeking employment. While jealous of his experienced workforce, Lee encouraged this agreement by occasionally loaning his skilled mechanics to other armories.\textsuperscript{34}

In November, 1816, as one more protection against the rise of unions and other types of combinations, Lee required each worker to sign what was in effect an early "iron clad" contract. In affixing their names, the workers pledged to "labor diligently," and to "accept of such pay and compensation as may be stipulated," and to "conform to such rules and regulations as are or may be Established in said Armory by the Superintendent thereof." Additionally, workers now consented to provide a sixty day notification before they
could individually quit the Springfield works. 35

Throughout his superintendency, Lee continued to issue regulations which undermined the workers' pre-industrial work habits. In 1819, he decreed that no worker could "be absent a single day without the knowledge of the Superintendent." 36 In another regulation he forbade night work in an attempt to prevent fires set by workers' laterns. 37 Lee assumed some of the workers' decision making power in several of the rulings. For instance, in 1826 he issued a set of directions to the "Driver of the Public Horses" detailing the proper use and handling of the animals. 38

IV

Whereas one aspect of Lee's labor policy centered on hovering the stick of strict regulations over the armorers' heads, another aspect of his policy tended toward dangling the carrots of higher wages and fringe benefits in front of their eyes. Along with being an early practitioner of industrial discipline, Lee also pioneered in what eventually became the policies of welfare capitalism. His actions in this realm stemmed from his paternalism, his drive to make the workers respectable citizens, and conditions imposed by technological developments.

Lee recognized that Armory wages needed to be sufficiently high to entice laborers to the works, keep them on the job, and out of combinations. He thus saw to it that Springfield wages were equal to, or if possible slightly higher than,
those paid in the private armories. Along with this policy, Lee urged government officials to pay the men promptly in currencies acceptable to Springfield merchants.

Only once did Lee advocate a wage reduction for his workers, and that was during his first year of command when he sought to demonstrate his authority. When Washington instructed him to initiate two other wage cuts, he insisted that the armorers' wages had to remain at least on par with those of mechanics in private industry. In 1822, he informed Bomford that "the rage for manufacturing Cotton prevails to such a degree and there is so great a call for first rate workmen, that I am apprehensive I shall lose some of our most valuable workmen except I am authorized to raise their wages..." Also realizing the cost and time required to train a mechanic, Lee argued to Bomford that higher wages would be a "means of saving." Again in 1824, Lee found that the Armory wages did not match those of the textile mills, and he cautioned Bomford that if the government did not increase wages, the Armory could not "retain such Mechanics as will be necessary for making and repairing tools and machinery."

Lee also sought to cajole his workers with fringe benefits. These non-economic programs attempted both to tempt the workers to remain at the Armory, and further to instill in them discipline and other traits of the new work culture. Some of Lee's fringe benefit activities occurred on a personal level. For instance, he arranged a transfer to Spring-
field for one Harpers Ferry worker whose son was in a nearby asylum for the deaf and dumb, and he attempted to procure a pension for another armorer who for years had "faithfully and honestly" performed his duties. Lee also devised programs to aid his employees collectively. Concerned that many armorers paid a "high rent for poor accommodations," he requested the government to provide housing at moderate rents. In 1817, he unsuccessfully proposed to the Ordnance Department an accident and health insurance program. Lee informed Colonel Wadsworth that each worker would "pay a moderate annual tax" and that the Armory also would contribute to the fund. Lee viewed the program as being for sick and injured workmen, and made no provisions for those men laid off or otherwise unemployed.

Lee extended the scope of his activities beyond caring for his workers' physical well-being to providing for their spiritual and intellectual needs. That armorers could not join Springfield churches because they lived on government property disturbed Lee. In 1816, therefore, he recruited an Episcopal priest who, working on a part-time basis, organized religious services at the Armory. Not fully satisfied with this make-shift arrangement, in 1817 Lee requested the Ordnance Department to establish a permanent chaplain. When his superiors refused, he petitioned Congress for authorization and funds. Lee revealed his desire to uplift the armorers' character when he told the lawmakers that "religious
instruction has a tendency to correct and improve the morals of men," and he demonstrated his paternalism when he argued that the government was obliged to prepare the workers "for a future world." 50

