"Liberalizers" versus "Scientific Men" in the Antebellum Patent Office

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> The great body of the enlightened inventors of this country . . . desire earnestly that the men who are to pass upon their valuable rights shall be not only men of integrity, but of the highest order of talents and scientific qualifications. [EDMUND BURKE, Commissioner of Patents, February 12, 1846]
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> Scientific men, without practical experience in mechanics, are generally governed in their opinions by what they have read in books. . . . [EDMUND MAHER, in *Scientific American,* April 28, 1849]
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> Some of the oldest and most experienced among the examining officers . . . are, to their discredit, the most illiberal in their feelings towards inventors and in their interpretation of the Patent Laws. . . . conceited, crabbed, mulish, illiberal-minded individuals—men who never see anything new—who are always prone to regard one device as but the mechanical equivalent for another. [*Scientific American,* January 3, 1857]

Passing judgment on patent applications is not an objective process. Sixteen years ago, in the second number of this journal, Nathan Reingold reminded us that "the issuance of a patent simply means that the language of the patent specifications met whatever standards of patentability were in effect at a given time."[1] Yet, the notion persists that gross patent statistics constitute a reliable index to "invention and economic growth." This seems all the more remarkable since even the late Jacob Schmookler—sort of the *haut curé* among economic theorists who place implicit faith in this assumption—admitted he could not establish that "the ratio of patents to inventions . . . is constant over time."[2]

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[1] Nathan Reingold, "U.S. Patent Office Records as Sources for the History of Invention and Technological Property," *Technology and Culture* 1 (1960): 156–57.

[2] Jacob Schmookler, "Economic Sources of Inventive Activity," *Journal of Economic History* 22 (1962): 2. *Invention and Economic Growth* is of course the title of Schmookler's stimulating and influential book published by the Harvard University Press in 1966.

That is a point well taken, because the converse can be established readily. As a matter of fact, quantitative variations may not stem from changes in the actual pace of inventive activity nearly so directly as from calculated modifications in administrative practice. A notable instance of this occurred during the modern patent system's formative years preceding the Civil War. A graph showing the ratio of patents to total applications (fig. 1) reveals a predominantly diminish-

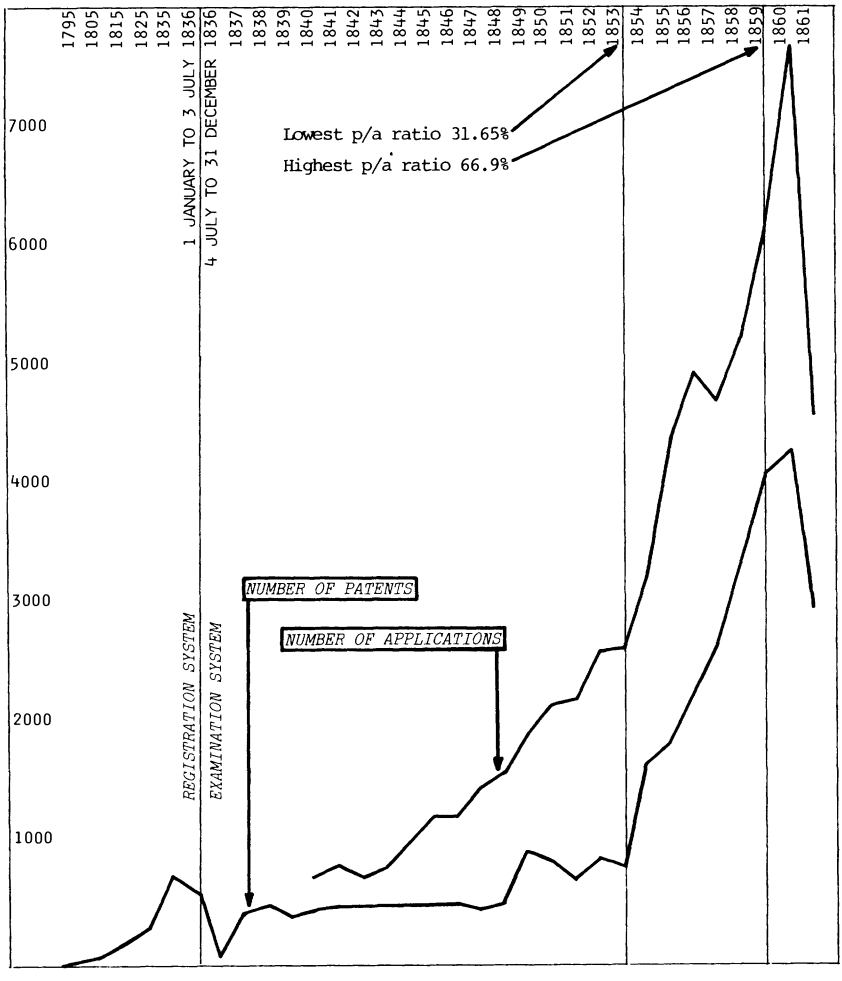

FIG. 1.—New patents issued annually relative to total applications received (p/a ratio). If design patents and reissues are added, the p/a ratio increases 4.35 percent at its nadir and 5.4 percent at its peak. Complete tallies of applications prior to 1840 are unavailable.

ing proportion from 1842 to 1853, a growing one thereafter.[3] Each trend clearly indicates a prevalent philosophical orientation within the Patent Office itself. The first reflects the autonomous behavior of an examining corps comprised largely of professional scientists to whom basic physical analogies were obvious and who were relatively impervious to claims for novelty; the second reflects a victorious effort by patent solicitors to induce key politicians and administrators to weed out those examiners who apparently assessed novelty on the basis of what they "read in books." There follows, then, a look at both the background and the outcome of this campaign for "liberalizing" the criteria for patentability.

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On April 28, 1836, a committee of three New England senators submitted a report on "the state and condition of the Patent Office, and the laws relating to the issuing of patents for new and useful inventions and discoveries."[4] In conjunction with its report, the committee also introduced a bill to revamp both the office's legal underpinning and its functional superstructure. Since 1793 the American patent system had consisted of a registry. Ostensibly, the sole requisite for obtaining letters patent was compliance with procedural formalities; proof of originality, novelty, or utility was unnecessary. Patents fell within the administrative domain of the secretary of state, and in 1802 James Madison instituted a new Office of Patents, awarding the superintendency to his close friend, William Thornton. Thornton remained for twenty-six years and came to feel a "sense of personal ownership in the Patent Office."[5] Occasionally he balked at issuing patents "in cases notoriously without merit," and there is evidence that, upon appeal, the secretary of state sometimes backed this "judicious exercise of a discretionary power."[6] Presumably, however, this was very unusual, for it amounted to subverting the patent act of 1793.

[3]As much as I dislike the idea of conjuring up jargon, even in shorthand, for the sake of brevity I shall henceforth call this the p/a ratio.

[4]U.S. Congress, Senate, *Report: The Select Committee to take into Consideration the State and Condition of the Patent Office . . .*, 24th Cong., 1st sess., April 28, 1836, S. Doc. 338. Reprinted with an introduction as "1836 Senate Committee Report," *Journal of the Patent Office Society* 18 (1936): 853–63 (hereinafter *JPOS*).

[5]William I. Wyman, "Dr. William Thornton and the Patent Office to 1836," *JPOS* 18 (1936): 84.

[6]William I. Wyman, "The Patent Act of 1836," *JPOS* 1 (1919): 210; U.S. Congress, House, William Elliot to John D. Craig, January 16, 1830, *A Communication from the Secretary of State in Relation to the Patent Office*, 21st Cong., 1st sess., January 27, 1830, H. Doc. 38, p. 4.

Thorton died in 1828 and was succeeded by Thomas P. Jones, editor of the *Journal of the Franklin Institute.* Jones was soon replaced by one John D. Craig. Craig tried to uphold the spirit of the law of 1793. However, he was a dreadful administrator who ended up getting fired in 1835.[7] By then it seemed clear that the whole system was in need of a major overhaul. One of several men who felt this keenly was Charles M. Keller, who had been keeper of the exhibit of patent models since 1829, having inherited that job from his father. Because so many applications seemed bereft of any originality, Keller had begun unofficially "advising applicants as to the novelty or want of novelty in their inventions."[8] Eventually he sat down and worked out a formal plan for procedural reform. This he presented to Craig's successor, Henry L. Ellsworth of Connecticut, and to Senator John Ruggles of Maine. In December 1835 Ruggles proposed an official inquiry, which he and his two colleagues completed the following spring. The Ruggles Committee reported that "the Department of State has been going on, for more than forty years, issuing patents on every application, without any examination into the merits or novelty of the invention. And the evils which necessarily result from the law as it now exists, must continue to increase and multiply daily until Congress shall put a stop to them."[9]

The bill drafted "to prevent these evils in the future" was signed into law by Andrew Jackson on July 4, 1836.[10] It provided for establishing the Patent Office as a separate bureau within the State Department. The president was to nominate a commissioner at a salary of $3,000. With the approval of the secretary of state, the commissioner would appoint several functionaries including an "examining clerk" at a salary of $1,500. It was the duty of this examiner to scrutinize each application for novelty, originality, and utility. In case he found it wanting, he was to withhold approval and explain why to the applicant, who could then modify his claims. This jousting might continue indefinitely, until the applicant either abandoned his application or satisfied the examiner.

For the examiner's reference Congress appropriated $1,500 to ini-

[7]William I. Wyman, "The Patent Office from 1828 to 1836," *JPOS* 1 (1919): 324; *An Account of the Destruction by Fire of the North and West Halls of the Model Room in the United States Patent Office Building . . . Together with a History of the Patent Office from 1790 to 1877* (Washington, D.C., 1877), p. 8.

[8]Thaddeus Hyatt, "Charles M. Keller and the American Patent Office," *Scientific American* 14 (May 21, 1859): 310 (hereinafter *SA*); see also Levin H. Campbell, *The Patent System of the United States* (Washington, D.C., 1891), pp. 38–39.

[9]"1836 Senate Committee Report" (n. 4 above), p. 857.

