



## **Intermediaries in the Market for Technology**

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Note to readers: This paper is a draft of the second chapter of a book that pulls together our collective work on the organization of technological discovery in the late nineteenth and early twentieth century United States. It is based on an earlier paper by Lamoreaux and Sokoloff, but the quantitative work is almost completely new. The preceding chapter covers the history of the patent system and problems that inventors faced in profiting from their inventions in an environment where production was geographically segmented. The third chapter makes the case that the geographic organization of the market for technology was as much or more important for the location of inventive activity as the location of production. Chapters four and five discuss the rise of large firms with in-house R&D laboratories (mainly in the Middle Atlantic region) and the persistence until the Great Depression of an alternative mode of technological discovery based on venture capital and innovative startups in the Midwest. For our new data work we have benefited from the excellent research assistance of Andrew Henderson.

## Chapter 2

### Intermediaries in the Market for Technology

Time dragged for John Francis Appleby in the trenches before the Battle of Vicksburg, but he took advantage of his enforced idleness to invent an automatic feeding device for rifle cartridges. Appleby obtained a patent for the invention in 1864, managed to sell it off for what seemed to be the princely sum of \$500, and then watched as his assignee quickly realized \$7,000 by reselling the patent. Although he was chagrined by his failure to reap the full rewards of his invention, the episode convinced him that his dream of a career as an inventor was financially possible.<sup>1</sup> Appleby had grown up in rural Wisconsin and, like many farm boys, hated the drudgery of agricultural labor. Invention offered him both a creative outlet and the possibility of escape, and whenever he could, he hung around a local machine shop to study the machinery and see how implements were made. During the 1850s, when reaping machines were beginning to spread through the region, he immediately grasped (and suffered from) their limitations: The machines did not do anything more than cut the grain, leaving young men like himself to bind it into sheaves using old-fashioned back-breaking labor-intensive methods. As he later put it, “I began to dream of a binding machine. I dreamed of it at night and I dreamed of it during the day, and in 1858 I made a knotter, probably the first one ever made that would tie a knot in a cord.”<sup>2</sup> Appleby was unable to raise any funds

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<sup>1</sup> “Appleby, John Francis,” *Dictionary of American Biography*, Vol. I, p. 325.

<sup>2</sup> Quoted in Swingle, “Invention of the Twine Binder,” 37. See also Greening, “Early Life of John Francis Appleby.”

to develop his binding machine before the war, but the money he earned from the gun invention allowed him to continue working on it until he finally managed to secure some outside financial support. After more than a decade of additional effort, he succeeded in developing a workable twine binder. He and his backers cashed in on the invention by selling the manufacturing rights to William Deering, a leading producer of agricultural machinery. Appleby then continued for some years afterwards to work on the machinery in Deering's employ, probably earning for the first time a comfortable living. By the time the company joined the International Harvester consolidation in 1902, he had accumulated enough savings to resign and focus on his latest preoccupation, the invention of a mechanical cotton picker.<sup>3</sup>

In the decades following the Civil War, thousands upon thousands of young men like Appleby (and a much smaller number of young women) devoted long hours to coming up with new technological ideas with the aim of profiting from them. As a result, patenting rates soared. In the last chapter we saw that both applications for patents and the number of grants awarded by the Patent Office rose dramatically during the 1850s. As the nation recovered from the war, patenting activity increased even more rapidly until by the early 1880s the number of patent applications and grants relative to the size of the population had climbed to more than treble their 1850s peak (see Figure 2.1).

Like Appleby, all these eager young inventors faced a number of pressing problems: How could they support themselves as they worked on their ideas? How could they pay their research and development costs and come up with the administrative and legal fees they needed to obtain patents? How could they extract their returns from

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<sup>3</sup> Swingle, "Invention of the Twine Binder."

the patents they finally secured? Intermediaries potentially could help resolve these problems, just as during the antebellum period they had helped resolve problems associated with the fraudulent misrepresentation of patents. For the most part, however, the types of intermediaries that had emerged during the years before the war were not up to the task. They had flourished in a context where markets were segmented, and where it was possible, once the worth of an invention was established, to sell off geographically delimited rights in one location after another. The most successful intermediaries in this environment had been patent agencies that published reputable trade journals. Inventors had flocked to them because the agencies could use their publications to promote inventions they found promising and thereby raised the confidence of potential buyers in the worth of the associated patent rights. As we have seen, the most important of these agencies, Munn & Co., publisher of *Scientific American*, handled as much as 15 percent of all patent assignments in the mid-1860s.