Lee also sought to provide education for the workers' children. Since the youths lived on tax exempt government property, they could not attend Springfield schools. Therefore, when Lee petitioned Congress in 1819 for a chaplain, he also requested funds for a schoolteacher. He informed the solons that common education prepared children for "future usefulness." The promotion of education, he continued, "would not only resound to the honors of the Government but add greatly to the respectability of this Establishment and render the workmen and their children worthy and useful members of the Republic..." 51 Although Congress denied the request and Bomford warned Lee not to expend government funds on the church or school, Lee circumvented these strictures by providing Armory rooms for religious and educational purposes and soliciting funds from the workers to pay a chaplain and schoolteacher. 52

The high wages paid at the Springfield Armory, coupled with Lee's attempts to provide his workers with insurance, education for their children, religious comfort, and decent housing apparently offset the discontent generated by the rather strict regulations he imposed. Throughout his eighteen years at Springfield, far more workers applied for positions
in the Armory than could be employed.\textsuperscript{53} "The desirability of Armory positions," Felicia J. Deyrup discovered, "led to a peculiar development; the opportunity to work there became almost a tangible right, known as a 'chance' or 'privilege'.\textsuperscript{54} Workers leaving the Armory often sold their privileges to work there for as much as $200, and in one case, the heirs of a deceased armorer attempted to sell the deceased's privilege.\textsuperscript{55} Although in 1823 Lee issued a regulation banning this practice, the pre-industrial right of workers to sell their privileges continued even after Lee's death.\textsuperscript{56}
Notes, Chapter Two


3. Lee to Bomford, 18 September, 1826, ibid. Lee stated that nearly all armorers lived on Armory property, and this would not have been the case if they were born in Springfield.


10. Ibid.


12. Lee to Captain James Morton, 9 October, 1815, Letters Sent, RG 156, SAR.

13. Lee to Senior Officer Ordnance, 8 May, 1815, ibid.
14. Whittlesey, "The Springfield Armory," ch. IV. Also, in every mention I have seen, the superintendent was called Colonel Lee.

15. Lee to Bomford, 20 August, 1815, Letters Sent, RG 156, SAR.

16. Lee to the Secretary of War, 12 December, 1817, ibid.

17. Adonijah Foot to Lee, 4 May, 1824, ibid.; James Weatherhead to James Baker, 28 May, 1827, ibid.

18. Lee to Bomford, 29 June, 1815, ibid.
19. Lee to Bomford, 12 September, 1816, ibid.
20. Lee to James Stubblefield, 15 September, 1816, ibid.
22. Lee to Wadsworth, 10 November, 1816, ibid.
23. Lee to Wadsworth, 12 November, 1816. ibid.
24. Ibid.
25. See note 1.

27. Ibid.
28. Ibid.

29. Lee to Eli Whitney, 8 March, 1816, Letters Sent, RG 156, SAR
30. Lee to Wadsworth, 8 May, 1816, ibid.
31. Lee to Levi Dart, 10 October, 1816, ibid.
32. Lee to Wadsworth, 24 August, 1819, ibid.
33. Lee to Wadsworth, 13 April, 1816, ibid.
35. Lee to Bomford, 2 November, 1816, Letters Sent RG 156, SAR.

36. Lee to Lewis Foster, 12 October, 1819, *ibid*.

37. Circular from the Superintendent's Office, 5 December, 1825, *ibid*.

38. Lee to the Driver of the Public Horses, 6 January, 1826, *ibid*.


40. Lee to the Secretary of the Treasury, 18 June, 1816, Letters Sent, RG 156, SAR.

41. Lee to Bomford, 11 August, 1816, *ibid*.

42. Lee to Bomford, 6 August, 1817, *ibid*.; Lee to Foot, 24 March, 1818, *ibid*.

43. Lee to Bomford, 18 February, 1822, *ibid*.

44. Lee to Bomford, 26 October, 1824, *ibid*.

45. Lee to Stubblefield, 22 October, 1828, *ibid*.; Lee to the War Department, 10 July, 1821, *ibid*.

46. Lee to Bomford, 18 September, 1826, *ibid*.

47. Lee to Senior Officer Ordnance, 1 December, 1817, *ibid*.


49. Lee to Rev. Titus Strong, 28 February, 1817, Letters Sent, RG 156, SAR.

50. Lee to Wadsworth, 4 January, 1819, *ibid*.

51. *Ibid*.