[10]"An Act to promote the progress of useful arts, and to repeal all acts and parts of acts heretofore made for that purpose," 5 *U.S. Statutes at Large* 117.

tiate a scientific library.[11] In some quarters this reinforced the supposition that Patent Office decisions would henceforth be grounded in the straightforward logic revealed by a methodical and objective—"scientific"—examination of all relevant facts.[12] However, it eventually began to appear that an examiner's assessments were highly subjective. One might differ a great deal from another in how assiduously he searched for precedents, and, especially, in his propensity to take into account parallel physical principles between one sort of device and another. Nominally the commissioner had the final say on such matters, since the examiner's function was intended as merely advisory. But Ellsworth showed little inclination, and his immediate successors even less, to countermand any examiner. Inevitably this generated concern about vesting the latter with what essentially was a judicial authority.

Not that the qualifications for nomination as an examiner were not rigorous, ideally at least. In the words of Senator Ruggles:

> An efficient and just discharge of the duties, it is obvious, requires extensive scientific attainments, and a general knowledge of the arts, manufactures, and the mechanism used in every branch of business in which improvements are sought to be patented, and of the principles embraced in the ten thousand inventions [already] patented in the United States, and of the thirty thousand patented in Europe. He must moreover possess a familiar knowledge of the statute and common law on the subject, and the judicial decisions both in England and our own country, in patent cases.[13]

[11]Subsequent appropriations enabled periodic purchases, and within a decade this constituted a respectable if not a distinguished library (see *Catalogue of the Library of the Patent Office in 1847* [Washington, D.C., 1847]).

[12]Explicit assertions regarding their "scientific" nature may be found even in relatively recent literature: e.g., "The act [of 1836], in brief, provided for the first time in any country, the means of protecting the rights of inventors in an intelligent, *scientific* [italics added], and adequate way, by giving the patent a *prima facie* standing of validity and by inaugurating a proper examination system, authorizing a personnel sufficiently trained to examine claims intelligently, and otherwise providing the machinery and directing the procedure for the protection of such rights" (Gustavus A. Weber, *The Patent Office: Its History, Activities and Organization,* Service Monographs of the United States Government, no. 31 [Baltimore, 1924], p. 11).

[13]In 1810, the government purchased Blodgett's Hotel, on the north side of E Street between Seventh and Eighth, for the occupancy of both the Patent Office and the Post Office. This building burned with virtually all its contents five months after an act was passed (also on July 4, 1836) authorizing construction of new quarters for the Patent Office. Senator Ruggles headed a special committee to determine the extent of the loss, and it was in his report on this matter that he enumerated the qualifications of a good examiner. An act approved March 3, 1837 (5 *U.S. Statutes at Large* 191), provided for restoration of records and models.

Candidates measuring up to these criteria, he mentioned rather superfluously, "are rare." The number of examinerships was increased to two in 1837, four in 1848, and a dozen by 1861. Thirty-four men held appointments during that quarter-century interim. Not each one possessed all the qualities enumerated by Ruggles, yet on the whole they were remarkable. As it turned out, examiners of "extensive scientific attainments" often proved most resourceful at ferreting out evidence on which to base rejections for lack of novelty. For a time such men thoroughly dominated the examining corps. Many of them the sultans of Washington science ranked as worthy peers, but their philosophical proclivities ultimately rendered them anathema to the patrons of the Patent Office.

The first appointee to the post of examiner was Charles M. Keller. In a sense this was appropriate, even though he did lack formal training in science. At the outset Keller denied three-quarters of all the applications he examined. This low initial patent-to-application (p/a) ratio was as much attributable to improperly prepared applications as to any marked "illiberal" streak in Keller. Indeed, by the time that epithet became current he had quit and set himself up as an agent to whom would-be patentees could delegate the job of steering applications through to approval with their original claims as much intact as possible.[14]

Patent solicitors, it goes without saying, were stout proponents of a "liberal" policy. The first in that occupation was Thomas P. Jones, onetime superintendent of the office. Jones plied his new profession during early 1837 until Congress authorized the employment of a second examiner and Ellsworth named him to the position. He stayed through 1838, when he resigned and revived his agency.[15] By then several others had set up agencies. The most prominent was William P. Elliot, whose father, like Keller's, had been employed by the office under the old regime. Elliot's role vis-à-vis the Patent Office proper was analogous to Keller's and the patent system, for he had conceived and drafted the original design of the new building, which was chris-

[14]At first very few applicants enlisted professional counsel, though members of Congress sometimes acted in lieu of patent agents; e.g., Senator Franklin Pierce, Senator James Buchanan, Congressman Millard Fillmore, and Speaker of the House James K. Polk each performed that service for constituents (Patented Files 136, 765, 1029, and 1088, Record Group 241, "Records of the National Bureau of Standards," National Records Center, Suitland, Md.).

[15]This sort of crossing back and forth was not unusual and fostered many touchy conflicts of interest. Indeed, in Jones's case, it appears that in some instances he examined applications he had previously helped draw up—e.g., Patented Files 348, 613, 1023 (n. 14 above) (see also Harvey W. Mortimer, "Patents a Century Ago," *JPOS* 46 [1964]: 666–70).

tened in 1840.[16] Initially Elliot and Jones took a commanding lead over any competitors, each negotiating about 10 percent of all letters patent.

For almost a decade the annual total remained virtually static, averaging a bit less than 500. The initial downturn in the p/a ratio proved temporary; it soon climbed to about 60 percent and held steady until 1843. After that, however, two telling changes began to occur. First, the number of applications started rising sharply, from 819 in 1843, to more than 1,000 in 1844, 1,500 in 1847, and 2,200 in 1851. Superficially this would seem befitting W. W. Rostow's designation of the year 1844 as the "take-off point" in American economic history. Yet, the number of new patents granted was actually less in 1845 than in 1844, only one more in 1847 than in 1843, and—relative to the number of applications—not even half as many in 1853 as in 1842.

Ellsworth's successor explained in one of his annual reports that "the rigid examinations now made in the Patent Office, with regard to originality and patentability of new discoveries and improvements, result in the rejection of much larger proportion of the applications than formerly, when a less scrutinizing system of examination was pursued."[17] This "rigid" trend in the examination procedure was to be decisively reversed before the Civil War, however. In 1858 and 1859, when the number of applications topped 5,000 and 6,000 respectively, nearly seven were approved for every ten received, compared with the one-third p/a ratio during the early part of the decade. Beginning around midcentury, inventors, their journalistic lobby, and their political allies, convinced that the proper role of the Patent Office had been subverted, began agitating for a reversion to a "less scrutinizing system." Their chief bogeys were those individuals pejoratively regarded as "scientific men" who temporarily reigned supreme among the examiners.[18]

[16]William I. Wyman, "The Patent Office Building," *JPOS* 1 (1919): 255–57; "Memento Mori" [Elliot obituary], *SA* 10 (November 18, 1854): 77; Robert W. Fenwick, "The Old and the New Patent Office," *Proceedings and Addresses: Celebration of the Beginning of the Second Century of the American Patent System at Washington, D.C.* (Washington, D.C., 1892), pp. 454–71. Several other architects and draftsmen played a significant role in the ultimate design of the building, and it therefore reflects "the confused rivalry that so characterized the American architectural profession in the early 19th century, especially in the Capital City" (Inventory-Nomination Form, National Register of Historical Places, Archives of the National Survey of Historic Sites and Buildings, National Park Service, U.S. Department of the Interior, Washington, D.C.). Nonetheless, Fenwick, who cites extensively from Elliot's papers, is persuasive in his conclusion that Elliot merits credit as "the architect of the Patent Office building" (p. 459).

[17]U.S. Congress, House, Edmund Burke, *Annual Report of the Commissioner of Patents for the Year 1848*, 30th Cong., 1st sess., February 28, 1849, H. Doc. 59, p. 5.

[18]The contemporary argument about what a "scientist" was—an argument which was

Such individuals did not come to the fore all at once. While a knowledgeable contemporary thought Keller "one of the master minds in the arts,"[19] prior to his appointment as examiner he was simply a machinist. Jones, on the other hand, had once held a professorship of natural philosophy and edited a work on chemistry, in addition to his editorship of the country's leading technical periodical.[20] But his tenure as an examiner was relatively brief, and his successor, Thomas Donovan, was apparently not a man of "extensive scientific attainments."[21] In 1839 Congress authorized two assistant examinerships. While the first appointee, Henry Stone, was an obscure draftsman, the second, W. P. N. Fitzgerald, had attained considerable notoriety. Fitzgerald was a lawyer, but at one time he had stood second on the list of most distinguished cadets at West Point and first in mathematics and natural philosophy.[22]

It was beginning with Fitzgerald that "scientific men" started to predominate. Stone's successor was Leonard Gale, a pioneer in electromagnetism and former professor of chemistry at New York University.[23] And Donovan's was Charles G. Page, the only American

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being brought to a boil by the activities of the Washington-Cambridge nexus of professionalizers—is simply too large a subject for me to get involved with here. Suffice it to say for now that inventors' partisans tended to treat the term "scientific man" as derogatory. It was characteristically applied to individuals who had formal training in science or engineering and who enjoyed some standing with the Washington-Cambridge professionalizers. But this was not necessarily so: Sometimes it was merely equated with an "illiberal" cast of mind concerning patents, regardless of a man's background or anything else. Examiners who resigned to go into business as agents invariably became "liberalizers," no matter how "tough" they may have been previously.

[19]U.S. Congress, House, W. P. N. Fitzgerald to Edmund Burke, January 21, 1846, *Annual Report of the Commissioner of Patents for the Year 1845*, 29th Cong., 1st sess., February 24, 1846, H. Doc. 140, p. 45. The inventions Keller himself patented were relatively inconsequential.

[20]There is much about Jones in Bruce Sinclair, *Philadelphia's Philosopher-Mechanics: A History of the Franklin Institute, 1824–1865* (Baltimore, 1974); see also *Dictionary of American Biography*, s.v. "Jones, Thomas P." (hereinafter *DAB*).

