

“GENIUS OF ART! WHAT ACHIEVEMENTS ARE
THINE?”¹ THE SOCIAL SHAPING OF INVENTIVENESS
REQUIREMENTS IN ANTEBELLUM PATENT LAW

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I. INTRODUCTION: INVENTION (V.), INVENTION (N.), AND
INVENTORS

Scholars have described non-obviousness² as a critical element of the United States patent system.³ The requirement mandates that, at the time of invention, an invention must not have been obvious to a person having ordinary skill in the art.⁴ In effect, this screens routine improvements out of the patent system and rewards inventions perceived to be scientific breakthroughs.⁵

Recent Supreme Court cases developing non-obviousness highlight the requirement’s contemporary importance in patent law,⁶ but this was not always the case. Non-obviousness requirements were noticeably absent from the early patent system, which required only utility and novelty.⁷ In patent litigation, judges considered the form of the invention itself in assessing novelty and utility, and explicitly refused to consider the inventive process—how an invention was made—

1. BRUCE SINCLAIR, *PHILADELPHIA’S PHILOSOPHER MECHANICS: A HISTORY OF THE FRANKLIN INSTITUTE, 1824-1865*, at 93-94 (1974) (quoting James M’Henry’s poem given at the opening exhibition of the Franklin Institute in October of 1828).

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2. 35 U.S.C. § 103 (2004).

3. John F. Duffy, *Inventing Invention: A Case Study of Legal Innovation*, 86 TEX. L. REV. 1, 2 (2007); Jeanne C. Fromer, *Layers of Obviousness in Patent Law*, 22 HARV. J. L. & TECH. 75, 75-76 (2008).

4. 35 U.S.C. § 103 (2004).

5. Fromer, *supra* note 3, at 75-76.

6. See generally *KSR v. Teleflex*, 550 U.S. 398 (2007) (litigating the proper interpretation of the level of ordinary skill in the art).

7. See *infra* Part II.

including who made it.⁸ In 1825, Justice Story famously summarized this refusal to consider the inventive process:

It is of no consequence, whether the thing be simple or complicated; whether it be by accident, or by long, laborious thought, or by an instantaneous flash of mind, that it is first done. The law looks to the fact, and not to the process by which it is accomplished.⁹

However, beginning in the middle of the nineteenth century, judges began to evaluate the process of invention by creating inventiveness doctrines, which later explicitly informed the drafting of § 103.¹⁰ The courts, which before 1848 refused to consider the inventor's methodology or personal characteristics, began to look to the type of skill used in the process of invention, and they invalidated inventions created through "mere mechanical skill."¹¹

In the body of scholarship that examines the historical development of inventiveness requirements, one line of inquiry has focused narrowly on doctrinal developments.¹² These accounts have frequently expounded Supreme Court narratives about the development of the doctrine,¹³ which the Court first articulated in the 1850 case, *Hotchkiss v. Greenwood*.¹⁴ These scholars neither question the accuracy of those judicial narratives, nor look to sources outside of the law to understand the social context of doctrinal changes.

Another line of scholarship has called these judicial narratives into question.¹⁵ By focusing on other legal evidence such

8. See *infra* Part II.

9. *Earle v. Sawyer*, 8 F. Cas. 254, 256 (C.C.D. Mass. 1825) (No. 4,247).

10. P.J. Federico, *Commentary on the New Patent Act*, 75 J. PAT. & TRADEMARK OFF. SOC'Y 161, 170 (1993).

11. *Tatham v. LeRoy*, 23 F. Cas. 709, 713 (C.C.S.D.N.Y. 1852) (No. 13,760), *rev'd*, 55 U.S. (14 How.) 156 (1852).

12. See generally Friedrich-Karl Beier, *The Inventive Step in Its Historical Development*, 17 INT'L REV. INDUS. PROP. & COPYRIGHT L. (IIC) 301 (1986); Duffy, *supra* note 3; P.J. Federico, *Origins of Section 103*, 5 AIPLA Q.J. 87 (1977); Giles S. Rich, *The Vague Concept of "Invention" as Replaced by Sec. 103 of the 1952 Patent Act*, 46 J. PAT. OFF. SOC'Y 855 (1964); George M. Sirilla & Hon. Giles S. Rich, 35 U.S.C. § 103: *From Hotchkiss to Hand to Rich, the Obviousness Patent Law Hall-of-Famers*, 32 J. MARSHALL L. REV. 437 (1999).

13. Notable judicial narratives about inventiveness appear in *Graham v. John Deere*, 383 U.S. 1, 5-6 (1966) and *Cuno Eng'g v. Automatic Devices*, 314 U.S. 84, 90-91 (1941).

14. *Hotchkiss v. Greenwood*, 52 U.S. (11 How.) 248 (1850).

15. E.g., Kenneth J. Burchfiel, *Revising the "Original" Patent Clause: Pseudohistory in Constitutional Construction*, 2 HARV. J. L. & TECH. 155, 155 (1989); B. ZORINA KHAN, THE

as treatises, indices, and citation practices, these scholars emphasize that *Hotchkiss* was a very narrow holding inapplicable to most patent cases.¹⁶ These scholars suggest that the rise of inventiveness requirements occurred in the 1870s as a byproduct of anti-monopolist fervor.¹⁷

Neither scholarly approach offers an explanation of why and how judges began to incorporate measures of mechanical and inventive skill in patentability requirements. This Note begins to fill the gap in the literature by looking at the broader social context underpinning doctrinal changes concerning inventiveness, arguing that inventiveness doctrines have deep roots in social changes that began during the antebellum period.

As the title suggests, this Note attempts to describe inventiveness—"Genius of Art"—within a broader social context. Who could be a genius of art? What sorts of inventions embodied genius of art? The Note argues that the creators of the early patent system designed it with low barriers to entry to reward a broad group of inventors who made incremental technological improvements during the course of their daily work. But during the first half of the nineteenth century, against the backdrop of the Industrial Revolution, several related social and political movements profoundly influenced the way courts described and theorized invention.¹⁸

Mechanics, the broad class encompassing most craft and trade workers, organized to improve their social standing, focusing on education as the key to social acceptance. Concurrently, natural philosophers—whom we would now describe as scientists—and engineers working within the mechanics' movement, linked science to the "useful arts" in an attempt to garner funding and support.¹⁹ They did so by forwarding an

DEMOCRATIZATION OF INVENTION: PATENTS AND COPYRIGHTS IN AMERICAN ECONOMIC DEVELOPMENT, 1790-1920, at 90 (2005); EDWARD C. WALTERSCHEID, THE NATURE OF THE INTELLECTUAL PROPERTY CLAUSE: A STUDY IN HISTORICAL PERSPECTIVE ch. 8 (2002).

16. See, e.g., KHAN, *supra* note 15, at 90.

17. See, e.g., Burchfiel, *supra* note 15, at 169 n.80.

18. See *infra* Part II.

19. Science had a much broader meaning in the early nineteenth century, referring to almost any form of systematized knowledge. What we now think of as science was referred to as natural philosophy. See, e.g., Ronald Kline, *Construing "Technology" as "Applied Science": Public Rhetoric of Scientists and Engineers in the United States, 1880-1945*, 86 *ISIS* 194 (1995). For ease of reference in this Note, I will refer to science in the contemporary sense of the word when discussing the political efforts of natural philosophers and engineers.

ideology that claimed scientific research as the basis for invention, even though this did not describe how most inventions were created at the time.²⁰

At first, these two movements formed a synergistic union under the umbrella of mechanics' interest groups as a part of a broader trend of advocacy for publicly supported science and engineering. However, by the early 1840s conflict had developed between two factions over how the patent system should be administered. An inventors' lobby, comprised mainly of mechanics, the press, and patent agencies, sought to keep barriers to invention low. The increasingly organized science lobby, however, sought legal recognition setting the moment of invention closer to theoretical work and away from incremental improvement.²¹

Within this framework, a new legal discourse about the process of invention emerged in the courts. Whereas legal doctrines had previously only allowed narrow assessment of inventions in judging patentability, the judicial gaze began to turn to the methods, actors, and acts of invention—the process of invention. Beginning with the circuit court decision in *Hotchkiss*, a cluster of cases decided at the Supreme Court, and by Supreme Court justices riding circuit, shows the creation of a judicial ideology about the process of invention, informed in part by ideologies proffered by advocates of science and engineering. This new judicial ideology of invention introduced method and education as proxies for inventiveness, novelty, and utility. Moreover, application of these new decisions countered the invention lobby's success in liberalizing patent office examination.²² These newly emerging inventiveness requirements began to change the types of inventions rewarded by the system, inventive practices themselves, and patent litigation strategies.²³

20. See *infra* Part III.

21. See *infra* Part III.

22. See *infra* Part III.

23. See *infra* Part IV.

II. THE EARLY PATENT SYSTEM: REWARDING THE “MARTYRS OF CIVILIZATION”²⁴

At its inception, the creators of the U.S. patent system envisioned it as a critical tool for maintaining democratic society. They believed the patent system would foster technological advance, assist the growing nation in cultivating its natural resources, and minimize economic dependence on Europe. They also hoped it would usher in a more egalitarian society. To achieve these goals, through the 1830s, the patent system had minimal barriers to entry. A broad cross-section of society made inventions and used the patent system. Moreover, inventions (and not inventors) were judged by their novelty and utility.