52. Lee to Bomford, 18 January, 1822, *ibid*.


55. *Ibid*.
III. The Machines

In instilling a new work ethic in the Armory, Lee sought to facilitate the workers' acceptance of technological innovations. While he was superintendent at Springfield, a number of American machinists and mechanics developed new metal and wood working machines. These advances furthered the impetus toward the interchangeability of parts. Lee and the Springfield Armory contributed to this drive by pressuring private contractors to manufacture more uniform firearms. At Springfield, Lee laid the foundation for the true interchangeability of parts in the production of firearms, a move which blossomed only after his death in the 1840's. In the industrial sector generally, he served as a propagator of technical information to other machine tool and firearms producers.¹

The concept of interchangeable parts did not originate in the United States. The Frenchman Honore Blanc in the 1780's first attempted to manufacture a product with interchangeable parts. Blanc's efforts, as well as those of other early proponents of interchangeability, were directed toward the production of military firearms.² Mass armies, lacking skilled gunsmiths in the field, needed a weapon which the common soldier could repair. Such a weapon could be better regulated for quality, even when produced in large numbers. With this need still pressing, Congress passed legislation in 1815 requiring greater standardization in ordnance supplies.³
Congress' new standards unsettled gun manufacturers, including Lee. They adhered to the traditional concept of uniformity which required little more than a rough similarity in the shape of the arms and in their ability to accept a standard bullet. Yet gradually Ordnance Department officials, especially Colonels Wadsworth and Bomford, dictated a tighter standard of uniformity on both private and public armories. The new standards required that "the component parts of the musket must be made to fit every musket." With slight hesitation, Lee accepted these standards, but in communicating them to private contractors, he faced strong resistance. "I can only inform you," he wrote one manufacturer in 1819, "that my Instructions are to make the Muskets with that exact uniformity that the several component parts will fit one Musket as well as any other. Relative to the practibility of this course, experience must decide."

At the Springfield Armory, the implementation of the new standard of uniformity advanced rapidly. By 1821, Lee informed Chief of Ordnance Bomford that the Armory's muskets were now "substantially uniform." Probably Lee used the word "substantially" to imply that guns then made at Springfield were interchangeable with others in the same lot after some slight hand fitting operations. This step toward true interchangeability applied only to discrete lots of guns produced at the Armory, and did not extend to other firearms
publicly and privately manufactured for the government. Lee realized that the goal of uniformity for all guns produced for the military required further work.\textsuperscript{9}

In their drive for industry-wide uniformity, Lee and other arms manufacturers faced a major difficulty in determining if component parts were indeed alike and could interchange. Lacking modern, sophisticated measuring devices, early arms producers experienced extensive problems in measuring close tolerances. Originally, the national armories produced pattern muskets which would be sent to all armories producing the gun. The pattern musket would serve as a model or standard from which all manufacturers would base their products, supposedly duplicating it exactly. In practice, this system had great failings. It provided no method of comparing the parts produced to the standard other than by visual inspection. A part which might be uniform with regard to the pattern musket in one armory, moreover, might not interchange with the pattern musket of another armory. The sheer volume of guns produced—up to 16,500 yearly at Springfield alone—prohibited the physical testing of the interchangeability of each part with a pattern musket.\textsuperscript{10}

When he became Chief of Ordnance in 1821, Bomford took the initiative in confronting these problems by instructing the government armories to include with each pattern musket a "set of Standard instruments of verification...[whose]
Figure 1

Go-No Go Type Gauge

An acceptable part, P, must be small enough to fit into the opening of the gauge, A, but must be large enough not to pass into the smaller opening, B. Any part which passed this test was accepted.
purpose is to secure a more exact uniformity in the manufacture of Arms..." Lee accepted Bomford's idea and convinced him that inspectors should employ eight gauges to determine an arm's acceptability. Most of these gauges were of the "go-no-go" type (see Figure 1). Lee further convinced Bomford that all gauges be made at the national armories, and that they be made of case hardened steel. From this blend of Bomford's conceptualization and Lee's application emerged a major technological advance toward true interchangeability.

Lee's role in the development of machine tools also propelled the firearms industry toward interchangeability. Here, Lee revealed his entrepreneurial instincts by seizing upon the notable advances made by public and private New England gun manufacturers and encouraged their development and application throughout the industry. He possessed sufficient technical expertise to recognize useable innovations in existing machinery as well as original inventions when either came to his attention. He encouraged the development of such machines, and diffused information concerning them throughout the American firearms industry. Lee's activities in this field made the Springfield Armory the focus for the development of machine tools and new machine techniques.