This method of marketing patents did not work as well in the postwar environment. Over the middle third of the century, the nation had extended and fleshed out its transportation network. Transportation costs fell, and firms increasingly sold their products in national markets. As a consequence, firms wanted full national rights to the patents they purchased. Moreover, because they needed to beat out their competitors in the race to acquire important patents, they sought to learn about promising new technologies before they became public knowledge. If they waited until an invention was described in a publication like *Scientific American*, they would not have any more or better information than anyone else who might be interested in the patent. Not surprisingly, therefore, the share of assignment contracts handled by Munn & Co.

dropped nearly to 5 percent by the early-1870s and became negligible by the end of the century.<sup>4</sup>

In this chapter we detail the emergence of a new type of patent lawyer turned intermediary who was able to match inventors with financiers or buyers for their inventions before the patents were even issued. We show that these patent lawyers were uniquely well placed to obtain advance information about technologies coming on the market and also about the technological needs of businesses who might want to purchase rights to them. We also show that they attracted to their clienteles small coteries of entrepreneurs who functioned essentially as angel investors or venture capitalists. Analyzing a sample of manuscript contracts for the assignment of patent rights, we demonstrate that inventors who made use of these intermediaries were able to assign their patents more quickly and over longer distances than those who handled the transactions themselves. Moreover, we find that inventors who formed stable relationships with patent attorneys had longer, more productive patenting careers than those who did not. Patent lawyers were the core of the market for technology in the late nineteenth century, and it was the growth of this market that made the period such a “golden era,” to quote the great historian of technology Thomas P. Hughes, for “independent inventors.”<sup>5</sup>

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<sup>4</sup> This figures is based on an examination (for patentees whose surnames began with the letter “B”) of the correspondents recorded as handling patent assignments in the manuscript digests of assignments, Records of the Patent and Trademark Office, Record Group 241, National Archives.

<sup>5</sup> Hughes, *American Genesis*, 15.

## **New Strategies for a National Market**

During the first half of the nineteenth century, the segmented character of the nation's product markets meant that inventors could exploit their patents in their own enterprises and at the same time sell off the rights to producers operating in other parts of the country. The development of a national transportation system in the post-Civil War era changed all this. As the proportion of geographically delimited assignments fell from 71.4 percent in 1851 to 22.8 percent in 1871, and continue to fall thereafter, inventors faced an increasingly stark choice (see Table 2.1). They could either exploit their patents themselves by founding their own enterprises, or they could capture the returns from their intellectual property by selling off (or licensing) the full national rights. They could no longer easily do both because that would mean competing head-on with their own assignees and licensees.<sup>6</sup>

For inventors who decided to found their own enterprises acquiring financial support was not an easy task, and the results were not always satisfactory. The great electrical inventor Elihu Thomson managed to secure the backing of investors in New Britain, Connecticut and organized the American Electric Company in 1880 to exploit patents he had obtained for an arc lighting system. Within two years, however, he had grown disenchanted with his investors' lack of entrepreneurial vision and insistent demands for short-term gains, and he determined to buy them out. But again he needed funds and literally spent months traveling to Boston, New York, and other cities in search of additional backers. He finally obtained the support he needed from a group of shoe

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<sup>6</sup> They could still follow both strategies internationally, exploiting their patents themselves in their home market and selling off the rights in foreign markets or selling patent rights in different countries to different parties.

manufacturers in Lynn, Massachusetts who had formed what was in essence a venture capital fund to diversify their portfolios. The resulting enterprise, the Thomson-Houston Electric Company, was extraordinarily successful—less than a decade later it would become the core of the General Electric merger—but the frustration and anxiety Thomson experienced during this search took a toll on his health.<sup>7</sup>

Although some inventors thrived in entrepreneurial roles, the kinds of people who excelled at envisioning new technologies were not necessarily well suited to running the firms they founded. Nor did they always want to be involved in day-to-day business matters. Many companies formed to exploit an inventor's discovery adopted a division of labor in which the company's financial backers took charge of marketing and general management, while the inventor supervised manufacturing operations and continued to make technological improvements. Inventors who thrived on the technologically creative part of the work might chafe under the demands imposed by their supervisory responsibilities and desire only to be left alone. At the same time, however, they might find themselves in disagreement with the decisions of those in charge of management. Thomson, for example, was frustrated by the demands the routine business of the Thomson-Houston Electric Company made on his time, but he also clashed with his fellow officers over business strategy, particularly their desire to rush the introduction of an alternating current system before he felt he had made it safe enough.<sup>8</sup> Edison notoriously fought with his financial backers, going to far as to wage a proxy battle for

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<sup>7</sup> Carlson, *Innovation as a Social Process*, Chs. 4-5.