During the antebellum period, European aristocrats and the gentlemen classes at home scorned the useful or mechanical arts—terms used to describe the trades.²⁵ “Unwashed artificers,” were derided because their crafts were classed as handwork and because they relied on their own labor to make a living.²⁶ These mechanics encompassed a very broad group of people, from humble apprentices to savvy and wealthy businessmen.²⁷ No matter how wealthy or accomplished, they faced persistent prejudices because they were employed in handwork.²⁸ But during the eighteenth century, the economic needs of the colonies and later, the country, combined with the liberal political animus of the day, offering an opening for me-

24. HENRY HOWE, MEMOIRS OF THE MOST EMINENT AMERICAN MECHANICS 3 (New York, Alexander V. Blake 1841).

25. Kline, *supra* note 19, at 196; Gordon S. Wood, *The Enemy is Us: Democratic Capitalism in the Early Republic*, 16 J. EARLY REPUBLIC 293, 300 (1996); see also JAMES W. ALEXANDER, THE AMERICAN MECHANIC AND WORKING MAN (Philadelphia, James S. Claxton 1867) (1847) (describing scorn toward the “unwashed artificer” as a part of the “old despotic realm”); THOMAS GREENE FESSENDEN, AN ESSAY ON THE LAW OF PATENTS FOR NEW INVENTIONS WITH AN APPENDIX CONTAINING THE FRENCH PATENT LAW, FORMS, & C. 1 (Boston, D. Mallory & Co. 1810) (describing that authors of inventions rarely are recognized or rewarded); HOWE, *supra* note 24, at 3 (describing the distaste for description of invention and the achievements of mechanics); J.K. Mitchell, *On Some of the Means of Elevating the Character of the Working Classes*, 14 J. FRANKLIN INST. 94, 94-95 (1834) (describing the scorn that handworkers face in Europe).

26. Hyman Kuritz, *The Popularization of Science in Nineteenth-Century America*, 21 HIST. OF ED. Q. 259, 259 (1981) (describing the gradual waning of the medieval attitude toward labor as the modern economy emerged); Wood, *supra* note 25, at 299-300.

27. James D. Watkinson, *Reluctant Scholars: Apprentices and the Petersburg (Virginia) Benevolent Mechanics’ Association’s School*, 36 HIST. ED. Q. 429, 429-30 (1996); Wood, *supra* note 25, at 300.

28. Wood, *supra* note 25, at 300.

chanics to gain political influence organized around the laboring interest.²⁹

Government and industrial leaders in the Early Republic believed the promotion of technological progress was necessary for economic survival and continued success of the newly formed democracy.³⁰ The country's vast natural resources far outstripped the labor resources required to utilize them.³¹ Therefore, labor-saving technology became crucial to the continued survival of the republic.³² Combined with the need for economic independence during war-time, this created a zeitgeist that lifted manual labor and technological innovation from a state of scorn to a critical element of Americans' self-perception, and their image abroad.³³ As a result, especially in the heavily industrialized middle atlantic states, artisans operated as entrepreneurs, rather than as dependent laborers, providing needed goods and services to the community.³⁴

Emerging from the revolution, mechanics leveraged their critical position in the nation's political economy and began to organize into political interest groups to advance their agendas.³⁵ They wanted protection of traditional craft ways and economic protection against imported goods, as well as advancement in the social hierarchy.³⁶ Mechanics became an increasingly socially mobile group of individuals and a vital component of the social and political order.

The American embrace of technological innovation found expression in patent law. By the early nineteenth century, this

29. *Id.* at 301.

30. See PAUL ISRAEL, FROM MACHINE SHOP TO INDUSTRIAL LABORATORY: TELEGRAPHY AND THE CHANGING CONTEXT OF AMERICAN INVENTION, 1830-1920, at 7 (1992) (articulating the belief that knowledge of the useful arts and sciences was necessary to progress just as the reliance on political science had been for the revolution).

31. See Edward W. Stevens, Jr., *Technology, Literacy, and Early Industrial Expansion in the United States*, 30 HIST. OF ED. Q. 523, 525 (1990).

32. ISRAEL, *supra* note 30, at 5; CARROLL PURSELL, THE MACHINE IN AMERICA: A SOCIAL HISTORY OF TECHNOLOGY 36 (1995).

33. See, e.g., ALEXIS DE TOCQUEVILLE, DEMOCRACY IN AMERICA 522-23 (Arthur Goldhamer trans., Oliver Zunz ed., Library of America 2004) (1835).

34. Charles S. Olton, *Philadelphia's Mechanics in the First Decade of Revolution 1765-1775*, 59 J. AM. HIST. 311, 315-16 (1972). In this role, they frequently found themselves at odds with merchants and other importers, who formed another interested group of business people in the Early Republic. *Id.*

35. *Id.* at 321.

36. Ronald Schultz, *The Small-Producer Tradition and the Moral Origins of Artisan Radicalism in Philadelphia 1720-1810*, 127 PAST & PRESENT 84, 87-88 (1990).

belief was expressed in terms distinguishing the social order of the Old World from the ideals of a democratic society that embraced labor. Thomas Greene Fessenden, in his 1810 treatise on American patent law, declared that, "In France, Germany, and other nations of continental Europe, useful science and the arts, have been persecuted by bigots."³⁷ In contrast, Fessenden argued that the U.S. patent laws rewarded inventors for their labors—handwork and headwork—that ultimately contributed to social progress.³⁸ Writing just seven years later, in 1817, Justice Story summarized this justification in *Lowell v. Lewis*: "The law confers an exclusive patent right on the inventor of any thing new, and useful, as an encouragement and reward for his ingenuity, and for the expense and labor attending the invention."³⁹

The relatively open and inexpensive U.S. patent system stood in contrast to European patent systems. For example, prior to the 1850s, the English system required a £100 application fee, and personal application in London, which was frequently a hardship for inventors working far from the capital.⁴⁰ Early on, English monopoly grants were highly political, locking out some inventors, and later, in reaction to those monopolies, the English courts were notorious for invalidating challenged patents.⁴¹ As a result, challenging patents through litigation was a patent management strategy, and the costs of defending patent rights were extraordinarily high.⁴² The French system prior to its reform in 1790, was also difficult for patentees to navigate because it relied on heavy state regulation.⁴³ Government bureaucrats identified and rewarded wor-

37. FESSENDEN, *supra* note 25, at xxx.

38. *See id.* at xxxiv, ("The invention is the work of his hands, and the offspring of his intellect.")

39. *Lowell v. Lewis*, 15 F. Cas. 1018, 1019 (C.C.D. Mass. 1817) (No. 8,568).

40. *See* Christine MacLeod, *The Paradoxes of Patenting: Invention and Its Diffusion in 18th- and 19th-Century Britain, France, and North America*, 32 *TECH. & CULTURE* 885, 889-94 (1991).

41. *Id.*

42. WILLARD PHILLIPS, *PHILLIPS ON PATENTS, THE LAW OF PATENTS FOR INVENTIONS INCLUDING THE REMEDIES AND LEGAL PROCEEDINGS IN RELATION TO PATENT RIGHTS* 55 (Boston, American Stationers' Co. 1837) ("[I]t tends to render the validity of patents so precarious, that only men of ample fortune can afford to run the hazard of speculating in this species of property.")

43. *See* MacLeod, *supra* note 40, at 889-94. French patent reform following the French revolution produced a system modeled on the United States' system. *Id.*

thy inventions.⁴⁴ Therefore, an administrator's bias against a patentee or invention could be an insurmountable obstacle for the inventor.⁴⁵

Conversely, the creators of the U.S. patent system designed it with low barriers to entry in response to problems with European patent systems. Although the Patent Act of 1790 incorporated substantive examination of the utility and novelty of inventions by the Secretary of State, the Patent Act of 1793 established a pure registration system.⁴⁶ For a fee of \$30,⁴⁷ an inventor received a patent by alleging that he or she was the first true inventor. The only assessment of the actual novelty and the utility of a patented invention occurred in the courts if it were raised in litigation. Therefore, prior to the Patent Act of 1836, which re-instituted examination, the system had extraordinarily low barriers to entry.

Because the system was so open,⁴⁸ early commentators noted the potential for abuse particularly in the area of improvement inventions. Fessenden wrote, "It is true that many novelties attempted to be introduced are not improvements, and sometimes patents are solicited for *new* inventions as *old* as the days of *Tubal Cain*. But the abuse of a privilege is no argument against the privilege itself."⁴⁹ As a check on the system, judges developed substantial similarity doctrines to regulate the scope of the patent grant, by determining when an original patent grant covered an improvement invention and when an improvement invention merited patent protection in its own right. Justice Story articulated the doctrine in *Odiorne v. Winkley*, stating:

44. *Id.* at 892.

45. *Id.* at 894.

46. BRUCE W. BUGBEE, GENESIS OF AMERICAN PATENT AND COPYRIGHT LAW 150-51 (1967).

47. MacLeod, *supra* note 40, at 893.

48. *See, e.g.,* Whitney v. Emmett, 29 F. Cas. 1074, 1083 (C.C.E.D. Penn. 1831) (No. 17,585) ("[T]he wise policy of the constitution and laws, for securing to inventors the exclusive privilege to use their discoveries for a limited time, has been fully illustrated by the great results produced by the skill of our citizens. Intended for their protection and security, the law should be construed favourably and benignly in favour of patentees When the invention is substantially new, is useful to the public, and the disclosure by the specification and other papers, is made in good faith, and fairly communicated in terms intelligible to men who understand the subject, juries ought to look favourably on the right of property.").

49. FESSENDEN, *supra* note 25, at xxxv; *see also* Dixon v. Moyer, 7 F. Cas. 758, 759 (C.C.D. Penn. 1821) (No. 3,931) ("[T]o permit the defendant to shelter himself under a mere formal difference, would be to sanction a fraudulent evasion of the plaintiff's right, and to render the patent law a dead letter.").

The first question for consideration is, whether the machines used by the defendant are substantially, in their principles and mode of operation, like plaintiff's machines The material question, therefore, is not whether the same elements of motion, or the same component parts are used, but whether the given effect is produced substantially by the same mode of operation, and the same combination of powers, in both machines. Mere colorable differences, or slight improvements, cannot shake the right of the original inventor.⁵⁰

The doctrine defined the scope of an invention through judging similarity. Therefore, the criteria used in making the judgment were extremely malleable.⁵¹ The characteristics of inventions that judges, juries, and experts considered important in determining similarity varied widely.⁵² However, prior to the late 1840s courts limited that malleability by contemplating similarity strictly through the lens of the discovery itself.⁵³ Inventive methodology and the skill of the inventor

50. *Odiorne v. Winkley*, 18 F. Cas. 581, 582 (C.C.D. Mass. 1814) (No. 10,432); *see also* *Davis v. Palmer*, 7 F. Cas. 154, 159 (C.C.D. Va. 1827) (No. 3,645); *Dixon*, 7 F. Cas. at 759.