When Lee arrived at Springfield, armorers welded musket barrels by hand. Barrel welders executed this tedious task by heating red hot a flat piece of iron called a scalp, and
then hammering it on a round iron mandrel into the basic shape of a barrel. He next closed the seam of the barrel by heating it white hot and hammering it until the seam shut. The welder, working in the hot atmosphere of a forge room and hammering the barrel by hand, tired quickly. If his blows lightened, or if he misjudged the temperature of the iron, he could produce a weak barrel, likely to burst at the seam when proofed with a charge of gunpowder.\textsuperscript{15}

Lee instituted the welding of barrels by water powered trip hammers, which had, he informed the Senior Office of Ordnance in 1816, "a decided advantage over the usual way of welding. It is easier for the workman--the Barrel is welded better--the work is done with more facility and the expense of each barrel is twenty-five cents less."\textsuperscript{16} When the news spread that Lee employed trip hammer welding, Asa Waters, a New England arms maker, claimed that he had introduced the method around 1800 and demanded some compensation from the government. While Lee concurred that Waters had used the system, he contended that his fellow arms manufacturer was not entitled to a royalty since some Philadelphia armorer had employed it even earlier. Lee's knowledge enabled the Ordnance Department to pacify Waters with a sum far less than he had requested.\textsuperscript{17}

While Lee did not invent trip hammer welding, he did employ the resources of the Armory to refine the method. In 1816, he informed the Ordnance Department of "a plan of
rising [sic] fours hammers to one water wheel (perpendicular to the shaft) and so constructed that any one of the hammers may be put in motion or stopped at pleasure, without interfering with the others."¹⁸ He further noted that this arrangement allowed the hammers to operate at four hundred blows per minute, which was far faster than any human welder could strike.¹⁹ When asked by the Ordnance Department to compare the cost of welding barrels by hand to the cost by his new trip hammer method, Lee noted:²⁰

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labor by hand welding</td>
<td>$.63₅</td>
</tr>
<tr>
<td>Expense of iron</td>
<td>.80</td>
</tr>
<tr>
<td>Expense of coal</td>
<td>.50</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>$1.93₅</td>
</tr>
</tbody>
</table>

Labor by trip hammer $ .52
Expense of iron .72
Expense of coal .42
Total $1.66

As Lee's figures suggest, welding by trip hammer required fewer applications of heat to the iron, and thus reduced the amount of iron and coal required.²¹

Having improved the quality and reduced the cost of the barrel blank, Lee in 1817 turned his attention to the machining of the exterior of the barrels. An armorer at Springfield, following a long established practice, ground the exterior of the barrels to their finished dimensions. The worker, continually revolving the barrel in his hands, held it against a water driven grindstone until he removed the extraneous metal. The armorer had to inspect the process by eye, stopping occasionally to measure the dimensions of the barrel, trusting to his instinct that he already had not removed too
much metal. If he accidentally held the barrel slightly off-center with respect to the bore, it would have an uneven wall thickness, increasing the chances for weak spots. Such a barrel might burst when proofed.

This entire process not only produced barrels of varying qualities, but also imposed great dangers on the workmen. Grindstones, located in the basements of the shops, were cooled and lubricated by a stream of water, so that the workers toiled in a cold, damp environment. The air, filled with metal and stone dust thrown off from the wheels, irritated the armorers' eyes, skin, and lungs. Added to these hazards, the rapidly spinning stones, loaded with water, frequently burst, throwing missiles of steel and stone throughout the grinding shop. For tolerating these hazards as well as for executing a delicate operation, grinders received high wages.  

Numerous inventors, recognizing the problems of barrel grinding, attempted to devise a barrel turning machine to replace the unsatisfactory grinding process. Their efforts resulted in at least five different machines being developed between 1816 and 1819.  

In December, 1817, the Ordnance Department instructed Lee to obtain and test one of the turning machines engineered by Daniel Dana and Anthony Olney of Canton, Massachusetts. Lee delegated the task to his master armorer, Adonijah Foot. After three months of experiments during which he made several improvements to the basic
Dana-Olney design, Foot reported his conclusions to Lee.