[21]An application pertaining to the employment of alcohol as a catalyst in separating elaine from stearine apparently was somewhat beyond the ken of either Donovan or Keller (Donovan to Henry Ellsworth, December 18, 1841; Keller to Ellsworth, December 24, 1841, Patented File 2534 [n. 14 above]). Ellsworth included the full specifications for this patent in his annual report for 1842 (U.S. Congress, House, 27th Cong., 3d sess., February 1, 1843, H. Doc. 109, pp. 91–92).

[22]He never graduated, however, having been drummed out in the wake of a personal scandal (see Paxton Hibben, *Henry Ward Beecher: An American Portrait* [New York, 1927], p. 29).

[23]Regrettably, biographical information on Gale remains fragmentary. The most useful source I know of is an article by Ben. Perley Poore (altogether misleadingly titled "Some New Things about Prof. Morse") in the *Electrical Review* 7 (January 2, 1886); 6–7.

whose reputation in experimental physics approached that of Joseph Henry.[24] Not long after Page's appointment in 1842 the rate of application commenced a pronounced upward trend which never abated until the hard times of 1857. Yet, in all those years the p/a ratio only twice topped 50 percent, and then just barely. More applications, but fewer patents—this meant, aside from anything else, that the examiners had to work harder, for a rejected or drastically amended application almost inevitably entailed a larger volume of correspondence. In 1844 Commissioner Ellsworth presented the first of a series of pleas to Congress to authorize additional examiners and to give them "more adequate compensation for their services."[25] When Congress refused, Keller resigned to set up a patent agency in partnership with John J. Greenough, who had once headed the corps of draftsmen the Patent Office employed to redo the drawings lost in the fire of 1836. The Keller and Greenough agency became the most successful of its time and its proprietors among the most persistent advocates of "liberalization."[26]

To fill the vacant examinership, Ellsworth promoted Fitzgerald, then picked a physician from Ireland named T. G. Clinton for the assistant's position. After Gale became Page's assistant in 1846, the four-man examining corps comprised three trained as doctors and one as an attorney—and at least three of the four were exceptionally well qualified as physical scientists. But that was just the beginning. Over the next few years, as authority was periodically received from Congress to augment the staff, there assembled in the Patent Office a most impressive conclave of scientific talent. Several examiners were intimately involved with Alexander Dallas Bache and Joseph Henry, who had taken it as their mission to upgrade the image of American

[24]See Robert C. Post, "Physics, Patents, and Politics: The Washington Career of Charles Grafton Page, 1838–1868" (Ph.D. diss., University of California, Los Angeles, 1973), *Dissertation Abstracts International,* publication no. 74-11, 561; also, *DAB*, s.v. "Page, Charles G."

[25]U.S. Congress, House, Henry Ellsworth, *Annual Report of the Commissioner of Patents for the Year 1844,* 28th Cong., 2d sess., January 29, 1845, H. Doc. 78, p. 4.

[26]Keller and Greenough's clients included S. F. B. Morse, who lent considerable prestige to their business though he did not invariably pay his fees promptly (see Greenough to Morse, February 12, 1846, Morse Papers, Library of Congress, Washington, D.C.). Greenough published on a wide range of technical, historical, and philosophical topics, and held several notable patents. One of them was the first in America for a sewing machine. In her otherwise admirable study, *The Invention of the Sewing Machine* (Washington, D.C., 1968), Grace Rogers Cooper treats Greenough as an *homme inconnu,* an error unfortunately perpetuated in the recent book by William and Marlys Ray, *The Art of Invention: Patent Models and Their Makers* (Princeton, N.J., 1974).

science by restricting entrée to individuals whose credentials and conduct they deemed properly "professional." Indeed, for a time the Patent Office employed as large a group of men in good standing with the professionalizers as did Bache's own Coast Survey. Among inventors, however, this was a state of affairs which eventually drew far more boos than bravos. By midcentury the office had once again become the focus of an ongoing controversy over procedural reform, with a concerted effort being mounted by an increasingly muscular patent lobby to force changes in the criteria for patentability. At the same time the office became vulnerable to the vicissitudes of partisan politics, and ultimately it was through recourse to spoilsmanship that personnel were juggled until liberalization became a reality.

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After Ellsworth left in 1845 the commissioner's office remained forever ensnared in the spoils system; no subsequent appointee enjoyed a tenure even approaching his full decade.[27] More typical was that of his successor, Edmund Burke of New Hampshire—four years almost to the day. From the outset Burke yielded nothing to Ellsworth when it came to extolling the expertise of his examiners to the public and to Congress: surely an occupation which required one to be "a living encyclopedia of science" merited a salary greater than $1,500.[28] There were, he added, "but very few offices in the government which require[d] more ability for sound and nice discrimination, more extensive and varied acquirements. . . ."[29]

While Congress still failed to act, the office was undeniably falling behind in transacting its routine affairs. By 1845, four or five months often elapsed between receipt of an application and its examination. The examiners were finding a mounting proportion unpatentable, and one of them suggested how that situation could help explain the backlog: an application might be rejected not just once but two or three times, and each reexamination required "new investigations and elaborate reasoning to meet the new claims and views of the

[27]For biography of Ellsworth, see William I. Wyman, "Henry L. Ellsworth, the First Commissioner of Patents," *JPOS* 1 (1919): 524–29; "The Death of Henry L. Ellsworth," *SA* 14 (January 8, 1859): 145; *DAB*, s.v. "Ellsworth, Henry L."

[28]See n. 19 above. The quotation at the beginning of this article is from p. 5 of this same report.

[29]U.S. Congress, House, *Annual Report of the Commissioner of Patents for the Year 1846*, 29th Cong., 2d sess., January 23, 1847, H. Doc. 52, p. 4. In *The Jacksonians: A Study in Administrative History, 1829–1861* (New York, 1954), p. 376, Leonard D. White explains the nature of the conflict between Congress, where economy remained ever the watchword, and executives in positions such as Burke's, who characteristically emerged as champions of their staff.

applicant, and to sustain the decision of the office."[30] Understandably, applicants often had trouble appreciating the "elaborate reasoning" and "nice discrimination" embodied in Patent Office rejections. American inventors were not yet fully conscious of a collective self-interest nor capable of rallying forces effectively, but all agreed that applications should be processed expeditiously.[31]

In 1847, a periodical called *Scientific American* began to provide them with a forum. Its proprietors, Orson D. Munn and Alfred E. Beach, were two ambitious young men who had snatched an infant weekly from death's jaws in July 1846 and during the next half-century were to mold it into a stalwart influence on the history of American technology—an influence "unapproached in kind and effect by any other periodical."[32] Munn and Beach knew how easy it would be to speed up the machinery of the Patent Office: because the examiners now seemed incapable of completing more than three examinations a day between them, Congress simply had to budget for more of them. That was that—but how to overcome its chronic sloth whenever this reform came up? Previewing the sort of élan that would make their enterprise an instant success (circulation had reached 10,000 by 1848 when they took in a third partner, Salem Howe Wales, and five years later neared 25,000),[33] they suggested the following means of stimulating the solons: "some torpedo inventor" ought to send "some strange locomotive thundering through the Capitol with its broad banner waving boldly amid the din of dismay, the wreck of overturned inkstands, singed wigs and broken winded speeches, and on which shall be inscribed 'immediate patent rights to prevent further damages.' "[34]

Munn and Beach did not even hint at the possibility of minimizing delay merely by conducting less exhaustive examinations. When only seven of the twenty-seven applications submitted for lever and screw

[30]C. G. Page to Edmund Burke, January 4, 1847, *Annual Report of the Commissioner of Patents for the Year 1846* (n. 29 above), p. 15.

[31]See, e.g., "The Delay at the Patent Office," *American Journal of Improvements in the Useful Arts and Mirror of the Patent Office* 1 (1846): 44.

[32]Frank Luther Mott, *A History of American Magazines, 1850–1865* (Cambridge, Mass., 1938), p. 324. On the history of *Scientific American*, see "The Rise, Progress and Influence of the "Scientific American,' " *SA*, n.s. 62 (June 5, 1915): 540–46; Jean Lipman, *Rufus Porter, Yankee Pioneer* (New York, 1968), pp. 49–62; Mott, pp. 316–24. On Beach, see *DAB*.

[33]Mott, p. 319; "Our New Volume," *SA* 9 (September 17, 1853): 5. This was very impressive, especially considering that when Beach's father, Moses, put his *New York Sun* over 50,000 in the late 1830s he could boast "the largest edition of any daily newspaper in the world." "Death of Moses Y. Beach," *SA*, n.s. 19 (August 5, 1868): 90; also *DAB*.

[34]"The Patent Office," *SA* 3 (October 2, 1847): 13.

devices in 1846 passed, they acknowledged that this naturally left a score of applicants "dissatisfied with the management of the Patent Office."[35] Yet they traced the roots of the problem not to unreasonably stringent standards of examination but to the difficulty inventors had in keeping up with the state of the art. The most easily identified villain was Congress, which habitually quibbled over such matters as the appropriation for the commissioner's annual report.

On the horizon, however, there began to loom the presence of yet another villain. In 1848 *Scientific American* began calling upon "the Smithson gentlemen" to publish a comprehensive and fully illustrated history of American inventions—a work which would "open up to the world a vast laboratory of American science."[36] This suggestion was reiterated periodically for some time thereafter. Gradually, though, its utter futility became obvious. Such a disposition of any part of the Smithsonian bequest was just about the furthest thing from the desires of Joseph Henry, a fact he was at no pains to conceal.

At issue was nothing less fundamental than a dispute over the nature and definition of "true science." A periodical calling itself *Scientific American* could perceive nothing worthwhile resulting from the Squier and Davis study of American Indian archaeology (the Smithsonian's first publication), or from "expeditions to the Dead Sea, &c," or from "analogical research to prove the absurdity of the lost *ten tribes* of Israel having been dwellers either in Chilicothe or Canajoharie."[37] The irony of *Scientific American* taking potshots at American scientists is only explicable in terms of the existence of radically opposed ideas as to what science *was,* and especially whether "invention" was or was not more "scientific" than "antiquarianism" and "speculation." Even impartial witnesses wondered who in fact had the more valid claim to the appellation "scientific"—and there were certainly those to whom *Scientific American*'s seemed the more compelling.