51. *See, e.g., Dixon*, 7 F. Cas. at 759 ("In actions of this kind, persons acquainted with the particular art to which the controversy relates are usually examined for the purpose of pointing out and explaining to the jury the points of resemblance, or of difference, between the thing patented, and that which is the alleged cause of the controversy."); *see also* Carolyn C. Cooper, *Social Construction of Invention Through Patent Management: Thomas Blanchard's Woodworking Machinery*, 32 *TECH & CULTURE* 960, 983 (1991) (describing how different expert witnesses relied on different features of a machine to assess similarity).

52. *See* Cooper, *supra* note 51, at 983.

53. *See, e.g., Evans v. Eaton*, 20 U.S. (7 Wheat.) 356, 430-31 (1822) ("[I]t is clear that the party cannot entitle himself to a patent for more than his own invention; and if his patent includes things before known, or before in use, as his invention, he is not entitled to recover, for his patent is broader than his invention. If, therefore, the patent be for the whole of a machine, the party can maintain a title to it only by establishing that it is substantially new in its structure and mode of operation. If the same combinations existed before in machines of the same nature, up to a certain point, and the party's invention consists in adding some new machinery, or some improved mode of operation, to the old, the patent should be limited to such improvement, for if it includes the whole machinery, it includes more than his invention, and therefore cannot be supported."); *Davis*, 7 F. Cas. at 159 ("It is not every change of form and proportion which is declared to be no discovery, but that which is simply a change of form or proportion and nothing more."); *Dixon*, 7 F. Cas. at 759 ("[I]f the difference between them be only in form or proportions, they are the same in legal contemplation; since to permit the defendant to shelter himself under a mere formal difference, would be to sanction a fraudulent evasion of the plaintiff's right, and to render the patent law a dead letter In actions of this kind, persons acquainted with the particular art to which the controversy relates are usually examined for the purpose of pointing out and explaining to the jury the points of resemblance, or of difference, between the thing patented, and that which is the alleged cause of the

were not considered in judging substantial similarity.

Although the level of skill and inventiveness could not be considered in judging substantial similarity, it was a part of the law regarding adequacy of the specification, which described an invention.⁵⁴ The specification controlled patent scope by limiting the invention strictly to what was claimed in the specification. In order to be held valid, the specification must have been clear enough to enable a person skilled in the art to make the invention.⁵⁵ In other words, a specification was adequate if making the invention did not require any further acts of invention.⁵⁶ This requirement ensured that in re-

controversy."); *Kneass v. Schuylkill Bank*, 14 F. Cas. 746, 748 (C.C.D. Penn. 1820) (No. 7,875) ("If the plaintiff's invention correspond [sic] substantially with the thing used by the defendants, how can the latter be permitted to say, that the thing so discovered and used is worthless? In the case of *Lowell v. Lewis*, Mr. Justice Story, commenting upon this subject, lays it down that the law only requires that the invention should not be frivolous or injurious to the well being, good policy, and sound morals of society."); PHILLIPS, *supra* note 42, at 127 ("The sufficiency of the invention depends not upon the labor, skill, study, or expense applied or bestowed upon it, but upon its being diverse and distinguishable from what is familiar and well known, and also substantially and materially, not slightly and trivially so."). Even with substantial similarity as a check on the system, frustrations about abuse were mounting. See, e.g., *Thompson v. Haight*, 23 F. Cas. 1040, 1041 (C.C.S.D.N.Y. 1826) (No. 13,957) (critiquing the registration system and calling for the institution of an examination system through legislative reform) ("The most frivolous and useless alterations in articles in common use are denominated improvements, and made pretexts for increasing their prices, while all complaint and remonstrance are effectually resisted by an exhibition of the great seal.").

54. See, e.g., *Whitney v. Emmett*, 29 F. Cas. 1074, 1083 (C.C.E.D. Penn. 1831) (No. 17,585) ("If from the patent, specification, drawings, model and old machine, clear ideas are conveyed to men of mechanical skill in the subject matter, by which they could make or direct the making of the machine by following the directions given, the specification is good within the act of congress."); PHILLIPS, *supra* note 42, at 282-84 ("The act of Congress of 1836, § 7, following very closely that of 1793 . . . requires the inventor to describe his invention, in his specification, so as 'to enable any person, skilled in the art or science to which it appertains, or with which it is most nearly connected, to make, construct, compound and use the same.' This is only an express enactment of what has been the established construction of the English statute of monopolies 'If the specification be such that mechanical men of common understanding can comprehend it, to make a machine by it, it is sufficient; but then it must be such persons skilled in the art or science to which the invention relates may be able to make the machine by following the directions of the specification, without making any experiments, and without any new invention or addition of their own.'").

55. E.g., *Whitney*, 29 F. Cas. at 1083 ("If from the patent, specification, drawings, model and old machine, clear ideas are conveyed to men of mechanical skill in the subject matter, by which they could make or direct the making of the machine by following the directions given, the specification is good within the act of congress.").

56. PHILLIPS, *supra* note 42, at 241 ("Mr. Justice Washington, speaking of the provisions of the act of Congress of 1793, relating to specifications, remarks, that 'the expressions are very strong, and seem intended to accommodate the description, which the patentee is required to give, to the comprehension of any practical mechanic, skilled in the art of which the machine is a branch, without taxing his genius or his inventive powers.'").

turn for a monopoly in the invention, the inventor fully enabled the public to benefit from it.⁵⁷

Inventiveness was neither a requirement of patentability, nor an accepted criterion for judging the similarity of inventions.⁵⁸ Nevertheless, in 1825, the defendants in *Earle v. Sawyer* included discussions of the skill of the inventor as a litigation strategy, arguing that inventiveness was a requirement of patentability in addition to novelty and utility.⁵⁹ *Earle v. Sawyer* was a substantial similarity case decided by Justice Story.⁶⁰ In *Earle*, the challenged invention was a shingle mill that substituted a circular saw in place of a perpendicular saw.⁶¹ Both the shingle mill and the circular saw existed unaltered from prior forms.⁶² Story rejected the litigant's arguments about the inventive skill required to make the improvement, instead upholding the settled law that utility and novelty were the only relevant criteria in assessing patentability:

It did not appear to me at trial, and it does not appear to me now, that this mode of reasoning upon the metaphysical nature, or the abstract definition of an invention, can justly be applied to cases under the patent

57. *E.g., Whitney*, 29 F. Cas. at 1081 (“[F]or the end and meaning of the specification is to teach the public after the term for which the patent is granted what the privilege expired is, and it must put the public in possession of the secret in as ample and beneficial a way as the patentee himself uses it. This I take to be clear law as far as respects the specification, for the patent is the reward which . . . is held out for a discovery, and therefore, unless the discovery be true and fair, the patent is void.”); FESSENDEN, *supra* note 25, at 105-07.

58. Because inventiveness was not a requirement, it is not discussed in the early case law. According to treatise writers, writing after the resolution of *Earle v. Sawyer*, inventiveness was considered only to the extent that it was implied through assessment of novelty. However, it is not clear whether inventiveness was ever even discussed in cases prior to *Earle*. See, *e.g.*, PHILLIPS, *supra* note 42, at 127 (“The sufficiency of the invention depends not upon the labor, skill, study, or expense applied or bestowed upon it, but upon its being diverse and distinguishable from what is familiar and well known, and also substantially and materially, not slightly and trivially so.”). But see Duffy, *supra* note 3, at 38 (contending that note 127 in Phillips stands for the proposition that inventive skill could be tested in judging similarity). Duffy makes much of Phillips’ passing use of the word obvious, but the note in Phillips describes how novelty was judged through the doctrine of substantial similarity. See PHILLIPS, *supra* note 42, at 125-26.

59. *Earle v. Sawyer*, 8 F. Cas. 254, 255 (C.C.D. Mass. 1825) (No. 4,247) (“[I]t was testified, that the machinery, by which a circular saw should be substituted for a perpendicular saw, in the plaintiff’s old machine, was so obvious to mechanics, that one of ordinary skill, upon the suggestion being made to him, could scarcely fail to apply it in the mode which the plaintiff had applied his.”).

60. *Id.*

61. *Id.* at 254.

62. *Id.* at 254.

act. That act proceeds upon the language of common sense and common life, and has nothing mysterious or equivocal in it It is of no consequence, whether the thing be simple or complicated; whether it be by accident, or by long, laborious thought, or by an instantaneous flash of mind, that it is first done. The law looks to the fact, and not to the process by which it is accomplished. It gives the first inventor, or discoverer of the thing, the exclusive right, and asks nothing as to the mode or extent of the application of his genius to conceive or execute it.⁶³

Earle was the first and only reported case discussing the rejection of mechanical skill as a metric for gauging similarity, and remained settled law until the late 1840s.⁶⁴

The open character of the patent system, and the unwillingness of judges to assess the process of invention, contributed to a broad distribution of patents throughout society.⁶⁵ Although formally educated inventors had some advantage even in the early patent system, historical data show the skills of invention were broadly dispersed,⁶⁶ and most inventors were regular laborers—mechanics—rather than career inventors.⁶⁷ Mechanics were viable inventors, and the settled law did not look to the skill or methodology of the inventor—in other words, to the process of invention—in assessing the patentability of a discovery.

63. *Id.* at 255-56.

64. The first case discussing mechanical skill in this context was *Hotchkiss v. Greenwood*, 12 F. Cas. 551, 552 (C.C.D. Ohio 1848) (No. 6,718), *aff'd*, 52 U.S. (11 How.) 248 (1850), discussed at length in Part III.

65. See KHAN, *supra* note 15, at 90 (discussing the standard set forth in *Earle v. Sawyer*).

66. Kenneth L. Sokoloff & B. Zorina Khan, *The Democratization of Invention During Early Industrialization: Evidence from the United States, 1790-1846*, 50 J. EC. HIST. 363, 377 (1990).