"On Thursday...," he informed his superintendent:

[we] turned four Barrels, but they were not very Smooth owing to the Sideways not agreeing with the other. We altered them several times to make them agree, and get the shape of the Barrels, but found the Wooden sideways not sufficiently hard to keep the rests steady. We then placed some sheet Iron on them which made them more steady. We also found it necessary to apply more weight to keep the Box in its place. On Friday We turned several more Barrels, but not so smooth as I wish to see them, the chips appeared to catch between the Rests and the Barrel which causes some Rings. We then applied some Leather under the rests but it was soon torn away. but I think the difficulty will all be overcome and the Machine made to answer an excellent purpose. It throws off the Iron with ease, and requires 20 minutes only to turn a Barrel, a good chisel goes through without sharpening and with little grind, produces a straight even Barrel but it will require a Week or two to become acquainted with its bearings and make it go well.

We are now at work fitting the Iron side-ways, which will require a few days to get them right and make some other alterations in the Rest and endless screw. 25

By May, after Foot completed the improvements to the machine, Lee recommended to Bomford that the government pay five hundred dollars for the right to use the new design. In his business-like tone, he informed his superior that the modified Dana-Olney mechanism was "equal if not better than the one at Harpers Ferry," and that it could turn one barrel in twenty-five minutes and often three in one hour. 26 After receiving authorization from the Ordnance Department, Lee had the Springfield Manufacturing Company build a number of the
machines for the Armory. Lee also recommended both barrel turning and the Dana-Olney machine to other manufacturers. 

"[We] turn our barrels in a lathe," he informed the operators of an iron firm in 1821, "which leaves the thickness of the barrel equal on its sides, therefore it is not so likely to burst as when ground..." Once again, Lee had moved the Springfield Armory toward uniformity, increased production speed, and reduced the costs through the use of machinery.

While trip hammer welding and new methods of barrel turning constituted important advances in the evolution of precision machinery, Thomas Blanchard of Sutton, Massachusetts devised and developed Springfield's most important mechanical contrivance—the Blanchard stocking lathe. Prior to the machine, a highly skilled woodworker took a wood blank, sawn to rough shape, and used simple hand tools to produce a finished gunstock. He had to inlet a deep groove to accept the barrel, cut out wood for the bands which held the barrel to the stock, and then cut recesses for the lock, heel plate, and other fittings. After time-consuming hand work, the skilled craftsman emerged with an individualized gunstock incompatible with the concept of interchangeability. In 1818, Blanchard sought to improve the process by developing an irregular lathe which "had a swinging frame in which the rough stock was hung and turned very slowly against a rapidly revolving disc-shaped cutting tool. A 'former' or pattern
of the finished stock also hung in a swinging frame and revolving slowly, bore against a pattern wheel which pushed the frame carrying the rough stock against the cutting tool in accordance with the shape of the pattern stock."³¹

In 1822, Lee and Ordance Department officials granted Blanchard, who had spent some time at the Harpers Ferry Armory, space inside the Springfield shops, and allowed him to hire his own wokers. He produced finished stocks for the Armory while continuing to improve on his basic design.³² By 1827, the Armory utilized fourteen separate Blanchard designed stocking machines, each executing a separate operation, but collectively producing a uniform stock which required only minor sanding and finishing.³³

While Blanchard's set-up in the Armory proved technologically fruitful, Lee disliked Blanchard's role as an inside contractor. In 1825, he complained to Bomford that Blanchard "is ambitious to make all he can, hires men and boys at very low wages that know little or nothing of the business, and is often changing hands, and many other circumstances that makes [sic] it rather unpleasant."³⁴ Lee urged the Ordnance Department to allow Armory personnel to run the machinery and pay Blanchard a percentage of the cost saved through their use.³⁵ Ordnance officials, however, ignored Lee's recommendation and Blanchard remained until 1829.³⁶
While Lee's primary activities in the development of new technology consisted of encouraging creative mechanics and diffusing technical information throughout the firearms industry, he also personally participated in the invention of new mechanical devices and techniques. In 1817, for example, he devised an improved spring vise. Armorers used this tool to compress the musket lock's main spring in order to remove or install the spring with greater ease and safety. Lee sent the vise to the Ordnance Department for a trial, but officials there apparently did not find it useful. 37