<sup>8</sup> Carlson, "Coordination of Business Organization."

control of Edison Electric and suing in court to try to oust the directors of the Edison United Phonograph Company<sup>9</sup>

In cases where the business was less successful, such conflicts could take an enormous toll on the inventor's creativity. After Elmer Sperry designed a new type of generator capable of supplying a constant current regardless of the load on its circuits, his backers organized The Sperry Electric Light, Motor, and Car Brake Company in 1883. Sperry, who owned a big chunk of the company's stock, served as electrician, inventor, and superintendent of the mechanical department. Plagued by financial problems and internal dissension from the very beginning, the company was for Sperry a constant source of anxiety that absorbed all his attention and left him little time and energy for creative pursuits. Indeed, this period was the low point of his career in terms of generating new technological ideas. The nineteen patents he applied for during his five years with the company amounted only to half his *annual* average over a career as an inventor that stretched from 1880 to 1930.<sup>10</sup>

Sperry emerged from this experience determined never again to become so deeply involved in the internal affairs of a company. But he was also determined to continue to invent and to profit from his discoveries. To this end, he sold off many of his inventions to companies that were well placed to put them to productive use. Others he commercialized himself, founding with the help of an assortment of financial backers a number of companies that bore his name, such as the Sperry Electric Mining Machine Company, the Sperry Streetcar and Electric Railway Company, and the Sperry

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<sup>9</sup> McGuire, Granovetter and Schwartz, "Thomas Edison"; Carlson, "Coordination of Business Organization"; *Edison v. Edison United Phonograph Company*, 52 N. J. Eq. 620 (1894).

<sup>10</sup> Hughes, *Elmer Sperry*, 37-45.

Gyroscope Company. Although Sperry often played an active role in these companies in their early stages, he always downgraded his position to technical consultant as quickly as possible and went on to something else.<sup>11</sup>

Although important inventors followed a variety of career paths in the late nineteenth century, more seem to have been like Sperry than like Thomson—that is, they preferred to maintain their independence rather than tie their futures to particular business ventures. Zorina Khan analyzed the patenting careers of successive cohorts of “great inventors,” defined as inventors whose technological achievements won them coverage in the *Dictionary of American Biography*. Those born between 1846 and 1865—that is, whose inventive careers spanned the last third of the nineteenth century—most frequently exploited their intellectual property by selling off or licensing the rights. Members of this cohort pursued this course for fully two thirds of the patents they obtained over their careers. Inventors who founded their own businesses accounted for less than a quarter of the cohort’s patents, and only about 10 percent went to inventors who were employees in someone else’s business.<sup>12</sup>

A similar pattern seems to have held for patentees in general. F. A. Cresee, a contemporary writer of advice manuals for inventors, estimated that only about one fifth of inventors wanted to manufacture their devices themselves, whereas the rest wanted to make their money by selling off patents rights.<sup>13</sup> Information we have collected about the occupations and assignment behavior for patentees in our “B sample” of inventors

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<sup>11</sup> Hughes, *Elmer Sperry*.

<sup>12</sup> Khan, “Premium Inventions.” For earlier cohorts of great inventors, see Khan and Sokoloff, “Schemes of Practical Utility.”

<sup>13</sup> Cresee, *Practical Pointers for Patentees*, 15.

suggests that Cresee's estimate was a bit exaggerated but basically on target.<sup>14</sup> The top panel of Table 2.2 reports snapshots of the occupations of different categories of inventors to the extent that we have been able to identify them. Only a small number of the inventors were clearly employees of firms, and they were concentrated in the group that had a moderately large number of patents (10 to 19). A greater proportion, especially of the more productive patentees, were principals in firms—that is, they were listed as officers, directors, partners, or proprietors of firms or were associated with firms that bore their surnames. The vast majority, however, fell into the “other” category. Some of these other inventors were clearly independents, but in most of the cases either we were unable to find any occupational information at all or the occupations we found did not allow us to classify the inventors as employees, principals, or independents.<sup>15</sup> Of course, we cannot assume that most of the inventors whose occupations could not be determined were independents. We can, however, say that their assignment patterns were not consistent with the idea that they devoted the bulk of their careers to a single firm, even as principals. Panel B reports, for patentees with various numbers of patents, the number of different assignees to whom inventors transferred patents over their careers. More than 40 percent of the inventors with 20 or more lifetime patents dealt with at least four different assignees over their careers and 26 percent dealt with at least six. In most cases, moreover, no one assignee dominated the transactions (see Panel C). For instance, only 15.8 of the latter group had one assignee who accounted for more than 40 percent of total patents. Inspection of the data confirms that productive inventors were hard to tie

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<sup>14</sup> For a description of the sample, see Table 2.2

<sup>15</sup> We are continuing to collect biographical information and hope soon to be able to classify more of the patentees.

down. They moved in and out of relationships with assignees (sometimes as employees, but more often as business associates) and often assigned to more than one individual or firm at the same time.