67. B. Zorina Khan & Kenneth L. Sokoloff, "Schemes of Practical Utility": *Entrepreneurship and Innovation Among "Great Inventors" in the United States, 1790-1865*, 53 J. EC. HIST. 289, 292 (1993) (describing that half of all inventors had little to no schooling and less than a quarter had any college or university training).

III. THE PHILOSOPHICAL MECHANIC AND THE PRACTICAL PHILOSOPHER: REIMAGINING SCIENCE, TECHNOLOGY, AND INVENTION

Under traditional systems of craft learning, knowledge was acquired through experience and passed on through oral traditions. But by the early nineteenth century, the mechanics' movement began to see scientific education as the key to improving the social status of mechanics. Simultaneously, prominent spokesmen for science linked science with technological innovation bringing science into the public eye and raising its' perceived worth. This re-imagining of the relationship among science, technology, and invention did not describe how most innovation occurred. Instead, it flowed from an ideology developed by prominent public proponents of science and engineering, and marked a significant shift away from the democratized discourse about invention that had persisted from colonial times through the 1840s. Factions soon developed within the mechanics' movement, a new core science lobby who advocated heightened requirements for patentability, and an inventors' lobby, proponents of inventors' rights who advocated continuing the relatively lax patentability requirements. These two groups contended for influence in the patent system. Against this backdrop, the Supreme Court Justices turned their attention toward the process of invention. They created a judicial ideology of invention, which adopted many of the arguments proffered by the proponents of science, and intertwined them with existing patentability doctrines.

Traditionally, in the colonial period and into the early nineteenth century, craft skills, including engineering,⁶⁸ were taught through an apprenticeship system.⁶⁹ Apprentices learned from master mechanics through oral instruction and by emulating their work.⁷⁰ Mechanics frequently made useful improvements in their craft because they thoroughly understood the state of the art and possessed the mechanical skill and

68. Terry S. Reynolds, *The Education of Engineers in America Before the Morrill Act of 1862*, 32 HIST. OF ED. Q. 459, 460 (1992).

69. See, e.g., Wood, *supra* note 25, at 300.

70. ISRAEL, *supra* note 30, at 13.

knowledge to create new prototypes through trial and error.⁷¹ But beginning early in the nineteenth century in response to perceived class bias against mechanics, mechanics' interest groups urged their members to obtain formal education in science and natural philosophy.⁷² They hoped that diligently working to educate themselves would improve their moral character and social standing.⁷³

Public and industrial need for qualified technical workers, which far outstripped the supply of skilled workers completing traditional apprenticeships, also drove the move toward formal education. During the first half of the nineteenth century, engineers—traditionally taught by apprenticeship—were in very short supply,⁷⁴ but the need for engineers had increased dramatically because of large public works projects undertaken between 1816 and 1850.⁷⁵

Industrial expansion and technological change also drove the need for educated workers. As industrial technology became more complex, technical knowledge was built into machines, driving private sector need for engineers and experienced workers who understood precision machinery.⁷⁶ As the century progressed, higher educational institutions—universities and polytechnics—began to fill the training gap.⁷⁷

While mechanics began to draw on the symbolic capital and practical advantages of formal education, proponents of science contemporaneously struggled to establish the social value of science. Beginning in the late 1820s and early 1830s,

71. *Id.* at 20-21.

72. SINCLAIR, *supra* note 1, at 13; Kuritz, *supra* note 26, at 262-64; Stevens, *supra* note 31, at 528-30.

73. Mitchell, *supra* note 25, at 95-96; see also ISRAEL, *supra* note 30, at 13; Watkinson, *supra* note 27, at 431-34.

74. Reynolds, *supra* note 68, at 459.

75. EDWIN T. LAYTON, JR., *THE REVOLT OF THE ENGINEERS: SOCIAL RESPONSIBILITY AND THE AMERICAN ENGINEERING PROFESSION 2* (2d ed., Johns Hopkins Univ. Press 1986) (1971).

76. Stevens, *supra* note 31, at 525-26.

77. Traditionally, military colleges had the only formal educational offerings in engineering. Beginning with West Point in 1802, and expanding to a handful of other military academies, these schools sought to fill the need for military engineers. But by 1824, with the founding of the Rochester Polytechnic Institute, civilian institutions began to step in and fill the void. At least four northeastern universities, including Princeton, Columbia, and Brown, included some technical engineering offerings prior to 1840, and many other institutions followed suit between 1840 and 1860. By 1861, with the founding of the Massachusetts Institute of Technology, the coupling of engineering training with university education was a foregone conclusion. Reynolds, *supra* note 68, at 463-68.

men like Alexander Dallas Bache,⁷⁸ who later ran the United States Coastal Survey and founded the National Academy of Sciences,⁷⁹ and Joseph Henry, who later became the first director of the Smithsonian Institution,⁸⁰ worked to improve popular awareness and support of science. To draw public attention and support to scientific work, they introduced utility into the public discourse about science⁸¹ by arguing that scientific discovery underpinned technological advance, and by tying the promotion of science to the cause of mechanics' education.⁸² For example, in a lecture delivered in 1831, Henry described the linkage between science and the mechanical arts:

The advancement of these arts must be felt as an object of great importance both to nations and individuals. Now without the application of correct scientific knowledge to this purpose they must ever remain stationary or their advance be extremely slow. This position will appear evident when we reflect that every mechanic art is based upon some principle of one of general laws of nature and that the more intimately acquainted we are with these laws the more capable we must be to advance and improve arts.⁸³

Henry's purpose was not only to show the linkage between science and the mechanical arts, but also to foster pure theoretical science, which, in his view, led to true progress in the mechanical arts. Henry and other proponents of science established pure science as a valuable commodity, and created an employment niche for scientists as teachers.⁸⁴ Later in the same lecture, Henry explained the importance of science to na-

78. SINCLAIR, *supra* note 1, at 129; Nathan Reingold, *Alexander Dallas Bache: Science and Technology in the American Idiom*, 11 *TECH. & CULTURE* 163, 171 (1970).

79. Reingold, *supra* note 78, at 163.

80. See, e.g., George H. Daniels, *The Pure-Science Ideal and Democratic Culture*, 156 *SCI.* 1699 (1967); Kuritz, *supra* note 26, at 259; Edwin T. Layton, Jr., *American Ideologies of Science and Engineering*, 17 *TECH. & CULTURE* 688, 690-91 (1976) [hereinafter Layton, *Ideologies*]; Arthur P. Mollera & Nathan Reingold, *Theorists and Ingenious Mechanics: Joseph Henry Defines Science*, 3 *SCI. STUDIES* 323, 333 (1973).

81. Daniels, *supra* note 80, at 1699; John C. Greene, *Science and the Public in the Age of Jefferson*, 49 *ISIS* 13, 23 (1958).

82. Kuritz, *supra* note 26, at 268-69; Layton, *Ideologies*, *supra* note 80, at 690.

83. Joseph Henry, *Introductory Lectures on Chemistry* (Jan.-Mar.1832), in 1 *THE PAPERS OF JOSEPH HENRY, DECEMBER 1797 - OCTOBER 1832*, at 381 (Nathan Reingold ed., 1972).

84. *Id.* at 397.

tional interests stating:

It is obvious then that if any study be of value to us as a nation it is that of science applied to the useful arts. By its prosecution we may be placed on the same level if not on a higher [level] with the most improved nations of Europe. By it alone our native talent for inventive tasks may be properly directed and successfully applied to the promotion of our national wealth and power.⁸⁵

In Henry's view, pure theoretical science was vital to the progress of the nation.

Mechanics' groups like the Franklin Institute, of which both Bache and Henry were members, seized this reasoning and used the linkage of science to technological advance to heighten the social status of mechanics.⁸⁶ By linking their upward mobility to scientific education, mechanics tapped into the popular vision at home and abroad of Americans as masters of useful innovation in a progressive democratic society free from Old World social prejudices.

The movement to link scientific research to technological advance raised the social position of mechanics, brought science into the popular eye, and created the economic circumstances necessary for its furtherance, but it did not accurately characterize how most patented inventions were actually created during this time period.⁸⁷ Even by the 1850s, most inventors applying for patents lacked formal education or university training—a trend that would not begin to notably change until the mid-1860s.⁸⁸ As such, most mechanics lacked

85. *Id.* at 395.

86. *E.g.*, Mitchell, *supra* note 25, at 94-95 ("Science, as contradistinguished from learning, enters into every, even the humblest and simplest mechanical occupation That mechanics have not closely studied philosophy, is attributable chiefly to the thralldom of prejudice, and the disabilities which, created in feudal times, are not yet removed, even in our own age and country [N]ow, when science opens her arms to receive him [the mechanic], and beckons him to her temple, he must enter her honourable [sic] courts, or blame himself alone for his exclusion The revolution begun in '76, will not be completed until the artificial barriers of society, instituted in Europe, have been entirely overthrown; and that can be done solely through that cultivation which will render them unnecessary.").

87. See generally Barry Barnes, *The Science-Technology Relationship: A Model and a Query*, 12 SOC. STUD. ON SCI. 166 (1982); Layton, *Ideologies*, *supra* note 80, at 688; Edwin T. Layton, Jr., *Mirror-Image Twins: The Communities of Science and Technology in 19th-Century America*, 12 TECH. & CULTURE 562 (1971).

88. Khan & Sokoloff, *supra* note 67, at 293.

the sophisticated reading comprehension required to consult written works using abstract mathematical notation or describing scientific principles using abstruse terms of art.⁸⁹ Nevertheless, because of their aptitude with spatial reasoning,⁹⁰ and their exhaustive familiarity with the machines they used, mechanics frequently made patentable improvements on the workshop floor.⁹¹ Finally, despite efforts of the mechanics' movement to formally educate workers by bringing together professional scientists and mechanics, such interactions were very rare.⁹² The proponents of science who argued that useful inventions emerged from theoretical scientific inquiry offered a normative ideology rather than descriptive theory of invention.