Undaunted, in 1829 Lee participated in the development of a promising new method of welding barrels by rolling. 38 Although Lee did not conceive the method, he actively supported the mechanics who did by providing them with his technical expertise. 39 Before long, he considered the new welding technique his special project and defended his role in its development. 40 Lee's poor health in the three years prior to his death in 1833 prevented him from carrying the project to fruition; without his technical advice and his commitment of Armory resources, the welding project also died. More than a quarter of a century later, armorers welded barrels by trip hammer, using techniques first introduced by Lee in 1815. 41

When Lee became superintendent of the Armory in 1815, the Ordnance Department charged him with implementing the
production of interchangeable parts. From 1815 until about 1821, the first years of his administration, Lee introduced new methods of measurement, new machine tools, and new manufacturing techniques. He discovered and supported inventive mechanics like Blanchard; he participated in and directed experiments geared towards producing uniform parts; and he served as a broker for technical information throughout the arms industry. Following this initial spurt of machine building, gauge construction, and technique innovation, the Armory produced few novel tools or practices. Rather, Lee together with assistants like Foot improved upon the designs introduced earlier. For example, though Blanchard did not change his basic 1818 design, he constructed more sophisticated and specialized stocking machines. By 1829, these refinements allowed armorers to produce a uniform stock. During Lee's final years, the Armory mechanics improved upon other basic machine designs and manufacturing techniques. Building upon this foundation, Lee's successors continued the process of technological refinement until by the 1840's they achieved true interchangeability.
Notes, Chapter Three

2. Ibid., pp. 42-42; Deyrup, Arms Makers, p. 87; Smith, "The Harpers Ferry Armory," pp. 150-151.
4. Ibid., p. 235.
6. Lee to Foot, 24 March, 1818, Letters Sent, RG 156, SAR.
7. Lee to Asa Waters, 8 June, 1819, ibid.
8. Lee to Bomford, 11 September, 1821, ibid.
12. Lee to Bomford, 18 December, 1821, Letters Sent, RG 156, SAR.
15. Deyrup, Arms Makers, p. 95.
16. Lee to Senior Officer Ordnance, 20 April, 1816, Letters Sent, RG 156, SAR.
17. Ibid.; Lee to Bomford, 22 June, 1818, ibid.
18. Lee to Senior Officer Ordnance, 20 April, 1816, ibid.
20. Lee to Wadsworth, 6 February, 1817, ibid.
21. Ibid.


24. Lee to John Morton, 6 December, 1817, Letters Sent, RG 156, SAR.

25. Foot to Lee, 1 March, 1818, *ibid.*


27. Lee to Brook Evans, 3 April, 1821, *ibid.*


34. Lee to Bomford, 16 July, 1825, Letters Sent, RG 156, SAR.


37. Lee to Wadsworth, 1 July, 1817, Letters Sent, RG 156, SAR.

38. Lee to Thomas B. Dunn, 16 September, 1829, *ibid.*


40. Lee to George Rust, 11 November, 1831, Letters Sent, RG 156, SAR.

Conclusion

In 1815 when Roswell Lee took over the Springfield Armory, the Ordnance Department charged him with producing uniform firearms in large numbers. Although the drive for a new system of manufacturing firearms actually predated his superintendency and reached fruition after his death, Lee contributed significantly to its success.

Lee, while appreciative of the gunsmith's skills, ironically did much to undermine the craft. By imposing industrial regulations and systematizing production, he accelerated the demise of the armorers' pre-industrial work habits. Occupational specialization and coordinated work hours, both of which intensified under Lee's direction, impeded the workers' volition and made them extensions of the machines they operated. By providing religious instruction, decent housing, and rudimentary education, the workers also became dependent extensions of the respectable community they labored for. Lee, aware that armorers were now industrial workers and not independent craftsmen, advised a friend not to send his son to work at the Armory. "Although it might afford him a living," Lee forecast, "yet it would not be a trade that he could set up and carry on for himself."¹

With the Armory one of the largest industrial enterprises in Jacksonian America, Lee also contributed to the great technological changes occurring in the early nine-
teenth century. His ability to recognize viable innovations plus his support of inventive mechanics made the Armory a good environment for machine development. Though he did not devise the new machinery, Lee took an active role in refining them for production use. He also gathered and diffused technical information throughout American industry, insuring the rapid and widespread use of new techniques in the firearms industry and beyond. The blossoming of factory mass production and interchangeable parts, later called the American System, occurred about a decade after Lee's death. Even though Lee did not live to see this system in full practice, he as much as anyone in American made it possible.
Notes, Conclusion