### **Problems in Finding Buyers for Patents**

Inventors who lacked the skills needed to run a business successfully also tended not to be good at selling their patents. Like running a business, moreover, marketing patents took inventors away from what they really wanted to do, which was to work on new technological ideas. The enormous amount of time (and other resources) that selling patents consumed can be seen from the advice manuals that targeted inventors in the late nineteenth century. These pamphlets laid out the various steps that an inventor should take to sell a patent. The first step, “if the inventor [could] afford it,” was to have the invention “illustrated and described in one or more of the scientific and mechanical publications of the day,” like *Scientific American* or the *American Artisan*. If the inventor did not have sufficient resources, it was still effective, the manuals claimed, to place a notice in the “regular advertising columns,” especially if one took care to choose specialized publications that would “meet the eye of the class or classes of persons to whom the invention [would be] of special interest.”<sup>16</sup> Patentees should also prepare circulars describing their inventions and their potential markets, procure a list of

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<sup>16</sup> Simonds, *Practical Suggestions on the Sale of Patents*, 24-25.

businesses most likely to be interested in the inventions, and mail the circulars to these firms. Patentees should then follow up these circulars with personal solicitations.<sup>17</sup>

In some industries, particularly those where large firms faced competitive pressure to operate on the technological frontier, inventors could get decisions relatively quickly and easily. For example, the American Bell Telephone Company established a patent department in 1877 whose main purpose was to evaluate patents offered for sale by outside inventors. Although the company did not buy many of the patents that inventors brought to it for review, its employees devoted considerable time, energy, and resources to evaluating the devices. The company's archives contain voluminous files of long, technically detailed reports evaluating the novelty and importance of outside inventions, even those submitted in messy, handwritten letters by unknown inventors.<sup>18</sup>

Some large firms so wanted inventors to come to them with ideas that they helped inventors find other buyers for patents they thought were valuable but could not use. Robert Harris, chief operating officer of the Burlington and Quincy Railroad, gave inventors advice in promoting their discoveries and, in some cases, even provided testimonials they could use in advertisements.<sup>19</sup> Similarly, although Western Union had no use for the typewriter invented by C. Latham Sholes and Carlos Glidden in the early 1870s, Vice President Anson Stager put the two men in contact with the officers of

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<sup>17</sup> Simonds, *Practical Suggestions on the Sale of Patents*, 19-28; Hutchinson and Criswell, *Patents and How to Make Money Out of Them; An Experienced and Successful Inventor, Inventor's Manual*; Cresee, *Practical Pointers for Patentees*, 46-52.

<sup>18</sup> See T. D. Lockwood, "Statement of Objectives and Practices of AT&T Patent Department," extracted in "Memorandum for Messrs. Root, Ballantine, Harlan, Bushby & Palmer," 22 November 1949, 15, Divestiture Collection, location 451 01 01, folder 17; and Lockwood, Reports of Inventions (Not Approved), 1904-08, AT&T Corporate Archives. These evaluations became especially important to the company after 1894, when the patents that had given American Bell an effective monopoly of the telephone business expired. See Galambos, "Theodore N. Vail," 99.

<sup>19</sup> Usselman, "Patents Purloined, 1057-58; and Usselman, *Regulating Railroad Innovation*, 69, 107, 123-24.

Western Electric, an associated company, which in turn arranged for the product to be manufactured by E. Remington & Sons, a manufacturer of rifles that then had considerable excess capacity.<sup>20</sup>

In industries where there were lots of small firms marketing an invention could be a more difficult task. Rather than simply approach a major concern like Western Union, inventors had to tramp from one manufacturer to another, describing or demonstrating the invention and trying to interest someone in buying it. Not only was this way of marketing a patent time consuming, but it was also entailed the risk that one of the manufacturers would benefit from the information the inventor revealed without buying the device. Although the patent system offered protection against outright theft of the inventors' ideas, imitators could sometimes find ways to invent around a device without actually infringing. For example, Jacob D. Cox, founder of the Cleveland Twist Drill Company, traveled to Cincinnati in 1893 to examine a socket for twist drills invented and patented by a Mr. Andrew. Cox concluded that the invention had merit but that Andrew's \$10,000 asking price was too steep relative to the tool's value. His response was to devise "a grip socket different from Andrew's, and in most respects superior to it," for which he applied for a patent himself.<sup>21</sup>

That someone like Cox would invent around a patent he thought was overpriced is a good indication of the potential risk involved in marketing inventions in this way. Cox was a respected businessman with a reputation for upholding patent rights. When he first embarked in the twist drill business, he discovered that a machine his partner claimed to

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<sup>20</sup> Adams and Butler, *Manufacturing the Future*, 14-44.