The early synergy between science and the mechanics' movements gave way, splintering the mechanics' movement into different interests. By the early 1840s proponents of science, who frequently had formal education, began to organize into their own interest groups. The American Association of Geologists formed in 1840, and was consolidated with the American Association of Geologists and Naturalists in 1843.⁹³ In 1846, the Smithsonian was founded and Henry installed as its director.⁹⁴ Under Bache's leadership, in 1848, the American Association of Geologists and Naturalists changed its name to the American Association for the Advancement of Science.⁹⁵ Finally, by 1851, Bache had organized a group of formally educated scientists to promote the causes of professional science, who mockingly called themselves "the Lazzaroni" after the group of poor monarchists from eighteenth-century Naples.⁹⁶

89. See Stevens, *supra* note 31, at 532, 544.

90. See generally Eugene S. Ferguson, *The Mind's Eye: Nonverbal Thought in Technology*, 11 LEONARDO 131 (1978).

91. See ISRAEL, *supra* note 30, at 20-21.

92. John B. Rae, *The 'Know-How' Tradition: Technology in American History*, 1 TECH. & CULTURE 139, 143 (1960).

93. LILLIAN B. MILLER, FREDERICK VOSS & JEANNETTE M. HUSSEY, THE LAZZARONI: SCIENCE AND SCIENTISTS IN MID-NINETEENTH-CENTURY AMERICA 3 (1972).

94. *Id.*

95. *Id.*

96. Reingold, *supra* note 78, at 163 n.1. Reingold lists the prominent members of the Lazzaroni as: zoologist Louis Aggasiz, astronomer B.A. Gould, mathematician Benjamin Pierce, chemist O.W. Gibbs, Navy astronomer Charles Henry Davis, and with some reservations about the program, physicist Joseph Henry. *Id.* Reingold notes that this was not a unitary

Like the science lobby, inventors also coalesced into interest groups, primarily to shape patent law to their advantage. The National Association of Inventors formed in 1845 “for the purpose of encouraging and protecting, as far as may be in their power, the rights of the inventors of new and useful improvements in the arts.”⁹⁷ Proponents of the inventors’ lobby included Munn and Co., the proprietors of the highly influential publication *Scientific American*, first published in 1847.⁹⁸ By 1850, Munn and Co. also owned the largest patent agency in the country.⁹⁹ Moreover, the inventors’ lobby expanded to include former examiners when they left the patent office to work as private patent solicitors.¹⁰⁰

Tensions soon flared between the science lobby and the inventors’ lobby surrounding ideological differences about the functioning of the patent system. The science lobby supported rigidly enforced standards for patent examination with rigorous prior art searching and a low level of patent grant.¹⁰¹ They disfavored patent grants for minor improvement inventions because they believed such invention stymied true technological progress, which they thought followed on groundbreaking scientific discoveries.¹⁰² Conversely, the inventors’ lobby favored liberal examination and grant of patents, with a high degree of deference toward the patentee in order to stimulate incremental improvement inventions.¹⁰³ The two factions fundamentally disagreed about which innovations were worthy of the patent grant, and which innovations would best drive economic growth. The science lobby and the inventors’ lobby were soon in contest over control of patentability standards.

The science lobby sought and achieved influence within in the Patent Office by ensuring that the office hired professional

group. There were some professional scientists who did not support the Lazzaroni or who were not closely affiliated with the group. *Id.* at 164 n.2; *see also* MILLER, VOSS & HUSSEY, *supra* note 93, intro.

97. Nat’l Ass’n of Inventors, *National Association of Inventors*, 10 J. FRANKLIN INST. 1 (1845).

98. Robert C. Post, “*Liberalizers*” Versus “*Scientific Men*” in the Antebellum Patent Office, 17 *TECH. & CULTURE* 24, 34 (1976).

99. *Id.* at 41.

100. *Id.* at 44.

101. *See* Molella & Reingold, *supra* note 80, at 337.

102. *Id.*

103. *See generally* Post, *supra* note 98, at 24. Early attempts to influence patent law used the press. *See, e.g.*, ISRAEL, *supra* note 30, at 20-21 (citing an 1836 publication).

scientists as patent examiners.¹⁰⁴ These men were formally trained scientists who had often held appointments as university professors.¹⁰⁵ Under these examiners rejection rates were high—in 1853, the percentage of patents granted compared to the number of applications filed was less than half that in 1842—and examiners were quick to find substantial similarity and mechanical equivalents to disqualify improvement applications.¹⁰⁶

Despite the early success of the science lobby in the Patent Office, by 1848, the inventors' pleas for reform reached Congress. But the call for reform had initially only been aimed at the speed of examination. Congress responded by adding more examiner positions, but this still did not change the methods and standards of examination.¹⁰⁷ By 1850, the inventors' lobby explicitly called for liberalization of examination.¹⁰⁸ In response, during the early 1850s, the Patent Office began to replace the so-called "scientific men" with counterparts more willing to confer the patent grant.¹⁰⁹ As a result, the ratio of patents granted to applications filed skyrocketed.¹¹⁰

Justices adjudicated patent litigation in the circuit courts and in the Supreme Court against this tumultuous political backdrop. Scientists and engineers, including Henry himself, sat as expert witnesses in litigation.¹¹¹ Likewise, the inventors' lobby

104. Post, *supra* note 98, at 32-33 (describing the connections between hired examiners and Henry and Bache). The level of Bache's influence in government generally cannot be overstated. According to Reingold, "Bache had neither peers nor effective rivals in governmental circles. From the lowly chemist of the Department of Agriculture to the lordly superintendent of the Naval Observatory, all were apparently friends, students, or sycophants." Reingold, *supra* note 78, at 165.

105. Post, *supra* note 98, at 37-39.

106. *Id.* at 30.

107. *Id.* at 35.

108. *Id.* at 42-44.

109. Post, *supra* note at 98. Interestingly, the new examiners frequently also had professional training. The difference was their views about the patent grant. Also interestingly, many of the dismissed examiners went into private practice as patent solicitors and subsequently changed their views about the patent grant, joining forces with the inventors' lobby. *Id.* at 43-44.

110. *Id.*

111. Henry testified as an expert witness in the landmark case *O'Reilly v. Morse*, 56 U.S. (15 How.) 62, 107 (1853). See also *Dixon v. Moyer*, 7 F. Cas. 758, 759-60 (C.C.D. Penn. 1821) (No. 3,931) (describing the practice of the use of expert witnesses in judging similarity, and that in this case, the testimonies of various witnesses were not in agreement); Cooper, *supra* note 51, at 983 (describing the many different persons called as expert witnesses and their varying interpretations of similarity).

was well-supported by patent agencies, as well as solicitors and attorneys who played roles in patent application and litigation.¹¹² Moreover, publications like *Scientific American*, an ardent and vocal supporter of the inventors' lobby, had become quite popular.¹¹³ The Justices reviewed patent cases in light of an ongoing and highly publicized debate about the patent system.

Early on, the science lobby gained leverage through the adjudication of decisions. Justice Story, who had once described handwork as a necessary element of invention,¹¹⁴ in 1840, described invention exclusively as a mental process.¹¹⁵ This opened the door to distinguishing mechanical skill from inventive skill. Justice McLean, riding circuit in 1848, decided the now famous case, *Hotchkiss v. Greenwood*, that first fully articulated this distinction.¹¹⁶ The issue in *Hotchkiss* was whether the substitution of porcelain for wood or metal in the construction of a door-knob amounted to an invention under the doctrine of substantial similarity.¹¹⁷ The plaintiffs asked for skill to be evaluated by the jury — arguing that if the invention was novel, was better and cheaper than prior knobs, and required skill and thought, then the patent should be upheld.¹¹⁸ This request backfired drastically when Justice McLean instead instructed the jury:

112. Post, *supra* note 98, at 34.

113. *Id.* at 41.

114. See *Earle v. Sawyer*, 8 F. Cas. 254, 255-56 (C.C.D. Mass. 1825) (No. 4,247) ("It did not appear to me at trial, and it does not appear to me now, that this mode of reasoning upon the metaphysical nature, or the abstract definition of an invention, can justly be applied to cases under the patent act. That act proceeds upon the language of common sense and common life, and has nothing mysterious or equivocal in it The thing to be patented is not a mere elementary principle, or intellectual discovery, but a principle put in practice, and applied to some art, machine, manufacture, or composition of matter.").

115. *Phila. & Trenton R.R. v. Stimpson*, 39 U.S. (14 Pet.) 448, 462 (1840) ("The invention itself is an intellectual process or operation.").

116. *Hotchkiss v. Greenwood*, 12 F. Cas. 551, 552 (C.C.D. Ohio 1848) (No. 6,718), *aff'd*, 52 U.S. (11 How.) 248 (1850).

117. *Id.*

118. *Hotchkiss v. Greenwood*, 12 F. Cas. 551, 552 (C.C.D. Ohio 1848) (No. 6,718) ("[I]f such shank and spindle had never before attached to potter's clay or porcelain, and if it required skill and thought and invention to attach the said knob of clay to the metal shank and spindle, so that the same would unite firmly and make a solid and substantial article or manufacture; and if the said knob of clay or porcelain so attached, were an article better and cheaper than the knob theretofore manufactured of metal or other materials, that the patent was valid."), *aff'd*, 52 U.S. (11 How.) 248 (1850).

[I]f knobs of the same form and for the same purposes . . . made of metal of other material, had been known and used in the United States prior to the alleged invention and patent of the plaintiffs; and if the spindle and shank . . . to be attached to the knob of potter's clay or porcelain . . . is the mere substitution of one material for another . . . the material being in common use, and no other ingenuity or skill being necessary to construct the knob than that of an ordinary mechanic acquainted with the business, the patent is void and the plaintiffs are not entitled to recover.¹¹⁹

The jury decided in favor of the defendants, but the case was subsequently appealed to the Supreme Court. Justice Nelson, writing for the Court, and adopting Justice McLean's reasoning from the decision below, held that:

[U]nless more ingenuity and skill in applying the old method of fastening the shank and the knob were required in the application of it to the clay or porcelain knob than were possessed by an ordinary mechanic acquainted with the business, there was an absence of that degree of skill and ingenuity which constitute essential elements of every invention. In other words, the improvement is the work of the skillful mechanic, not that of the inventor.¹²⁰

The language in *Hotchkiss* marked the first time the Court accepted level and type of skill of the inventor as a measure of similarity of the inventions, making skill a factor in judging the scope of invention.¹²¹ The Court's language implied that inventive skill and ingenuity *must be present* in every invention.¹²² Conversely, the Court used the presence of mechanical

119. *Id.* at 553 (emphasis added).