1. Lee to William Aiddell, 12 February, 1825, Letters Sent, RG 156, SAR.
Appendix I

Pre-1815 Lee-Whitney Relationship

Jeanette Mirsky and Allan Nevins in their The World of Eli Whitney (New York: The Macmillan Company, 1952) claim that Whitney employed Lee to oversee the maintenance of his rented cotton gins (p. 268). Since Whitney sought to make his fortune by such rentals, he must have respected Lee's technical and managerial skills. While Mirsky and Nevins provide no specific reference for the claim (the work is not footnoted), they cite the Whitney papers at Yale University as their major source for the biography.

Constance M. Green in her Eli Whitney and the Birth of American Technology (Boston: Little, Brown, and Company, 1956) paraphrases Mirsky and Nevins, leading one to suspect that her source was the earlier Mirsky-Nevins work. Green likewise provides no specific source for the claim, but does state that the papers at Yale were her major source. In a recent communication, Dr. Green states, "I cannot remember seeing anything about Lee at all before 1815," [Dr. C. M. Green to C. S. Duckworth, 20 February, 1975]. She suggests the Whitney papers as a possible source for early information on Lee. However, Dr. Robert S. Woodbury, who examined the papers in preparing his article "The Legend of Eli Whitney and Interchangeable Parts," Technology and Culture I(Summer, 1960), pp. 235-253, states, "I have never seen any evidence that Lee was ever an employee of
Whitney's," [Dr. R. S. Woodbury to C. S. Duckworth, 1 February, 1975].

All of this leads me to doubt that Whitney employed Lee. I do know that Lee never mentioned such a relationship in his official letters to Whitney written from 1815 until the latter's death in 1825; nor did he mention it in his other correspondence. Lee evidently liked Whitney and provided him with information, but their friendship, as seen in the Armory records, was not exceptional. In fact, Lee's friendship with Robert Johnson, another private contractor, appeared warmer.
Appendix II

Regulations Governing Workers' Conduct

Adopted 8 March, 1816

The amount of the value of all public property or property located on lands belonging to the United States (personal or moveable property owned by the workmen or other individuals excepted) that is wantonly maliciously or carelessly wasted injured or destroyed will be deducted from the pay of the person so offending. No scuffling playing of Ball or other proceedings that have a tendency to impede the regular advancement and progress of the work will be suffered in the Public work shops nor within thirty rods of the same.

No fighting will be allowed or tolerated among the workmen.

No indecent or unnecessary noise will be suffered in or about the shops.

The workmen employed in the Armory are hereby cautioned against riotous and tumultuous conduct and every person who shall begin, excite, or join, in any mutinous, riotous or seditious, conduct against the regulations of the Armory, or shall oppose the officers, when in the execution of their duty, or shall willfully refuse to observe the Lawful directions of the Officers of the Armory will be prosecuted before
the United States Court and dismissed from the Armory.

All combinations against the Officers or regulations of the Armory will be noticed by an immediate reduction of wages of all concerned, or in such other manner as in the opinion of the Superintendent, circumstances may require--Except for improper conduct the workmen will not be dismissed until thirty days after notice is given, and the same notice as to time is required from the workmen to be given to the Superintendent or Master Armorer previous to their leaving work in the Armory, that is, one month's labor will be expected after such notice is given--A workman will be considered as having forfeited his place in the Armory by a violation of any of the foregoing regulations or by absenting himself from the Public works for more than two days in succession or more than four days in a month without the knowledge and approbation of the Superintendent or Master Armorer or at the Water Shops of the Foreman of the Shop where the person wishing to be absent is employed--

From and after the 15th day of April 1816 no Rum, Gin, Brandy, Whiskey, or ardent Spirits of any kind will be suffered to be carried or drunk in or about the public work shops at this place, and the Master Armorer, Assistants, Foremen and Inspectors are directed to see that this regulation is strictly adhered to.
In the absence of the Superintendent the duties of that office will devolve upon the Master Armorer.
Notes, Appendix II

1. Quoted in Whittlesey, "The Springfield Armory," Appendix VI.
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