<sup>21</sup> Cox, *Building an American Industry*, 143-44. The story has an interesting twist because Cox attempted to sell the device before he patented it, and Andrew got a copy of the circular and filed for a patent on essentially the same device. Cox won the ensuing litigation.

have invented was a fraud that infringed on patents owned by the Brown & Sharpe machine-tool firm. He immediately wrote Brown & Sharpe admitting the infringement and arranged to produce the machine under license.<sup>22</sup> Cox also from time to time bought patents for inventions that he thought were valuable and worth the asking price. After the Andrew incident, a man name Morse showed him an optical pyrometer (a type of heat gauge) he had invented. Cox “saw at once what a tremendous help it could be to us in attaining uniform quality, and what an advantage we might gain over our competitors if we could acquire exclusive rights to his invention.” He successfully negotiated to purchase all rights to the patent with respect to the manufacture of twist drills.<sup>23</sup>

Some scholars have hypothesized that the risks involved in marketing patents were so great that they impeded the sale of inventions in the market and encouraged firms instead to devote resources to in-house R&D.<sup>24</sup> However, as we will see, inventors found ways to overcome these problems that enabled them to sell large numbers of patents at arms’ length. In particular, they discovered that there were intermediaries who could help them reduce the amount of information they had to reveal and, at the same time, relieve them of much of the time-consuming work of marketing their discoveries.<sup>25</sup>

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<sup>22</sup> Cox, *Building an American Industry*, 110.

<sup>23</sup> Cox, *Building an American Industry*, 172-72.

<sup>24</sup> This idea traces back at least to Arrow, “Economic Welfare and the Allocation of Resources for Invention.” See also Teece, “Technological Change and the Nature of the Firm”; Mowery, “The Relationship between Intrafirm and Contractual Forms of Industrial Research”; Mowery, “The Boundaries of the U.S. Firm in R&D”; and Zeckhauser, “The Challenge of Contracting for Technological Information.”

<sup>25</sup> For theoretical discussions of how intermediaries could solve such problems, see Gans and Stern, “The Product Market and the Market for ‘Ideas.’”; and Rubinstein and Wolinsky, “Middlemen.”

## Patent Attorneys as Intermediaries

The changes in the market for technology that resulted from the fall in transport costs encouraged a host of new intermediaries to solicit patentees' business. The technical periodicals of the time are full of their advertisements:

Inventors and Capitalists will find it to their mutual advantage to call at this Agency, which is established for the purpose of bringing into contact those who have important inventions which they desire to bring into notice, and those who have capital at command which they desire to invest in profitable business.<sup>26</sup>

This is the only Agency for the sale of patents in America that has two PRINCIPAL OFFICES and permanent branch offices in all the prominent cities of the Union.<sup>27</sup>

We have a large number of good patents for sale and would be pleased to have you call attention to this fact in your paper. We have thoroughly investigated all the articles in our possession and consider them to be of great value and money makers.<sup>28</sup>

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<sup>26</sup> Advertisement for Inventors' Agency, *American Artisan and Patent Record* 1 (24 May 1865), 31.

<sup>27</sup> Advertisement for American Patent Agency, *American Inventor* 6 (Jan. 1883), 23.

<sup>28</sup> Advertisement for International Patent Promotion Co., *The Patent Record and Monthly Review*, New Series 3 (Mar. 1902), 9.

According to the manuals that offered advice to inventors, intermediaries who advertised in this way were often unscrupulous. Inventors should not be taken in by their slick sales pitches, the writers warned, because most such agencies “seek only to get what money they can from the patentee.”<sup>29</sup> Although their solicitations were “attractive and temptingly prepared,” in actuality “very few of these concerns [had] any facilities whatever for selling patents.” They were little more than schemes for extracting money from patentees in the guise of fees for advertising circulars and other marketing expenses.<sup>30</sup>

It is difficult to evaluate these charges but they are certainly plausible. Most patentees obtained only one or two patents over their careers, had little business experience, and had even less experience selling patents. They were easy prey for agencies touting the riches they had secured for other inventors. The threat of losing repeat business probably mattered little to such advertisers, moreover, because patentees who got burned were unlikely ever to have another patent to sell and also were unlikely to have extensive connections with other inventors. Searches of our datasets, moreover, fail to turn up any examples of agencies with the advertised (or similar) names handling assignments of patent rights at the U.S. Patent Office.

Inventors who took the advice manuals’ warnings seriously turned to people they knew and trusted for help in marketing their patents. Sometimes inventors sought assistance from local merchants or manufacturers whose business acumen they admired, even though these people had little or no experience in the relevant area of the

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<sup>29</sup> Hutchinson and Criswell, *Patents and How to Make Money Out of Them*, 162.