120. *Hotchkiss v. Greenwood*, 52 U.S. (11 How.) 248, 267 (1850).

121. *But see* GEORGE TICKNOR CURTIS, A TREATISE ON THE LAW OF PATENTS FOR USEFUL INVENTIONS IN THE UNITED STATES OF AMERICA 26-29 (Boston, Little, Brown 2d ed. 1854) (contending after *Hotchkiss* that inventiveness is only judged through the invention itself) [hereinafter CURTIS, 1854]; GEORGE TICKNOR CURTIS, A TREATISE ON THE LAW OF PATENTS FOR USEFUL INVENTIONS IN THE UNITED STATES OF AMERICA 23-25 (Boston, Little, Brown 3d ed. 1867) (still contending that novelty and utility are the only standards for patentability). However, the litigants in *Hotchkiss* had cited Curtis' first edition for these propositions, and the *Hotchkiss* court found it unpersuasive and instead relied on skill. *Hotchkiss*, 52 U.S. (11 How.) at 255-57.

122. *Hotchkiss*, 52 U.S. (11 How.) at 267.

skill as an indication that inventive skill had not been present in the conception of the invention.¹²³ If an inventor had only used mechanical skill, then the requisite amount of inventiveness was lacking.¹²⁴ The consideration of mechanical skill and inventiveness introduced in *Hotchkiss* therefore shifted the gaze of the Court away from the products of invention and toward the *process* of invention.¹²⁵

The *Hotchkiss* decisions were part of a cluster of cases decided from 1848 through 1853 that illustrate the Justices of the Supreme Court grappling with issues raised in the debate between the science lobby and the inventors' lobby. *Hotchkiss* itself forwarded the science lobby's more restrictive view toward patents by adding a new hurdle—the presence of inventiveness rather than mere mechanical skill—to obtaining improvement patents.¹²⁶ Subsequently, in the decisions decided in the wake of *Hotchkiss*, the Court espoused an ideology of invention, which adopted elements of the science lobby's ideology and intertwined them with existing legal doctrines.

The new judicial ideology of invention built directly from *Hotchkiss*' clear statements that the act of invention was a form of headwork, but the exercise of mechanical skill was not invention. The circuit cases following *Hotchkiss* reiterated that the exercise of mechanical skill indicated an absence of invention.¹²⁷ Moreover, invention was defined solely as headwork

123. *Id.*

124. *See id.*

125. *See supra* notes 48-53 and accompanying text (describing that substantial similarity doctrines focused on the invention itself rather than the process of invention).

126. *Hotchkiss*, 52 U.S. (11 How.) at 267.

127. *See, e.g.,* *Gibson v. Van Dresar*, 10 F. Cas. 329, 333 (C.C.N.D.N.Y. 1850) (No. 5,402) ("Some mechanical ingenuity is doubtless displayed in transferring the pressure from the face of the board to the edges, and in combining it with the planes or cutters. But that is not always enough to distinguish the new from the old machine. If it were, a patent would not be worth the money paid for the parchment upon which it is written. A given mechanical power is frequently essential to enable an inventor to carry his improvement into operation and effect. For this he is indebted to another department of knowledge - mechanical experience and skill; and such is the proficiency in that department, that an ingenious mechanic will furnish him with the necessary power in various ways, and by different combinations of machinery."); *Many v. Jagger*, 16 F. Cas. 677, 683 (C.C.N.D.N.Y. 1848) (No. 9,055) ("Now, any person of common understanding would see that the thing could be done in that way. It was a mere difference in the mechanical contrivance, and a change in form, in which there was no skill and no ingenuity. This illustrates the difference between a change of form, and a substantial change involving mind, ingenuity and invention."); *see also McCormick v. Seymour*, 15 F. Cas. 1322, 1325 (C.C.N.D.N.Y. 1851) (No. 8,726) ("It is insisted by the defendants that this arrangement is not the subject of a patent, but is a very common device, involving no skill or ingenui-

in contrast to mechanical skill, which was associated with manual labor.¹²⁸ For example, in *Tatham v. LeRoy*, Justice Nelson explained that the distinction between mechanical skill and invention was based on whether the improvement could be construed as headwork as opposed to manual labor stating:

What I mean to say is this – that, in order to ascertain and determine whether the change in the arrangement and construction of an existing machine is to be considered as a substantial change or not, you must ascertain and determine *whether the change is the result of mechanical skill, worked out by mechanical devices – of a knowledge that belongs to that department of labor – or whether the change is the result of mind, of genius, of invention, in which you discover something more than mere mechanical skill and ingenuity.* A change in the arrangement and construction is not substantial, unless you find embodied in it, over and beyond the skill of the mechanic, that inventive element of the mind which is to be found in every machine or improvement that is the proper subject of a patent.¹²⁹

Moreover, the Justices sided with the science lobby in determining what *kind* of headwork indicated the presence of invention. They favored invention done empirically and methodically over trial and error methods and *a priori* reasoning. This shift is illustrated by *Goodyear v. Day*, decided in 1852 by Justice Grier riding circuit.¹³⁰ Goodyear had discovered, counter intuitively, that rubber would vulcanize when exposed to extreme heat.¹³¹ The court found in Goodyear's favor seizing on the arguments of Daniel Webster, Goodyear's counsel, that the distinction between Goodyear and other experimenters was that they had reasoned *a priori*, while Goodyear had per-

ty beyond that of the clever mechanic; that it would have suggested itself to any one using the machine; and that it embodies no inventive mind."'). In *Larabee v. Cortlan*, Justice Taney took a slightly different approach to the problem, explaining that if a mechanic of ordinary skill could have made the improvement, it did not amount to invention. 14 F. Cas. 1136 (C.C.D. Md. 1851) (No. 8,084).

128. *Tatham v. LeRoy*, 23 F. Cas. 709, 713 (C.C.S.D.N.Y. 1852) (No. 13,760), *rev'd on other grounds*, 55 U.S. (14 How.) 156 (1852).

129. *Id.* (emphasis added).

130. *Goodyear v. Day*, 10 F. Cas. 678 (C.C.D.N.J. 1852) (No. 5,569).

131. *Id.* at 680.

sisted in empirical scientific experiments.¹³²

The Court also adopted a temporal framework from the science lobby, within which it located the entire process of invention, from the initial steps that preceded the moment of invention, to the final steps of perfecting and operationalizing an invention that anteceded the moment of invention. Within this temporal framework, the Court viewed abstract scientific understanding as a necessary precursor to invention, and mechanical skill as a necessary tool in perfecting an innovation after it was invented.¹³³ In the landmark decision of *O'Reilly v. Morse*, litigating both the priority and scope of the electromagnetic telegraph,¹³⁴ the Court described the relationship of science to invention asserting that the telegraph could not have been made without scientific knowledge—a necessary precursor of invention.¹³⁵ Moreover, the Court also asserted that it could not have been made without mechanical skill, which was necessary for successful operation stating:

[I]t is evident that such an invention as the Electro-Magnetic Telegraph could never have been brought into action without it [scientific knowledge]. For a very high degree of scientific knowledge and the nicest skill in the mechanic arts are combined in it, and were both necessary to bring it to successful operation.¹³⁶

The work of mechanics, while necessary to perfect the device, occurred after the moment of invention and did not itself rise to the level of invention.¹³⁷ The reasoning in the cases litigating substantial similarity therefore assumed that only a person who both understood and articulated the underlying

132. *Id.*

133. *E.g.*, *O'Reilly v. Morse*, 56 U.S. (15 How.) 62, 109 (1853).

134. *Id.* at 62.

135. *Id.* at 109 ("No invention can possibly be made, consisting of a combination of different elements of power, without a thorough knowledge of the properties of each of them, and the mode in which they operate on each other. And it can make no difference, in this respect, whether he derives his information from books, or from conversation with men skilled in the science For no man ever made such an invention without having first obtained this information, unless it was discovered by some fortunate accident.").

136. *Id.*

137. *Id.* ("[T]he whole process, combination, powers, and machinery, were arranged in his mind, and that the delay in bringing it out arose from his want of means. For it required the highest order of mechanical skill to execute and adjust the nice and delicate work necessary to put the telegraph into operation, and the slightest error or defect would have been fatal to its success.").

scientific principles could properly be an inventor.¹³⁸ Although this may not have required formal educational credentials, it certainly required access to book knowledge or scientists. If a mechanic could be an inventor at all, only a “philosophical mechanic” could qualify. However, as discussed above, it was extremely unlikely that a mechanic could meet these criteria.¹³⁹

The Justices intertwined this temporal framework with existing judicial doctrines conditioning the scope of patent rights. Longstanding judicial exclusions from patentable subject matter, adopted from the English judicial decisions, had traditionally precluded the patenting of abstract principles.¹⁴⁰ In the new ideology, these exclusions from patentable subject matter were described as the scientific discoveries that preceded and underpinned all inventions.¹⁴¹

Specification requirements also regulated how broadly an invention could be construed. Assessment of skill was used prospectively to ascertain the adequacy of disclosure of the specification since the earliest days of the U.S. patent system.¹⁴² Disclosure of the invention was believed to be the *quid pro quo* for the right to exclude others from its use.¹⁴³ If an ordinary mechanic could make the invention using the specifica-

138. See, e.g., *id.*

139. Alternatively, a skilled patent agent could craft an appropriate narrative about a mechanic’s invention. Because patented inventions were still being made primarily through trial and error on the workshop floor, it can be inferred that at least initially the discourse shifted more than actual practice. See *supra* notes 87-92 and accompanying text.