As for Henry, even though his ideology of original research was incomprehensible to most Americans,[38] his personal stature rendered him relatively immune to criticism. Specific enemies had to be sought elsewhere—later, among a clique who apparently had managed to wheel a Trojan horse right into the Patent Office. However, the issues remained too vaguely defined for anyone to be concerned about the

[35]"The United States Patent Office," *SA* 2 (May 8, 1847): 261.

[36]"Report of the Commissioner of Patents," *SA* 3 (April 22, 1848): 245; "What to Do with Part of the Smithson Bequest," *SA* 3 (January 1, 1848): 117.

[37]"What to Do with Part of the Smithson Bequest."

[38]See Nathan Reingold, ed., *Science in Nineteenth Century America* (New York, 1964), p. 153.

presence of possible subversives in 1848, when agitation for accelerating the machinery of the Patent Office at last began to receive serious attention on Capitol Hill.

In February a bill passed the Senate which provided for doubling the staff by employing two additional examiners and two more assistants and also for revising the salary schedule. It met stiff opposition in the House, especially the provision boosting the examiners' pay 60 percent, to $2,500. Debate focused primarily on the question of how much expertise an examinership actually necessitated, with Congressmen Andrew Johnson and Robert Toombs leading a move to trim the raise. But the Senate would not accept the bill as returned —its original sponsor insisting that examinerships "cannot be filled by mere politicians or mere clerks" but only by gentlemen "qualified for one of the learned professorships in our institutions of learning"—and sent it back to the House with the $2,500 sum restored.[39] *Scientific American* soon tired of the ensuing impasse and demanded that the bill receive "a speedy action and a liberal one." The editors insisted that congressmen opposing the bill

> are not aware of the qualifications required for an Examiner nor the labor he has to perform. The duties . . . are more arduous than an Ambassador's or a Cabinet Minister's, and their pay is not disbursed by a tax upon the nation, but paid by inventors. These are the very people that desire the increase. . . . Congress must not adjourn without passing the bill. . . . Why do [congressmen] seek to cut down the $2,500? . . . They surely do not know that there are but few men in the country capable of filling the [examiner's] offices.[40]

Within three weeks the House capitulated. *Scientific American*'s warning to step lively lest it "be remembered with ill will" probably had some effect, a preview of the authority it would soon wield as the chief steward of the inventors' lobby. Of more immediate significance, however, was its assumption that the interest and outlook of its constituency, inventors, coincided with that of Patent Office professionals.[41] This was an assumption it would soon renounce in no uncertain terms.

[39]The debates over the bill are reported in the *Congressional Globe,* 30th Cong., 1st sess., December 29, 1847–May 18, 1848. These are collated in "Debate on a Bill to Increase Force and Salaries in the Patent Office," *JPOS* 1 (1919): 588–96.

[40]"Congress and Inventors," *SA* 3 (April 29, 1848): 253.

[41]*Scientific American* even suggested that a salary of $3,000—the amount the bill's sponsor initially proposed—"would have met the wishes of all our inventors" (ibid.). It is perhaps worth noting that when Albert Einstein went to work for the Swiss Patent Office in Berne in 1902 his salary was 3,500 francs ($700).

Competition for the newly created examinerships was intense.[42] Clinton, who expected a promotion but was bypassed, proceeded to stir up quite a fuss by filing a long list of charges against Burke. Although the House Committee on Patents exonerated Burke in August 1848, his day of reckoning was fast approaching. The Whig victory in November foretold his ouster, and soon after inauguration day President Taylor rotated him back to private citizenship.[43]

Burke's successor was Thomas Ewbank, an English-born polymath whose works included a treatise on hydraulics which had become a classic in its own time.[44] Since retiring from business in 1836 he had "devoted his entire attention to travel, to science, literature, the history of invention, and speculations respecting its future development." His reputation was as a man of massive erudition and "great scientific attainments," a philosopher—indeed, a philosopher of science and technology.[45]

The two new examinerships likewise went to individuals regarded first and foremost as "scientific men." Clinton was skipped over for Henry B. Renwick, whose family name practically every American associated with signal achievements in science, invention, and architecture. Something of a prodigy, Renwick had graduated from Columbia at the age of sixteen, then spent two years studying engineering and several more in the federal service as a civil engineer. His training and "great technical knowledge"[46] were such that he bore only the faintest intellectual resemblance to the typical patent applicant. The other examinership went to Gale, an intimate of the famous

[42]U.S. Congress, House, *Report: The Committee on Patents, to whom was referred the petition of Thomas G. Clinton . . . preferring charges against Edmund Burke . . . and the Memorial of Mr. Burke, asking for a thorough investigation of the charges preferred,* 30th Cong., 1st sess., August 10, 1848, H. Rept. 939, pp. 181, 238. One applicant reported that eighty men had filed for the four new positions (Titian R. Peale to John F. Frazer, June 2, 1848, Frazer Papers, American Philosophical Society, Philadelphia).

[43]For biography of Burke, see N. J. Brumbaugh, "Edmund Burke, Commissioner of Patents, 1845 to 1849," *JPOS* 1(1919): 584–87.

[44]First published in 1842, *A Descriptive and Historical Account of Hydraulic and Other Machines for Raising Water . . . With Observations on Various Subjects Connected With the Mechanic Arts, Including the Progressive Development of the Steam Engine* had become known simply as "Ewbank's Hydraulics" within just a few years, and inside of a decade it had gone through at least a dozen printings. Ladislao Reti called Ewbank "that pioneer of the history of technology in America" ("The Double-acting Principle in East and West," *Technology and Culture* 11 [1970]: 178).

[45]N. J. Brumbaugh, "Thomas Ewbank, Commissioner of Patents 184[9] to 1852," *JPOS* 1 (1919): 3; "The New Commissioner of Patents," *SA* 4 (May 19, 1849): 277; "Obituary—Death of Thomas Ewbank," *SA*, n.s. 23 (October 1, 1870): 213; also, *DAB*.

[46]*DAB*. Renwick's Patent Office assignment included the divisions of civil engineering, metallurgy, steam power, navigation, and ordnance.

inventor S. F. B. Morse, yet also well regarded by the Washington scientific establishment.

The most talented newcomer, however, was one of the assistants, Jonathan Homer Lane. While an undergraduate at Yale in 1846, Lane had published a paper noteworthy in the history of American science as the first to deal with electrical phenomena mathematically, a paper even said to have elicited "unqualified encomiums" from Michael Faraday.[47] In 1847 Lane had taken a job with the Coast Survey, but when the Patent Office job became available he decided to apply—mainly, it seems, because of Charles Page's presence there: Page he regarded as "a scientific man of high order" and he considered it a great privilege to become his associate.[48]

Indeed, the Patent Office staff as constituted when Lane arrived *was* remarkable, perhaps the best assembly of physics and engineering brainpower under one roof anywhere in the country. The commissioner and four principal examiners—Ewbank, Page, Fitzgerald, Gale, and Renwick—all commanded respect as scientific experts. For that matter, so did the assistants, the other three of whom were Samuel Cooper, Thomas Everett, and Titian R. Peale. Cooper's background was as a military engineer, Everett was a professor of mechanics and meteorology, Peale a renowned naturalist.[49] The latter two moved in the same circles as Henry, as did Lane, about whom Page could write: "His attainments in mathematics & physics are such as would do honor to the best professorship in the Country."[50] Moreover, these men regarded examining patents as serious business; Lane was not exceptional in being "laborious and thorough, cautious and critical, conscientious in the extreme." Almost inevitably, though, this tended to preclude establishment of a rapport with "the exterior world of inventors."[51] This phrase speaks volumes about the attitude

[47]C. G. Page to the trustees of Mississippi University, June 13, 1848, J. H. Lane Papers, Record Group 167, "Records of the National Bureau of Standards," National Archives, Washington, D.C. The paper in point was "On the Law of Electric Conduction in Metals," *American Journal of Science,* 2d ser. 1 (1846): 230–41. Among several other letters of recommendation pertaining to Lane's application for this job as professor of mathematics is one from Joseph Henry in which he states that Lane "may become one of the first in the line of original research in our country."

[48]Lane diary, July [?], 1848, Lane Papers (n. 47 above).

[49]Cooper to John Varden, August 12 and 18, 1847, William J. Rhees Collection, Henry E. Huntington Library, San Marino, Calif.; "Dr. Everett, of the U.S. Patent Office," *The Inventor* 2(July 1, 1857): 331; Albert C. Peale, "Titian R. Peale, 1800–1885," Philosophical Society of Washington *Bulletin* 14 (1905): 317–26; also *DAB,* s.v. "Peale, Titian."

[50]C. G. Page to A. D. Bache, July 9, 1852, Lane Papers (n. 47 above).

[51]Cleveland Abbe, "Biographical Memoir of Jonathan Homer Lane, 1819–1880," National Academy of Sciences *Biographical Memoirs* 3 (1895): 256. As Nathan Reingold

of such examiners, and quite soon the patent lobby was to begin questioning whether they were the proper sort "to fill a public station of this character."[52]

* * *

Rarely after 1849, when it was subsumed under the jurisdiction of the new Home Department, or Department of Interior, were controversies involving the Patent Office long dormant. "Encroachments" upon its domicile by other Interior bureaus were almost continually at issue, as were a welter of proposals for organizational and procedural reform. Aside from occasional legislation affecting the size of the staff, Congress did little. However, de jure reform actually proved irrelevant to achieving the paramount goal of the patent lobby. Indeed, its campaign to vitiate the policy of subjecting applications to what it regarded as hypercritical examination succeeded quite well without statutory sanctions. It just took a liberal drenching with "the proper spirit."