<sup>30</sup> Cresee, *Practical Pointers for Patentees*, 41-42. For similar warnings, see Simonds, *Practical Suggestions on the Sale of Patents*, 7-9; and An Experienced and Successful Inventor. *Inventor’s Manual*, 61

technology. For example, when James Edward Smith, a machinist and professional inventor, designed a cigar machine, he approached George E. Molleson, owner of a granite quarry and agent for marble producers, for help in getting “a practical moneyed man who understood the manufacture of cigars to take an interest in Mr. Smith’s cigar machine.” Smith had previously had dealings with Molleson that encouraged his trust. Indeed, Molleson had previously advanced him money to develop a patent letter box.<sup>31</sup> There are numerous similar examples in the AT&T records, which show that intermediaries whose primary activities were as diverse as textile manufacturing and engineering consulting submitted telephone inventions to the company on behalf of independent inventors.<sup>32</sup>

The problem with using local businessmen as agents, however, was that they were unlikely to be known to buyers of patents, especially those located at some remove, and so potential buyers had no particular reason to trust their expertise or honesty. There was, however, a type of intermediary who was well situated to earn the trust of both sellers and buyers of inventions, and that was patent agents and attorneys.<sup>33</sup> This profession had begun to grow after the establishment of the patent examination system in 1836, when initially high rejection rates for patent applications encouraged inventors to

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<sup>31</sup> “Testimony Taken on Behalf of James Edward Smith,” *Hammerstein v. Smith* (1890), 62-68, Case 13,618, Box 1,868, Interference Case Files, 1836-1905, Records of the Patent and Trademark Office, Record Group 241, National Archives.

<sup>32</sup> T. D. Lockwood, Reports of Inventions (Not Approved), 1904-8, Box 1383, AT&T Corporate Archives.

<sup>33</sup> In the discussion that follows we use these terms interchangeably. Standards for entry to the legal profession were quite lax in this period, and some practitioners who hung out shingles as patent attorneys had little formal training in the law. In order to do business with the Patent Office, however, patent agents and attorneys had to register there. From time to time, the Patent Office “disbarred” attorneys, probably because of malfeasance. The Patent Office published regularly published lists of registered and disbarred attorneys. On professional legal standards in the nineteenth century, see Bloomfield, *American Lawyers*; and Bloomfield, “Law.”

seek expert assistance. The earliest practitioners were former patent examiners or other Patent Office employees who saw that there was money to be earned from helping inventors secure favorable judgments on their applications.<sup>34</sup> Very quickly, however, people with other backgrounds entered the field. Some were trained as lawyers, some had degrees in science or engineering, and some came out of drafting and engraving.<sup>35</sup> Not surprisingly, the specialty developed first in Washington, DC, in the vicinity of the Patent Office, and then spread to other urban centers, especially in the Northeast, where the overwhelming majority of patentees lived. By the early 1880s the Patent Office's list of approved agents included about 540 names. Slightly more than half of these agents resided in the New England and Middle Atlantic states, almost a quarter in the District of Columbia, another fifth in the Midwest, and the rest were scattered through a few southern and western locations. Over the next several decades the numbers of these practitioners would multiply more than a dozen times, and they would spread throughout the country, though patent agents would continue to be most densely concentrated in old industrial regions of the country (see Table 2.3).

In the regular course of their business, patent agents obtained a great deal of information about participants on both sides of the market for technology, and buyers and sellers of patents obtained a great deal of information about patent agents as well. Manufacturers learned about patent agents when they hired them to evaluate the merits of inventions they thought they might need or when they used them to conduct research at the Patent Office. For instance, executives of the Waltham Watch Company asked Arthur H. Brown, a patent attorney in the firm of Wright, Brown, Quinby & May, to

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<sup>34</sup> Post, "'Liberalizers' versus 'Scientific Men,'" 29-30.

<sup>35</sup> Cooper and Schmitz, *History of Inventions*, 30-35.

provide them with a detailed technical assessment of an instrument they were considering manufacturing under an exclusive license.<sup>36</sup> Subsequently, the same Waltham Watch executives again turned to the firm for copies of all patents “now in force covering self winding watch and clock devices, especially those operated by electricity” and to find out whether a particular solution they had developed for a problem with their chiming hall clocks infringed on patents owned by a rival manufacturer.<sup>37</sup>

Through these kinds of assignments patent attorneys earned manufacturers’ respect and trust. They also gained knowledge about the manufacturers’ businesses and the kinds of patents they might be interested in purchasing—information that put them in a better position to sell patents. For example, after reporting the results of a search of agricultural machine patents undertaken on behalf of Rollin H. White of the White Motor Company, the Cleveland patent agency of Thurston and Kwis added, “It occurred to us that perchance you might desire to control the Landrin patent #1,055,765. Perhaps the construction disclosed in this patent would never be used by you, but ... it might serve your purpose to control it so as to prevent others from making it.”<sup>38</sup>