140. See, e.g., PHILLIPS, *supra* note 42, § 99 (“[T]he signification in which a *principle* is not a subject of a patent is distinctly pointed out by Abbott C.J. He says, ‘No merely philosophical or abstract principle can answer to the word manufactures.’”). See generally Dana R. Irwin, *Paradise Lost in Patent the Law? Changing Visions of Technology in the Patentable Subject Matter Inquiry*, 60 FLA. L. REV. 775 (2008).

141. E.g., *O’Reilly*, 56 U.S. (15 How.) at 109. Irwin, *supra* note 140, at 800-04.

142. See, e.g., *Whitney v. Emmett*, 29 F. Cas. 1074, 1083 (C.C.E.D. Penn. 1831) (No. 17,585) (“If from the patent, specification, drawings, model and old machine, clear ideas are conveyed to men of mechanical skill in the subject matter, by which they could make or direct the making of the machine by following the directions given, the specification is good within the act of congress.”); PHILLIPS, *supra* note 42, at 282-84.

143. *Whitney*, 29 F. Cas. at 1081 (“[F]or the end and meaning of the specification is to teach the public after the term for which the patent is granted what the privilege expired is, and it must put the public in possession of the secret in as ample and beneficial a way as the patentee himself uses it. This I take to be clear law as far as respects the specification, for the patent is the reward which . . . is held out for a discovery, and therefore, unless the discovery be true and fair, the patent is void.”); FESSENDEN, *supra* note 25, at 105-07; PHILLIPS, *supra* note 42, at 8-9; see also CURTIS, 1854, *supra* note 121, at 1-2.

tion then it was adequately disclosed.¹⁴⁴ Like the judicial exclusions from patentable subject matter, this limited the scope of the invention.

At the other end of the spectrum, doctrines of substantial similarity and mechanical equivalents also regulated the scope of inventions by determining which improvements were so insubstantial that they fell within the scope of the original patent.¹⁴⁵ Beginning with *Hotchkiss*, courts used mechanical skill retrospectively to ascertain whether an allegedly infringing improvement was covered by the existing patent, or was an invention in its own right.¹⁴⁶ This involved two related judgments. In its use to gauge the similarity of the inventions, it determined the scope of the original patent.¹⁴⁷ Accordingly, application of mechanical skill also implied that the exercise of inventive skill and therefore the moment of invention had passed.

Despite their adoption of a general temporal framework advocated by the science lobby, and its integration with judicial doctrines regulating the scope of patents, the Justices disagreed within this framework about precisely when the moment of invention, and therefore the scope of invention, should be set. All agreed that a patent could not be upheld for an abstract scientific principle,¹⁴⁸ but a faction of the Court advocated the patenting “principle of the machine” — the principles that were harnessed by and embodied in the machine.¹⁴⁹

144. *Whitney*, 29 F. Cas. at 1083.

145. *See, e.g.,* *Odiorne v. Winkley*, 18 F. Cas. 581, 582 (C.C.D. Mass. 1814) (No. 10,432); *see also* *Davis v. Palmer*, 7 F. Cas. 154, 159 (C.C.D. Va. 1827) (No. 3,645); *Dixon v. Moyer*, 7 F. Cas. 758, 759 (C.C.E.D. Penn. 1821) (No. 3,931).

146. *Hotchkiss v. Greenwood*, 12 F. Cas. 551, 552 (C.C.D. Ohio 1848) (No. 6,718), *aff'd*, 52 U.S. 248 (1850).

147. *See, e.g.,* *McCormick v. Seymour*, 15 F. Cas. 1322 (C.C.N.D.N.Y. 1851) (No. 8,726); *Larabee v. Cortlan*, 14 F. Cas. 1136 (C.C.D. Md. 1851) (No. 8,084); *Gibson v. Van Dresar*, 10 F. Cas. 329, 333 (C.C.N.D.N.Y. 1850) (No. 5,402); *Many v. Jagger*, 16 F. Cas. 677, 683 (C.C.N.D.N.Y. 1848) (No. 9,055).

148. *LeRoy v. Tatham*, 55 U.S. (14 How.) 156, 175 (1852).

149. *See id.* at 183; *see also* GEORGE TICKNOR CURTIS, A TREATISE ON THE LAW OF PATENTS FOR USEFUL INVENTIONS IN THE UNITED STATES OF AMERICA, 10-11 (Boston, Little, Brown 2d ed. 1854) (“However inadequate, therefore, the term may be, to express what it is used to convey, it is obvious that there is a characteristic, an essence, or purpose of every invention, which, in our law, has been termed by jurists its *principle*; and that this can ordinarily be perceived and apprehended by the mind, in cases where the purpose and object of the invention does not begin and end in form alone, only by observing the powers or qualities of matter, or the laws of physics, developed and put in action by that arrangement of matter, and the effect or result

This disagreement was at the heart of dissenters' arguments in *LeRoy v. Tatham* and *O'Reilly v. Morse*.

In *LeRoy*, the plaintiffs had discovered a method of fusing solid lead pipe together under extreme pressure and heat, rather than by heating alone.¹⁵⁰ Chief Justice Taney, writing for the Court, explained the longstanding judicial doctrine that a principle could not be the subject of a patent,¹⁵¹ but he ultimately based his decision narrowly on the fact that the broader "principle of the machine" had not been claimed by the patentee in the specification.¹⁵² The dissenters, Justices Wayne, Nelson, and Grier, argued that an abstract principle embodied for a specific industrial purpose or application—the principle of the machine as opposed to an abstract principle—could be the subject of a patent whether it was claimed specifically or not, such that any other machine employing the principle of the machine would infringe.¹⁵³ In justifying this argument, they emphasized that discovery of the principle of the machine was the exercise of inventive skill, which should be rewarded by the patent system, but the combination of machinery was the exercise of mere mechanical skill, which did not deserve the patent grant.¹⁵⁴ Therefore, they argued that the

produced by their application. Even in cases where the subject of invention consists in form alone, the principle or characteristic of the invention is the result produced by the aid and through the act of the qualities of matter In the case of inventions which are independent of form, we arrive at the principle of invention in the same way.").

150. *LeRoy*, 55 U.S. (14 How.) at 172.

151. *Id.* at 174-75.

152. *Id.* at 176-77 ("But we must look to the claim of the invention stated in their application by the patentees. They say . . . 'What we claim as our invention, and desire to secure by letters-patent, is, the combination of the following parts above described' The patentees have founded their claim on this specification, and they can neither modify nor abandon it in whole or in part. The combination of the machinery is claimed, through which the new property of lead was developed, as a part of the process in the structure of the pipes. But the jury were instructed, 'that the originality of the invention did not consist in the novelty of the machinery, but in bringing a new principle into practical application.' . . . The question whether the newly developed property of lead, used in the formation of lead pipes, might have been patented, if claimed as developed, without the invention of machinery, was not in the case.").

153. *Id.* at 180-82, 186-87 (Wayne, Nelson, and Grier, J.J., dissenting).

154. *Id.* at 187 ("To hold, in the case of inventions of this character, that the novelty must consist of the mode or means of the new application producing the new result, would be holding against the facts of the case, as no one can but see, that the original conception reaches far beyond these. It would be mistaking the skill of the mechanic for the genius of the inventor It would be found, on consulting the system of laws established for their [inventors as public benefactors] encouragement and protection, that the world had altogether mistaken the merit of their discovery; that, instead of the originality and the brilliancy of the conception that had been unwittingly attributed to them, the whole of it consisted of some simple me-

majority's holding failed to reward the exercise of inventive genius.¹⁵⁵ In essence, the dissenters agreed with the views of the science lobby, scorning incremental improvement inventions, and seeking to set the point of invention earlier and the scope of right broader—closer to the moment and scope of scientific discovery.¹⁵⁶

O'Reilly also addressed patent scope and the timing of invention. The Court held that Morse was the first true inventor of the telegraph, but that his eighth claim, directed toward the use of electromagnetism for communication at a distance, was overly broad because it was not adequately described in the specification.¹⁵⁷ Justice Wayne, joined by Justices Nelson and Grier, dissented again, arguing that the principle of the invention in this case was a new art and should be protected regardless of its description in the specification because the inventor was the first discoverer of the principle.¹⁵⁸ The dissenters sought to hold the eighth claim of Morse's patent valid because the discovery of such a principle was an act of invention and an exercise of inventive skill the patent system should reward¹⁵⁹—a belief long held by the science lobby.¹⁶⁰ The dissen-

chanical contrivances which a mechanician of ordinary skill could readily have devised And if these simple contrivances, taken together, and disconnected from the control and use of the element by which the new application, and new and useful result may have been produced, happen to be old and well known, his patent would be void; or, if some follower in the tract of genius, with just intellect enough to make a different mechanical device or contrivance, for the same control and application of the element, and produce the same result, he would, under this view of the patent law, entitle himself to the full enjoyment of Franklin's discovery.").

155. *Id.*

156. *See LeRoy*, 55 U.S. (14 How.) at 187.

157. *O'Reilly v. Morse*, 56 U.S. (15 How.) 62, 119-20 (1853).

158. *Id.* at 133 (Wayne, Nelson, and Grier, J.J., dissenting).

159. *Id.* at 132 ("He who first discovers that an element or law of nature can be made operative for the production of some valuable result is a discoverer and inventor of the highest class. The discovery of a new application of a known element or agent may require more labor, expense, persevering industry, and ingenuity than the inventor of any machine. Sometimes, it is true, it may be the result of a happy thought or conception, without the labor of an experiment, as in the case of the improvement in the art of casting chilled rollers, already alluded to. In many cases, it is the result of numerous experiments; not the consequence of any reasoning a priori, but wholly empirical; as the discovery that a certain degree of heat, when applied to the usual processes for curing India rubber, produced a substance with new and valuable qualities He who takes this new element or power, as yet useless, from the laboratory of the philosopher, and makes it the servant of man; who applies it to the perfecting of a new and useful art, or the improvement of one already known, is the benefactor to whom the patent law tenders its protection.").