While several major newspapers contributed to the campaign,[53] the strategic headquarters was unquestionably the New York editorial offices of *Scientific American.* The initial sally in the spring of 1849 was almost diffident, tucked away in an item ostensibly devoted to commending the examining corps for how well it was "making the business fly." The number of patents issuing had more than doubled, the backlog was dwindling—indeed, the present organization of the office was "almost perfect." But one matter still merited attention: There needed to be "a widening of the field of decision respecting what is new." As it was, the examiners' decisions were "frequently too contracted in spirit, as if ingenuity was exercised to invent objections."[54]

Now this was scarcely a devastating assault, yet it was at least an omen. Less than a year previously a correspondent had told of selling the Patent Office a copy of Agostino Ramelli's 16th-century treatise on mechanics—the only one in America so far as he knew. And *Scientific American* had commended the office for its "large and valuable library of works on all branches of the arts and sciences" which enabled it to decide questions of novelty with strict authority. Inventors,

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points out in his essay on Lane for the *Dictionary of Scientific Biography,* Abbe never knew Lane well, if at all. But this assessment is no doubt accurate—being, it seems certain, the recollection of William B. Taylor, Lane's friend and Patent Office colleague from 1854 to 1857.

[52]"The Commissioner of Patents and the Patent Office," *SA* 13 (September 12, 1857): 5.

[53]E.g., Horace Greeley's *New York Tribune,* March 3, 1849.

[54]"Business at the Patent Office," *SA* 4 (April 21, 1849): 245.

therefore, had no call for surprise at "the great number of rejections for patents."[55]

Scientific American did not reorient its thinking on this matter all at once, though some of its contributors were utterly appalled at the idea that examiners would actually search out precedents in a work as obscure as Ramelli. Did this not betray why their decisions tended to be "contracted in spirit"? A Washington inventor named Edmund Maher came right to the point by insisting that "scientific men" should no longer be permitted to dominate the examining corps. In order to guarantee inventors "a fair and candid examination and decision," there should be a special board to review all rejected applications—a board with majority control vested in "thorough bred mechanics."[56] While only a little of what Maher proposed was ever written into law, his plan of reform is noteworthy as the first detailed plea for liberalization, with its corollary proposition that too scientific a cast of mind was an undesirable trait in a patent examiner. Subsequently, *Scientific American* became an open forum for any who would comment on the matter. There was, for example, "Junius Redivivus."

Junius was an adherent of the biblical stricture that "great men are not always wise." He thought it especially unwise, for instance, not to resolve any borderline question of novelty in favor of the applicant. Yet this was extremely rare. The cause lay in "the great fault with some analytic minds," namely, their tendency to "pulverize the spirit of the law as unscientifically as a miller does his wheat, by setting his upper stone too close." Rather than showing a proper "generous spirit," patent examiners relished playing "executioner."[57] The publishers of *Scientific American* concurred in much of what Junius said. Still, they directed most of their own fire not at the examiners but at Congress for its habitual stinginess and much of their ire at the obtrusion of partisan politics into Patent Office affairs—not yet realizing that this was a situation which could well be turned to advantage.

To wish the Patent Office could be altogether dissociated from politics was chimerical, even insofar as routine appointment and promotion of examiners was concerned. When Commissioner Burke submitted the names of candidates for the new positions Congress

[55]"Ancient Work on Mechanics," *SA* 3 (June 17, 1848): 309. The correspondent was R. Varick DeWitt, a onetime associate of Joseph Henry in Albany.

[56]Edmund Maher, "Prize Essay . . . on the Patent Laws, With Suggestions of Alterations and Additions for Their Improvement," *SA* 4 (May 5, 1849): 264. Maher's essay was serialized in three installments; the quotation at the beginning of this article is from the first, April 28, 1849, p. 256.

[57]Junius, "Patent Laws—Subjects of Patents,"*SA* 4 (June 16, 1849): 312; ibid., (June 30, 1849): 325; "Patent Laws and Business" *SA* 4 (July 7, 1849): 336.

authorized in 1848, Secretary of State James Buchanan insisted on reviewing these with an eye to their partisan sympathies. Peale, after several times getting bypassed for promotion despite continued efforts on his behalf by Henry and Bache, finally confessed to a friend in Philadelphia that "nothing but strong political backing can secure my rights." And Gale, after seeing two capable assistants bypassed for a vacant examinership, lamented the ruinous effect political interference had on "the stability of the Office." Examiners who conceived of themselves as disinterested professionals—the vast majority of those during this period—continually bemoaned the fact that their position was so "very public."[58] And well they might, for it was precisely because of this that the patent lobby eventually prevailed in its demands.

Scientific American made its first wholly unequivocal declaration regarding liberalization in April 1850, when it demanded an immediate halt to "the custom of the Patent Office to throw every doubt in the scale against applicants."[59] Thenceforth, it never spoke in terms any less emphatic than that, and occasionally it struck a far more vindictive note. This it did, for example, in responding to an allegation that criticism of the Patent Office "mainly emanated, not from inventors, but from agents and patent pirates."[60] By 1850, the proprietors of *Scientific American* had also become the operators of the largest patent agency in the world. Such talk was bound to incur their wrath, and a week later they lashed out at the "biggest pirate" of all:

> There is abundant evidence to prove the Patent Office guilty of injustice, recklessness and partiality. . . . Applications are granted or rejected according to the *state of mind* the examiners may be in. There are four chief examiners in the Patent Office, each a feudal baron in his own domain. . . . One has acquired for himself the glorious title of "the guillotine." He knows every thing that was, is, and is not, and never will be. . . . It is time that there were some uniform rules and regulations for *all cases* in the Office. One applicant will be rejected this week upon some shallow plea, when lo and behold another will receive a patent next week for something which has far less claims to patent protection.[61]

[58]Lane diary, June 26, 1848, Lane Papers (n. 47 above); Peale to John F. Frazer, April 21, 1852, Frazer Papers (n. 42 above); Gale to S. F. B. Morse, Aug. 16, 1852, Morse Papers (n. 26 above); C. G. Page to A. D. Bache, July 9, 1852, Lane Papers.

[59]"Reform of the Patent Laws," *SA* 5 (April 13, 1850): 237.

[60]"The Patent Office, and Reform of the Patent Laws," *SA* 5 (June 15, 1850): 307.

[61]"The Patent Office, and Reform of the Patent Laws," *SA*, 5 (June 22, 1850): 317. The "guillotine" was Fitzgerald.

Intemperate language was atypical of *Scientific American* though not of some of its regular contributors, and Junius pounced upon the charge of partiality with undisguised relish. He likened the examiners to "a sort of 'Privy Council' from whose decision no appeal may be taken, without a great deal of expense. . . ." As a consequence, truly new and useful innovations had been deprived of patent protection, while "schemers, backed by good friends, have got patents for what was worthless and old"—on occasion, "as old as the ruins of Ninevah."[62]

Now, it was one thing to accuse the examiners of being too "scientific" and quite another to impugn their integrity by accusing them of favoritism. The latter remained but an undercurrent in the rising swell of criticism directed at the Patent Office. The former, on the other hand, became the very heart of the case against the way the examiners behaved: too "scientific" an attitude was conducive to an "illiberal spirit," a trait repeatedly condemned in the strongest of terms. Soon, explicit attacks on certain examiners became commonplace, often forwarded from readers who affected some Latinate nom de plume. One "Daclede," for example, launched a diatribe against Fitzgerald with the observation that he lacked "that first of all important qualifications—knowledge of his proper relation to us, as inventors."[63]

Fitzgerald, recall, had the longest tenure of any examiner and was not only a lawyer but had also been a standout at West Point both in mathematics and natural philosophy. But assaults such as Daclede's often carried a powerful aroma of Jacksonian anti-intellectualism: "Mr. F. evidently possesses no feeling in common with inventors, hence he can never be a man acceptable to them. . . . Give me a vacillating simple headed enthusiast, in fact, anybody, to reason with, in preference to a dogmatic examiner. . . . As an inventor, I do not pretend to disguise the fact that I want to see Mr. Fitzgerald dismissed from the office and a *practical* man—a man of known feeling and community of interest with us, appointed in his place.[64] One can almost sense the specter of Old Hickory standing by, saying, "The duties of all public offices are, or at least admit of being made, so plain and simple that men of intelligence may readily qualify themselves for their performance. . . ." How remote seemed the day when Commissioner Burke had declared that the great majority of inventors de-

[62]Junius, "Reform of the Patent Laws," *SA* 6 (October 12, 1850): 29; "Powers of the Patent Office," *SA* 5 (July 27, 1850): 357.

[63]Daclede, "Patent Office Reform," *SA* 6 (December 28, 1850): 118.

[64]Ibid., Fitzgerald passed about one-fourth of the applications he examined.

sired only men "of the highest order of talent and scientific qualifications" in the Patent Office, or when *Scientific American* had estimated that there were "but few men in the country" qualified to be examiners!

Fitzgerald and Renwick, the two who took the worst drubbing, both quit in 1852. So did two others, Cooper and Page. So did Ewbank. The Patent Office was left in serious disarray. Gale complained privately about the "bad management" of Ewbank's successor and feared that shortly there would be "little honor" in holding an examinership.[65] Gale expected to resign soon himself, but actually he stayed on until 1857 and in the end left unwillingly—the victim of demands by the patent lobby that examiners who would not shape up be discharged.

* * *

Despite last-ditch efforts to mend "the community of interests between the philosopher and the practical man, the man of science and the artisan,"[66] whatever unity of outlook and purpose had once overlapped these realms was rapidly disintegrating by the early 1850s, with mutual recriminations becoming ever more corrosive. In 1853 Henry addressed a convocation of Washington inventors in the new Seventh Street wing of the Patent Office and remarked that the records stored there testified to "the immense expense of time and money lavished on futile attempts to innovate and improve." He felt he could "safely venture to affirm that out of fifty propositions for improvements in arts or mechanics forty-nine at least are either useless or old."[67]

In suggesting that no more than 2 percent of all patent applications warranted approval, Henry of course located himself ideologically on the nether fringe of the "illiberal" school. Spokesmen for the inventors were not about to take that kind of talk lying down, not even from Joseph Henry, not even if he *was* president of the Metropolitan Mechanics' Institute of Washington. *Scientific American* wanted to

[65]Gale to Morse, August 16, 1852, Morse Papers (n. 26 above). The commissioner to whom Gale was referring was S. H. Hodges, who served only a brief interim term at the end of the Fillmore administration, though later he returned to the office as an examiner and stayed in that capacity for fourteen years (see N. J. Brumbaugh, "Silas Henry Hodges, Commissioner of Patents, 1852–1853," *JPOS* 2 [1919]: 67–68).