Inventors, of course, needed patent agents to file their applications and negotiate on their behalf with examiners at the Patent Office. When they found a patent agent whom they trusted they dealt with him repeatedly. Inventors who patented a lot often used a number of different attorneys over their careers, but most ultimately settled into a

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<sup>36</sup> See the 22 July 1912 letter from Conover Fitch, vice president of the Waltham Watch Company to Wright, Brown, Quinby & May, and Brown’s report of 27 July 1912, Wright, Brown, Quinby & May Correspondence Files, Waltham Watch Company, 1854-1929, Mss. 598, Case 2, Baker Library, Harvard Graduate School of Business Administration.

<sup>37</sup> Letters of 25 January 1915 and 18 September 1917 from the Waltham Watch Company, Wright, Brown, Quinby & May Correspondence Files.

<sup>38</sup> Letter of 31 August 1914 from Thurston and Kwis to Rollin H. White, Container 1, Folder 4, Rollin H. White and Walter C. White Papers, Ms. 4734, Western Reserve Historical Society.

relationship with one, who then handled the bulk of their applications. As Table 2.4 indicates, over half of the patentees with at least ten career patents entrusted more than three quarters of their patents to this “preferred attorney,” once they hooked up with him. The table understates the importance of these relationships because patentees with long careers often had extensive dealings with several different lawyers sequentially. However, even if we force ourselves to treat each patentee as having had just one preferred attorney ever, the proportion of the inventors’ patents handled by this single agent is impressive. On average, for example, more than 60 percent of the patents received by the most productive group of inventors (those with 20 plus patents) were handled by the preferred attorney.<sup>39</sup>

These kinds of repeat dealings fostered the development of close personal relationships between inventors and their attorneys that encouraged inventors to use their attorneys as sounding boards. For example, when Joseph Arbes, a fur manufacturer and sewing-machine inventor in New York City, came up with an idea for a blind stitching machine that used a flat-sided needle, he immediately dispatched a sketch of the needle to his attorney, William E. Knight, for a judgment as to its potential patentability—before he had even tried it out on a sewing machine. Knight apparently thought that the invention was not promising, so Arbes experimented with the needle for a few more months before trying it out on Knight again.<sup>40</sup>

When patent agents filed applications on behalf of inventors, and even more when they acted as inventors’ sounding boards, they acquired knowledge of promising

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<sup>39</sup> The median was 57.1 percent.

<sup>40</sup> See “Testimony on Behalf of Joseph Arbes,” 10, 22-23, 26, *Arbes v. Lewis* (1900), Case 20,049, Box 2,715, Interference Case Files, 1836-1905.

technologies long before they came on the market. This knowledge was valuable in and of itself,<sup>41</sup> but it was particularly advantageous when the agents were functioning as intermediaries. Firms wanted to beat out their competitors and secure rights to important new technologies, but they hesitated to encourage inventors to bring them their inventions before they had been patented for fear of being accused of stealing the ideas.<sup>42</sup> Patent agents were not similarly constrained and so could offer firms assessments of inventions before information about them became publicly available.

Another advantage that enabled patent agents and solicitors to serve as intermediaries was the links they had with colleagues in other cities—colleagues who could be sources of information about inventions originating elsewhere and also about potential buyers in other parts of the country. Some of these links were formal. For example, Boston patent lawyer Frederick Fish took on a partner, Charles Neave, in 1893. Two years later Fish sent Neave to New York City to open a branch office.<sup>43</sup> Similarly, after Samuel S. Fisher, U.S. Commissioner of Patents during the Grant administration, returned to private practice in Cincinnati, he took in Samuel A. Duncan as a partner and almost immediately packed him off to New York to open an office for the firm there.<sup>44</sup> Other links derived from familial connections or simply from letters of introduction and repeat business. The Boston firm of Wright, Brown, Quinby & May had ties with a

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<sup>41</sup> For example, the Waltham Watch Company asked its patent attorney to collect copies of patents issued to a competitor, adding “If there is any way for us to find out regarding any patents that they have applied for but not yet been granted, we would like very much to have that information.” Letter of 20 August 1915 from the Waltham Watch Company to Wright, Brown, Quinby & May, Wright, Brown, Quinby & May Correspondence files.

<sup>42</sup> For example, Olaf Ohlson, a superintendent at the Waltham Watch Company wrote, “I am interested to see the invention to which you refer, if it is protected by patents; otherwise not.” Letter of 13 March 1913 from Ohlson to Wright, Brown, Quinby & May, Wright, Brown, Quinby & May Correspondence files.