160. *See supra* notes 101-02 and accompanying text.

ters advocated shifting the moment of invention closer to the point of scientific breakthrough and away from gradual incremental improvement.

Although the Justices disagreed in *O'Reilly* and *LeRoy* about how early invention occurred and how broadly inventions should be construed, they disagreed within the same overarching understandings about the process of invention; both the majority and the dissent understood scientific research to precede invention.¹⁶¹ The dissenters in *LeRoy* and *O'Reilly* again drew on the science lobby's ideology of invention, which scorned incremental improvement inventions and sought to favor monumental innovations like the telegraph. Even though the Court as a whole had accepted the general position of the science lobby, the majority was not yet ready to embrace these broader patent rights. Ultimately, the Court remained willing to use the principle of the invention as a heuristic to rule out substantially similar inventions and uphold a patent against potentially infringing machines, but not to broaden rights, extending them closer to monopolizing abstract "scientific" principles. One can only speculate about the Court's reticence to extend rights this way, since the English courts had already begun to extend patent rights over the principles of inventions.¹⁶² Perhaps the answer lies in part in Justice Story's telling observation that in the United States the Patent Act was based in "common sense and common life."¹⁶³

The synergy that had caused the mechanic movements to blossom during the first half of the nineteenth century gave way to competition between newly forming interests for control over the limited resources of the patent grant. Advocates of science, losing ground rapidly in the patent office, found a receptive audience in the courts. With the introduction of the concept of inventiveness, which excluded all exercises of mechanical skill, the Court began to consider more closely the en-

161. See, e.g., *O'Reilly*, 56 U.S. (15 How.) at 109, 132; *LeRoy v. Tatham*, 55 U.S. (14 How.) 156, 187 (1852).

162. E.g., *Nielson v. Harford*, 1 Webst. Pat. Cas. 295 (1841) (the leading English case recognizing broad rights in pioneer inventions). Doctrines of pioneer patents and process patents, which later developed and granted broader rights in principles proved *Nelson*, *Grier* and *Wayne's* dissents to be prophetic. See, e.g., *Morley v. Lancaster*, 129 U.S. 263, 273 (1889) (pioneer patent); *Telephone Cases*, 126 U.S. 1 (1888) (pioneer patent); *Tilghman v. Proctor*, 102 U.S. 707, 728 (1880) (process patent).

163. *Earle v. Sawyer*, 8 F. Cas. 254, 255-56 (C.C.D. Mass. 1825) (No. 4,247).

tire process of invention. The justices intertwined and commingled existing legal doctrines with some of the rhetoric about inventive process forwarded by the science lobby, resulting in a new legal landscape in patent law.

IV. CONCLUSION: "MISTAKING THE SKILL OF THE MECHANIC FOR THE GENIUS OF THE INVENTOR"¹⁶⁴

The Court's creation of a new ideology of invention added an additional check against liberalization of the patent examination. At the same moment that the inventors' lobby finally achieved change in the patent office, pushing out the partisans of science whom the Lazzaroni had installed, the science lobby successfully reoriented the Court's basic views about the process of invention. This new legal platform led to widespread invalidations in the courts for lack of invention during the 1870s through the 1890s.¹⁶⁵

The reorientation of the courts away from the product of invention and to the process of invention also fundamentally changed the judicial decision-making process in patent litigation. At a time when inventions were becoming more complex and difficult to understand, the new framework allowed judges to use factors such as scientific methodology and the education level of the inventor as proxies for inventiveness. Judges found it increasingly difficult to understand engineering principles well enough to ascertain which factors or design elements might make an invention novel or useful,¹⁶⁶ but a

164. *LeRoy*, 55 U.S. (14 How.) at 187 (Wayne, Nelson, and Grier, J.J., dissenting).

165. See, e.g., *Knapp v. Morss*, 150 U.S. 221 (1893); *Patent Clothing Co. v. Glover*, 141 U.S. 560 (1891); *Cluett v. Claffin*, 140 U.S. 180 (1891); *Florsheim v. Schilling*, 137 U.S. 64 (1890); *St. Germain v. Brunswick*, 135 U.S. 227 (1890); *Hendy v. Miner's Iron Works*, 127 U.S. 370 (1888); *Miller v. Foree*, 116 U.S. 22 (1885); *Atlantic Works v. Brady*, 107 U.S. 192 (1883); *Double-Pointed Tack Co. v. Two Rivers Mfg. Co.*, 109 U.S. 117 (1883); *Dalton v. Jennings*, 93 U.S. 271 (1876); *Reckendorfer v. Faber*, 92 U.S. 347 (1875); *Brown v. Piper*, 91 U.S. 37 (1875); *Union Paper Collar Co. v. Van Dusen*, 90 U.S. 530 (1874); *Fraser v. Gates Iron Works*, 85 F. 441 (7th Cir. 1898); *Brunswick-Balke-Collender Co. v. Phelan Billiard-Ball Co.*, 79 F. 85 (2d Cir. 1897); *Westinghouse v. Edison Electric Light Co.*, 63 F. 588 (3d Cir. 1894); *Thomson-Houston Electric Co. v. Union R. Co.*, 87 F. 879 (C.C.S.D.N.Y. 1898); *Facer v. Midvale Steel-Work Co.*, 38 F. 231 (C.C.E.D. Penn. 1888); *Muller v. Ellison*, 27 F. 456 (C.C.S.D.N.Y. 1886); *Yale Lock Mfg. Co. v. Norwich Nat. Bnk.*, 6 F. 377 (C.C.D. Conn. 1881); *Perfection Window Cleaner Co. v. Bosley*, 2 F. 574 (C.C.N.D. Ill. 1880).

166. Indeed, it seems that the bar was not in favor of judges skilled and educated in the arts. See, e.g., PHILLIPS, *supra* note 42, at 58-59 ("It would evidently be quite impracticable to procure judges or even jurymen, who have actually worked at or practiced all the innumera-

person's social affiliations and educational background, while of questionable utility, could be easily understood and proved. The new ideology of invention facilitated the use of such proxies, which rested on scientific expertise and therefore favored the formally educated scientists and engineers.

The new judicial ideology also had a powerful effect on the way that patentees and litigants talked and wrote about invention and, perhaps, even on how they created inventions. A new world of legal arguments about the education and character of inventors themselves opened the door to new patent management techniques.¹⁶⁷ Moreover, the legal discourse about invention changed before the demographics and methods of invention changed.¹⁶⁸ The majority of inventors did not use empirical methodology, attend universities, or seek out association with scientists, but it behooved them to construct legal narratives that portrayed them as doing so. This new legal discourse about invention actually played a role in creating the practices it described.

The new legal discourse drastically moved the patent system away from its roots. Ironically, at the very moment the United States added new barriers to entry and resorted to proxies like formal education, Europe was embroiled in debates about patents that led to outright abolition of the patent systems in many countries, and significant reform in others.¹⁶⁹ In the

ble trades and professions by which civilized society is diversified, nor would it be desirable were it practicable. It is then quite nugatory to object that judges have not practical experience in any trade to which any particular patent relates. It is enough that they expand the law of patents.”)

167. One very prominent example of this style of argument can be seen in the famous *Telephone Cases* litigating the invention of the telephone. The various associations and methods of the purported inventors are described by the parties at length. Notably, one of the purported inventors, Drawbaugh, was a simple country tinkerer and it was argued at length that he could not possibly have invented the telephone because he lacked the scientific training, associations, and understanding of principles. 126 U.S. 1, 416 (1888) (statement of Mr. Storrow of the American Bell Telephone Company replying to Drawbaugh defense) (“But from the beginning to the end of his deposition, which occupied thirty-two days, he never but once undertook to make any statement as to the origin or mental growth of his conception, or as to the principles it involved.”). See generally *Blanchard v. Putnam*, 3 F. Cas. 633 (C.C.S.D. Ohio, 1867); *Potter v. Whitney*, 19 F. Cas. 633 (C.C.D.Mass. 1866); *American Bell Tel. Co. v. People’s Tel. Co.*, 22 F. 309 (C.C.S.D.N.Y. 1884).

168. See *supra* notes 87-100 and accompanying text; see also B. Zorina Khan & Kenneth L. Sokoloff, *History Lessons: The Early Development of Intellectual Property Institutions in the United States*, 15 J. EC. PERSPECTIVES 233, 239-42 (2001).

169. See Fritz Machlup & Edith Penrose, *The Patent Controversy in the Nineteenth Century*, 10 J. EC. HIST. 1 (1950) (detailing the patent controversy and its effects throughout Europe, in-

United States, mechanics, once a cogent group organized around their common laboring interest, splintered into factions and formally educated scientists and engineers gained political influence at the expense of their less-educated counterparts. The promise of the patent system began to close for many craftsman and laborers.

Ultimately, the arguments of the science lobby became even more deeply enconced in the patent law during the latter half of the century. Doctrines for pioneer patents and process patents, which granted broader rights in principles, made Justices Nelson, Grier and Wayne's dissents appear prophetic.¹⁷⁰ By the beginning of the twentieth century, science and engineering had become fully professional pursuits, and the patent system had embraced their epistemologies, which looked to the "uniformity and the perfection of machines 'to utilize unskilled labor.'"¹⁷¹ However, the triumph of the professional science and engineering community in turning the patent system toward their interests was short lived. Corporate interests would soon step in to influence and manipulate the patent system, dulling the promise of patent rewards for scientists and engineers.¹⁷²

cluding 1851 patent reform in the U.K.).

170. See, e.g., *Morley v. Lancaster*, 129 U.S. 263, 273 (1889) (pioneer patent); *Telephone Cases*, 126 U.S. 1 (1888) (pioneer patent); *Tilghman v. Proctor*, 102 U.S. 707, 728 (1880) (process patent).

171. SINCLAIR, *supra* note 1, at 325.

172. See generally Catherine L. Fisk, *Removing the 'Fuel of Interest' from the 'Fire of Genius': Law and the Employee-Inventor, 1830-1930*, 65 U. CHI. L. REV. 1127 (1998) (describing the development of laws governing the inventions of employee-inventors).