[66]C. G. Page, "Our Journal," *American Polytechnic Journal* 1 (1853): 270 (hereinafter *APJ*).

[67]Joseph Henry, "The Improvement of the Mechanical Arts: Closing Address at the Exhibition of the Metropolitan Mechanics' Institute of Washington," in *Scientific Writings of Joseph Henry* (Washington, D.C., 1886), 1:317.

know what exactly was being accomplished at Washington's great institution for the discovery of "theoretical knowledge," the Smithsonian. So little, it seemed, "that if Smithson were to rise from the dead, his first object would be to try and get the funds he bequeathed to our nation . . . removed from the guardianship of our government at Washington."[68]

Others directly challenged Henry's assertions about inventions and patents, including his former close friend, Charles Page. By 1853, *Scientific American* was no longer the sole organ of the patent lobby, though it remained the pacesetter. Each of the four examiners who resigned in 1852 set himself up as a patent solicitor, and, ipso facto, a proponent of liberalization. Page, in partnership with J. J. Greenough and another ex–Patent Office employee named Charles L. Fleischmann, launched a monthly called the *American Polytechnic Journal* (fig. 2) and added its voice to that of *Scientific American*. Even while still an examiner, Page had begun to reconsider his proper role, and the "conversion to right" of such a celebrity represented a major coup for the patent lobby.[69] Once the toughest of examiners, Page now became the most persuasive of proponents of liberalization.

Unlike such simplistic critics as Junius, Page well knew that deciding questions of patentability was "one of the most difficult undertakings within the whole range of jurisprudence." He felt that the wisest occupant of the commissioner's office had been the first, Ellsworth —for he had clearly foreseen "the temptations, tendencies, and dangers of blending executive and judicial powers." While Ellsworth had been determined to prevent the office from becoming "a star-chamber," Page felt that in the years since 1845 it had acquired "too

[68]"The Smithsonian Institute," *SA* 9 (March 11, 1854): 205. This variety of criticism was literally benign compared to what Greeley printed in his *Tribune* regarding such matters as the Smithsonian's "vicious system of publication." About Henry himself *Scientific American* was nothing if not ambivalent. Even in late 1854 it could come to his defense against the "abuses" of the *Albany Knickerbocker,* which had called Henry and his cohorts "a lazy set of professors; too deficient in talent and industry to obtain situations in colleges." Regarding the secretaryship, *Scientific American* declared, Henry had "conferred honor upon those who solicited him by accepting their offer, not they upon him" ("The Smithsonian Institute Again," *SA* 10 [October 7, 1854]: 13). Yet, unkind words for the Smithsonian had been commonplace in that periodical from the beginning, when it characterized the secretaryship as a "fat office of eleven dollars a day, and not much to do" ("The Smithsonian Institute," *SA* 2 [December 26, 1846]: 109).

[69]Daclede (n. 63 above). Fleischmann, who specialized in securing patents for foreigners, was not such a hard-liner on liberalization as were Page and Greenough, and he exited their partnership after about a year (see "Patents in the United Sates of America," in his *Erwerbszweige, Fabrikwesen und Handel der Vereinigten Staaten von Nordamerika* [Stuttgart, 1852], trans. as *Trade, Manufacture, and Commerce in the United States of America* [Jerusalem, 1970], pp. 12–18).

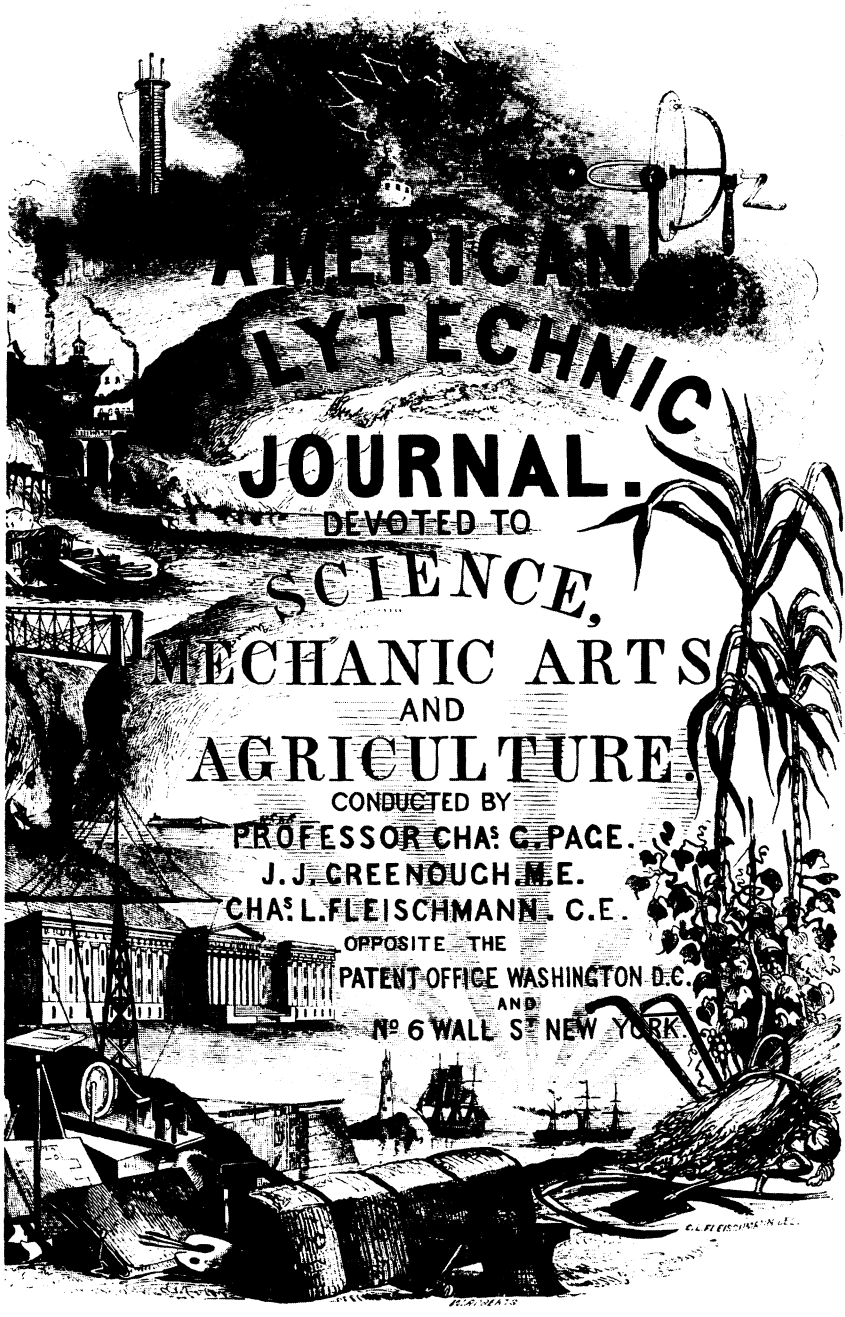

FIG. 2.—Cover of the *American Polytechnic Journal,* a short-lived (1853–54) but influential herald of "liberalization" edited by three former employees of the Patent Office.

much of this odious feature." Indeed, there now existed the distinct possibility of it becoming "a dangerous oligarchy of Examiners."[70]

Page conceded that "the disposition to refuse patents [was] not universal with Examiners, nor [was] this search for remote analogies, and 'travelling out of the record' for certain single elements of an invention . . . upon which to refuse a patent. . . ." Nonetheless, this did not diminish the necessity for curbing the inordinate amount of discretionary power the examining corps had arrogated. Page then proceeded to proffer the startling observation that most of the examiners appeared "to be *entirely unfit* for their stations."[71]

One should remember that he was referring to an examining corps still comprised of men highly regarded for their scientific expertise. The six principal examiners included Lane and Gale, Peale and Everett, and lately added was the eminent George C. Schaeffer, whom Benjamin Silliman, Jr., called a man of "original power" and "one of the best read chemists of his time."[72] But Page had gone all the way over to an extreme radical position, proposing a set of reforms which would so emasculate the examiners that it was tantamount to reverting to a simple registry. While never officially effected, in a de facto sense it very nearly came to fulfillment.

By the end of the 1850s the p/a ratio would increase more than 100 percent. The suggestion is not far from truth that the examiners then "seem to have granted about everything that was applied for, without giving themselves the trouble to look up and ascertain whether the thing applied for was new and useful, or whether it had been patented previously or not."[73] These were obviously the words of someone who was not overjoyed by this turn of events. Yet, it needs be noted that liberalization was not something that had been pushed *only* by personally interested parties such as patent agents. Joseph Whitworth, for example, had wondered "whether too much is not attempted by the examiners in undertaking to decide the important questions of novelty and utility." He suggested that preliminary examination might "be limited to warning an applicant of what has been done or known before, and referring him to authentic sources of information, but allowing him upon such warning to take out letters patent at his own risk." Whitworth's estimate of how this would work out was much the same as *Scientific American*'s or Page's: "In such a

[70]C. G. Page, "Rules of the Patent Office," *APJ* 1 (1853): 176; "The Patent Office," ibid., pp. 380, 381.

[71]Ibid., p. 382; "The Patent Law," *APJ* 2 (1853): 398.

[72]Benjamin Silliman, Jr., "American Contributions to Chemistry," *American Chemist* 5 (1874–75): 88–89.

[73]C. R. Tomkins, *A History of the Planing Mill* (New York, 1899), pp. 31–32.

case the patent might safely be left to find its proper position and value when brought before the public, and there would be ample opportunity of testing its validity and utility both by public opinion and, if requisite, ultimately in a court of law."[74]

* * *

That it should become much easier to obtain patents was literally intoxicating to most inventors—and certainly to every agent. However, there was one unfortunate concomitant of this insofar as the examining corps was concerned. A drastic reorientation in its basic frame of reference was called for, and it so happened that the examiners least amenable to this were those of "extensive scientific attainments"—a requisite Senator Ruggles had regarded as essential to "an efficient and just discharge of the duties." Their day of reckoning was put off, however, when President Pierce awarded the commissionership to Charles Mason—first in his West Point graduating class, engineer, jurist, editor, entrepreneur, and certainly the most versatile and urbane of all the antebellum commissioners.[75] While definitely sensitive to the position of the patent lobby, Mason also had a great deal of respect and personal regard for such individuals as Lane, Gale, and Schaeffer. Indeed, he even hired several more able scientists. One was Thomas Antisell, who had begun his distinguished career with a Continental education under Dumas, Biot, Pelouse, and Berzelius; another was William B. Taylor, who, in the words of Lester Frank Ward, "was widely informed on all the deeper topics of general science."[76]

As for Commissioner Mason, he was highly adroit at persuading Congress to appropriate funds for augmenting his staff. By 1855 he had managed to double the number of examiners, and a year later he had fully thirty-six employees at the level of assistant examiner or above.[77] (Recall that two decades previously there had been exactly

[74]*New York Industrial Exhibition: Special Report of Mr. Joseph Whitworth* (London, 1854), reprinted in Nathan Rosenberg, ed., *The American System of Manufactures* (Edinburgh, 1969), p. 385.

[75]N. J. Brumbaugh, "Charles Mason, Commissioner of Patents, 1853–1857," *JPOS* 2 (1919): 122–26; George W. Cullom, *Biographical Register of the Officers and Graduates of the U.S. Military Academy* (New York, 1868), 1:22; also *DAB*, s.v. "Mason, Charles." Second in Mason's West Point class was Robert E. Lee.

[76]See *National Cyclopedia of American Biography*, s.v. "Antisell, Thomas"; William J. Rhees, "William Bower Taylor," *Annual Report of the Board of Regents of the Smithsonian Institution . . . to July, 1896* (Washington, D.C., 1898), p. 655.

[77]For providing me with statistics on the growth of the staff, plus a wealth of general information on the history of the Patent Office, I am indebted to P. J. Federico, for many years editor of the *JPOS* and still the ranking authority on the subject.

one "examining clerk.") Old points of contention such as the Department of Interior's appropriation of space in the Patent Office building had by no means simply evaporated. But Mason's first two years were a period of relative calm during which he was able to accomplish a great deal, and his department stood forth, "lifelike, active, and strong."[78]

That Mason could garner virtually unqualified enthusiasm from the patent lobby is very strong testimony indeed to his executive talents, for he never really threw the full weight of his authority behind liberalization. At the beginning, the p/a ratio did show a big jump, from 32 percent in 1853 to almost 53 percent the next year. In 1855 and 1856, however, it slipped below 50 percent. While still much higher than during the early 1850s, not until after 1857 did the ratio reflect a truly dramatic philosophical reorientation. The sine qua non for this was the appointment of a commissioner willing and able to demand compliance from the examiners, or else.

Mason often reversed his examiners, but he did nothing about removing any of the "old school." Besides Gale, Lane, Schaeffer, Peale, and Everett, those who served under Mason included Alfred Herbert, a talented engineer, Edward Foreman, onetime assistant at the Smithsonian, and William Chauncy Langdon, formerly a professor of astronomy at Shelby College.[79] The assistants included Antisell and Taylor, and also Daniel Breed, a former student of Eben Horsford's and translator of Heinrich Will's *Outlines of Chemical Analysis;* Samuel Coves, whose son became America's preeminent ornithologist; and John Tyssowski, a Polish political exile who had established a remarkable scholarly record at the University of Vienna. At the outset of the Buchanan administration in 1857, the Patent Office still employed a number of men who took pride in their scientific erudition and who presumed that their capacity for drawing fine distinctions and perceiving recondite analogies constituted a prime tool of their trade. Before long, most were gone.

Mason's successor had a simple credo: that patent laws "were enacted for the government of an office whose range of action is altogether above the barren field of mere technicalities. That office," he continued,

> . . . would be forgetful of its mission, and disloyal to one of the highest interests of humanity, were it to permit itself to be en-

[78]"Doings at the Patent Office," *SA* 10 (January 13, 1855): 141.

[79]Besides Lane and Peale, only Langdon has attracted any appreciable attention from historians; there is a *DAB* sketch and also an account of his role in the founding of the YMCA (in concert with three others, including William J. Rhees) in C. Howard Hopkins, *History of the Y.M.C.A. in North America* (New York, 1951), pp. 54–71.

> tangled in a mesh of mere words, or palsied by doubts, born of intricate metaphysical disquisitions. It has to do with the substance of things, and to deal with the earnest, ingenuous, practical intellect of the age, and it should be dealt with frankly, not perplexing and discouraging inventors, by subtle distinctions, but kindly taking them by the hand, as the benefactors of their race, and strewing, if possible, their pathway with sunshine and with flowers.[80]

The man who penned these words was Joseph Holt of Kentucky, named commissioner by Secretary of the Interior Jacob Thompson in August 1857, and, for the patent lobby, a dream come true. Very soon it became obvious that Holt was not going to countenance any "hairsplitting niggardly system of examination," and rumors began to fly that he contemplated a purge of illiberal examiners. By now *Scientific American* believed it "folly to suppose that *too many* patents can be granted." Among the examiners, only those it characterized as "old fogies" still held contrary notions, and Holt soon started disposing of this "refractory element."[81] Of the twelve principal examiners in the office when Holt took over, five had been removed by early 1858 and all but two of the rest before the war. Even those directly affected did not completely understand why. The first to get fired, Lane, outlined his impression of what had happened in a letter to a friend:

> Myself together with Drs. Gale and several other Examiners, have been dismissed by order of Secretary Thompson of Mississippi. . . . When Thompson came into office he undertook to take the Patent Office into his special keeping. Commissioner Mason however resisted the attempted encroachment and refused to make removals or to be dictated to in other things which the law places in the Commissioner's hands. . . . After a time Mr. Holt of Kentucky was appointed for the new Commissioner and he has shown himself the willing tool of the Secretary. On the 1st of October [1857] Dr. Gale and myself and a number of others in lower places were removed. A short time before, all the *colored laborers* but two or three had been dismissed. Not long after Dr. Gale and myself, Capt. Herbert followed. During the winter Dr. Everett, and in March [1858] even Prof. Schaeffer, by all odds the most learned and able man of all the Examiners, was dismissed.

[80]Quoted in *SA* 13 (November 14, 1857): 78.

[81]"The New Commissioner of Patents," *SA* 13 (September 19, 1857): 13; "Patent Office Management—Liberality of Examiners," *SA* 13 (October 17, 1857): 45; "State of Affairs at the Patent Office," *SA* 13 (December 26, 1857): 125; "The Patent Office and its Management," *SA* 13 (March 20, 1858): 221.

> . . . The pretext in this case was retrenchment of expenses, no successor being *then* appointed, but the absurd selection of such a person as the one to be dropped [Schaeffer] gives the lie to that plea. In fact, a recently appointed assistant Examiner represented to be utterly unqualified, has since been promoted to the place of Principal Examiner.[82]

Lane, who admitted to being a " 'black republican,' " believed the purge was merely partisan. Journalists and historians have generally come to the same conclusion.[83] However, there is more to the story than this. Compare the number of patents approved by various examiners. During four months in 1857 two of them passed more than 100 apiece. Gale and Herbert approved around seventy. Everett approved forty-six. Lane approved twenty-nine and Schaeffer all of ten—in four months![84] Naturally, certain classes attracted more applications than others, so some disparity would be inevitable. Yet, it so happened that Schaeffer had charge of the class which comprehended all land conveyances, a field of great activity. Munn and Company had been advising would-be applicants for patents on railroad improvements not even to bother as long as an examiner so "deficient in the spirit of liberality" kept his post.[85]

This is not to say that Holt's removals did not embody an element of traditional spoilsmanship. Nearly all the new men were southerners. (Schaeffer's successor, Rufus R. Rhodes, later headed up the Confederate Patent Office in Richmond.) Nevertheless, the motivation was not *purely* partisan. After 1858 a new spirit pervaded the Patent Office, and the number of patents increased dramatically. This was to a considerable extent because the examiners approved 67 percent of the applications in 1859 as against 47 percent in 1856 and 31 percent in 1853. And that was because it was clearly understood that examinations were *not* to be conducted with an eye to physical analogies—a

[82]Lane to Ari Davis, October 26, 1858, Lane Papers (n. 47 above).

[83]An 1883 obituary of Gale, e.g., states that "he was removed for political reasons" ("Death of Dr. Gale," *Electrical World* 2 [October 27, 1883]: 141), while Reingold comes to essentially the same conclusion in his *DSB* essay on Lane.

[84]These figures derive from a tally of examiners' signatures on Patented File wrappers during February, May, July, and August 1857.

[85]"Changes in the Patent Office," *SA* 13 (October 10, 1857): 37; "The Commissioner of Patents and the Patent Office," *SA* 13 (September 12, 1857): 5. Schaeffer certainly did not lack expertise in this field; from 1836 to 1844 he had edited the predecessor of the *American Railroad Journal*. In Schmookler's *Invention and Economic Growth* (n. 2 above) there is a table showing that railroad patents increased from 44 and 50 in 1856 and 1857, to 147 and 160 in 1858 and 1859 (p. 223). Analyzing such a sudden upswing in terms of a set of complex variables is rather pointless in view of the fact that it need be traced no further than the "illiberal spirit" of Schaeffer.

practice which, as Joseph Whitworth saw it, had resulted in patents having been refused "for inventions confessedly valuable, and producing new manufactures, because in totally different branches of manufacture inventions somewhat similar had been already patented."[86]

For *Scientific American* the golden age had come: when the commissioner's annual report appeared in 1858, it was literally beside itself in praise of "this admirable document—so frank, so manly, and so outspoken in support of the high claims of inventors." As for Holt, after having apparently established that it was "clearly the duty of every employé in the office to resign unless they can lend their obedience to the rightful authority of the Office," and that "the Patent Laws *shall be liberally construed,*" he himself resigned in March 1859 to become postmaster general.[87] His successor was a railroad promoter from Connecticut named William D. Bishop. Bishop's term was uneventful, but his successor, Philip Thomas, turned out to be a reactionary who proved quite unpalatable to the patent lobby. In October 1860 Thomas appointed a "censor," charged with ferreting out errors in the examiners' decisions. Holt had created a permanent board of appeals, along the lines suggested in 1849 by Edmund Maher, to review rejected applications. The review of approved applications was something else, especially since Thomas gave the post to William B. Taylor, a man who moved freely among Washington's scientific elite but was none too popular among patrons of the office.[88]

Thomas subsequently modified his initial plan by setting up a "Revising Board" comprised of Taylor and Peale. As one correspondent who signed himself "Liberal" pointed out, these two were among the oldest examiners, and "while they possess[ed] abundant talent and are skilled in the arts and sciences," they both had "been educated in the illiberal old school practice of the Office, which prevailed as far back as 1850, '51 and '52 when terror to the inventor reigned triumphant." "Liberal" feared they would "unwittingly return to their early pro-

[86]*New York Industrial Exhibition* (n. 74 above), p. 380.

[87]"Remarks on Commissioner Holt's First Annual Report," *SA* 13 (February 6, 1858), 173; "Another Important Decision by the New Commissioner of Patents," *SA* 13 (November 14, 1857): 77. For biography of Holt, see E. D. Sewall, "Joseph Holt, Sixth Commissioner of Patents," *JPOS* 2 (1919): 171–85.

[88]Taylor had been Schaeffer's assistant, then succeeded Lane as examiner of electrical and philosophical apparatus. In 1871 he signed the call for the first meeting of the Washington Philosophical Society—an organization whose founders included Peale, Lane, Antisell, and Schaeffer, along with Benjamin Peirce, J. E. Hilgard, Spencer Baird, J.S. Billings, J. H. C. Coffin, Simon Newcomb, and of course, Henry himself. Taylor's best-known publication is no doubt his 1879 *Memoir of Joseph Henry*.

clivities" and that this new board represented "the commencement of a retrograde movement in the prosperity of the Patent Office."[89]

During late 1860 a fretful debate over the Revising Board continued, and the p/a ratio skidded 10 percent. But the man appointed commissioner by Abraham Lincoln, David Holloway, abolished the board in May 1861, and the ratio again rose to about two-thirds, remaining there for the duration of the Civil War.[90] After that it leveled off a bit lower, averaging about 60 percent during the quarter century following the war. "Liberalization" as such had lost its quality as a cause célèbre with the patent lobby. The p/a ratio never dropped below 50 percent until 1896. It had been forty years since this last happened.

During the 1920s, when applications averaged nearly 90,000 annually, the p/a ratio skirted 40 percent once or twice. Yet never has it come anywhere close to the thirtieth percentile, as it did five times between 1847 and 1853. And never has it roller-coastered anywhere near so wildly as it did in the 1840s and '50s, when it fell 100 percent in a decade, then redoubled in half that time.

* * *

What these gyrations reflected was an adjustment phase virtually inevitable with an institution whose formal modus operandi was as loosely defined as was that of the Patent Office. While it would serve little purpose to consider whether the office was "too strict" at one point, "too liberal" at another, it is worth reiterating that the prevailing administrative philosophy played a major role in determining whether relatively few patents were issued, or many. Thus, the seeming efflorescence of invention in the late 1850s is at least partly an illusion—an illusion resulting from patents being granted that previously would have been refused. The graph of patents issued during

[89]"Trouble at the Patent Office—'Revising Board' Appointed," *SA*, n.s. 3 (November 3, 1860): 299. In fact, Taylor had been in the office only since 1854. On Commissioner Thomas, cf. "The Patent Office and Its Administration," *SA*, n.s. 3 (November 24, 1860): 345, and "Philip Francis Thomas," *JPOS* 2 (1920): 275–82.

[90]The Lincoln administration literally turned the Patent Office topsy-turvy. Since the president had been a patentee himself, there was hope that he would "ignore all partizan feeling in reference to this office." But he wielded the sword of patronage far more ruthlessly than any of his predecessors ever had, and within three months after Holloway became commissioner no less than eight of the twelve examiners were gone. A ninth went out in 1861 and a tenth in 1862. The only two to survive were Peale and Taylor, who must both have been very good Republicans indeed. Two of the vacancies were filled by Page and by the chemist B. S. Hedrick, each a seasoned Republican. On the latter, see *National Cyclopedia of American Biography*, s.v. "Hedrick, Benjamin Sherwood"; George Crossette, *Founders of the Cosmos Club of Washington 1878* (Washington, D.C., 1902), pp. 84–86.

those years ascends quite smoothly. Yet, at one point, in 1857, the number of applications actually declined. Conversely, while the number of patents fell off from one year to the next no less than seven times between 1842 and 1853, the number of applications describes a steady upward curve.

All this may be more instructive to economic historians than to historians of technology. Yet, the achievement of liberalization has noteworthy implications for the history of American technology —implications regarding the influence of *Scientific American,* for instance. Moreover, the whole story is worth at least peripheral consideration with respect to the field of administrative history, and also the institutional history of American science. During the same period that Bache was taking command of federal science and trying to mold the Coast Survey into "the general scientific agency of the government,"[91] a good many "scientific men" were employed by the Patent Office. These men made exceptionally good money for relatively short hours (six daily, or seven, depending on the season) and were thus enabled to pursue scientific research they might otherwise have had to forego.[92]

This is not to suggest that the Patent Office was in any sense comparable to the Coast Survey in terms of its mission or scientific accomplishment. But it did provide a sort of sinecure for scientists.[93] Whatever else one chooses to make of this, I think it does underscore the need to take a closer look at the role of the Patent Office in the prewar federal establishment, at very least by ascertaining more about some of its other professionals besides the handful I have mentioned —examining the examiners, if you will (see table 1). Along with this, one might also take Bache's organization and make a careful survey of the surveyors.

All that, needless to say, is another story. So is unraveling the contemporaneous dispute about the definition of "true science." Suffice it

[91]A. Hunter Dupree, *Science in the Federal Government* (New York, 1964), p. 87.

[92]It is at least of curiosity value that, as of 1855, fourteen of the Patent Office's forty-one employees were paid $2,500 or more, whereas of the sixty who worked for Bache only three were in that bracket (see *Register of the Officials and Agents, Civil, Military, and Naval, in the Service of the United States on the Thirtieth September, 1855* [Washington, D.C., 1856], pp. 22–23, 83–84).

[93]The idea of an examinership as a kind of sinecure, I should say, is Nathan Reingold's. I think he is correct, although certain commissioners seem to have been more amenable to treating it as such than others. Burke expressly forbade the examiners "to engage in any pursuit not connected with their official duties," but it is not clear that his crackdown was very successful (Burke to H. H. Sylvester, July 16, 1846, *Report: The Committee on Patents, to whom was referred the petition of Thomas G. Clinton . . .* [n. 42 above], p. 398).

TABLE 1

EXAMINERS EMPLOYED BY THE PATENT OFFICE, 1836–61

Adams, J. H., Jr.	*French, James S.	*Page, Charles G.
Arick, C.	Gadsden, Thomas	*Peale, Titian R.
*Antisell, Thomas	*Gale, Leonard	*Peck, H. P. K.
*Baldwin, Henry	Galpin, John	Pool, David
Blanchard, J. M.	Halsted, J. J.	Read, W.
Breed, Daniel	*Hedrick, Benjamin S.	*Renwick, Henry B.
Bull, Marcus	*Henry, J. M.	*Rhodes, Rufus R.
*Clarke, Robert D.	*Herbert, Alfred	Ritter, Frederick W.
Clinton, Thomas G.	*Hodges, S. H.	Van Santvoord, J.
*Coues, S. E.	Holmead, J. E.	*Schaeffer, George C.
Connolly, T. C.	*James B. F.	Schoepf, A.
*Coombs, J. J.	Jayne, J. W.	Shaw, Edward
*Cooper, Samuel	Jenkes, Amos T.	Shugert, J. W.
Crawford, N.	Johnston, R. W. M.	Smith, A. M.
Doane, W. C.	*Jones, Thomas P.	*Smith, F. Southgate
*Dodge, Thomas H.	*Keller, Charles M.	Stewart, D. S.
Dodge, W. C.	*King, Henry	Stone, Henry
*Donovan, Thomas W.	*Lane, Jonathan H.	Taft, H. N.
*Everett, Thomas	*Langdon, William C.	*Taylor, William B.
Fahnestock, S. S.	*Lawrence, DeWitt C.	*Theaker, T. C.
Fales, Joseph T.	*Little, Amos B.	Toll, Isaac D.
Fitch, Timothy	McCormick, Hugh	Tyssowski, J.
*Fitzgerald, William P. N.	McIntire, Arthur L.	Wurtz, Henry
*Foreman, Edward	Moss, C. B.	Yulee, E.

NOTE.—The author is compiling a biographical directory of these examiners and would appreciate receiving information about any of them. The information should be sent to Dr. Robert C. Post, National Museum of History and Technology, Smithsonian Institution, Washington, D.C. 20560.

*Those whose names are asterisked served as principal examiners, the others as assistants.

for now to say this, about a less unwieldy subject—patent statistics: While these can be useful, we ought once and for all to banish the assumption that they provide any but the most tenuous basis for generalizing about trends in the economy or about invention itself. I hope this is apparent from the story of how an "oligarchy" of examiners—ostensibly only functionaries, but in fact privileged with considerable autonomy—managed to set the Patent Office on a peculiar and controversial course, and how it happened that this was eventually changed to a different and more popular course.