<sup>43</sup> Nathan, *Fish & Neave*, 13, 19.

<sup>44</sup> *In Memoriam*, 23-24.

Chicago firm established by the brother of one of the partners. It also funneled its Philadelphia business through a firm with which the partners had no apparent personal connection except through long association.<sup>45</sup> Patent agents built up extensive networks around the country and, indeed, around the world in this way. Virtually all agents, moreover, had regular dealings with at least one attorney in Washington, who assumed responsibility for conducting searches of patent records and also represented them in preliminary interviews with examiners in the Patent Office.

That these links to agents in other locations could be used to market patents is suggested by a letter from one intermediary to “friend Jenks” (Lemuel Jenks, a patent lawyer in Boston) asking for Jenks’s assistance in marketing the device: “We have offered said Patent so far to the B&O and NCRR Comps. . . . We intend to sell it to one person for the six New England States and I therefore wish you would give me your opinion in that matter: to viz what price you think we should ask; what would we have to pay you for your assistance [sic] in carrying out and effecting a sale.”<sup>46</sup> A patent solicitor in London wrote members of the firm of Blatchford, Seward & Griswold, calling their attention a rust-prevention patent in which “an old and much esteemed client of ours” held an interest and asking the partners “whether you can find us a purchaser of the American patent” for a commission of 5 percent.<sup>47</sup>

Of course, patent lawyers could not all be trusted to be reliable intermediaries. Just as advice manuals cautioned inventors not to use intermediaries who advertised in

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<sup>45</sup> See the Wright, Brown, Quinby & May Correspondence Files for letters among patent agents in different cities.

<sup>46</sup> Letter of 30 April 1870 from Aug. H. [last name not legible] to Jenks, Box 3, Folder 59, Lemuel Jenks, 1844-1879, Mss. 867, Baker Library, Harvard Graduate School of Business Administration.

<sup>47</sup> Letter of 12 July 1877 from Roger Cartwright of London to Blatchford, Seward & Griswold, Box 5, Folder 243, Records of Blatchford, Seward & Griswold, 1841-1910, Archives and Special Collections, Massachusetts Institute of Technology.

trade publications, there were warnings to be wary of unscrupulous patent agents and attorneys. Indeed, some practitioners themselves took the extreme position that it was improper for members of their profession to function as intermediaries. Thus H. W. Boardman & Company announced in a pamphlet promoting the firm's services that it was "a rule rigidly adhered to in this establishment, never to take contingent interests in applications for Patents, nor to negotiate sales of Patent rights, or become the owners in whole or in part of them." As the pamphlet explained, such activity potentially put the interests of the patentee in conflict with those of his attorney: "If an attorney become a dabbler in Patents (as many do), how is it possible for an Investor to be assured that he is not disclosing his secret to the very party who will be the most interested in defeating his application?"<sup>48</sup>

Certainly, patent solicitors who "dabbled" in patents may have put their own interests before those of either the patentee or the assignee. In this respect the market for technology was much like the real estate market, where an agent's primarily goal is a sale, and where buyers and sellers alike face a great deal of uncertainty about whose interest the agent is truly representing. Although these kinds of conflicts of interest have been mitigated in the case of real estate by a combination of regulation and self-policing, during the late nineteenth and early twentieth centuries the market for technology was essentially unregulated, and professional organizations like bar associations were

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<sup>48</sup> H. W. Boardman & Co., *Hints to Inventors*, 13. Practitioners in this wing of the profession also warned inventors that if they entrusted their inventions to agents who were primarily intermediaries rather than legal specialists, they risked obtaining patents that would not withstand scrutiny by the courts. "The result is, that out of the numerous patents which have been litigated since the foundation of our Patent System, not one in ten has been sustained by the courts without being reissued to cure defects." See the brochure of A. H. Evans & Co., 1.

extremely weak.<sup>49</sup> In such a context, one would expect to see reputational mechanisms playing an increasingly important role and to observe that successful patent agents and lawyers were those who made substantial investments in cultivating reputations for fair, as well as insightful, dealing.<sup>50</sup> In the next section, we describe the business of a patent attorney who did indeed make such investments.

### **The Example of Edward Van Winkle**

Most patent agents and lawyers have left only fragmentary traces in the historical record, but the fortuitous preservation of Edward Van Winkle's business diaries enables us to track the activities of one practitioner in unusually close detail. Van Winkle resided in Jersey City, New Jersey, but worked in New York. In January 1905, he moved into a new office in the Flatiron Building in lower Manhattan, and for the rest of that year we are able to analyze the relationships he cultivated with men on both sides of the market for technology and to observe the various ways in which he performed the function of intermediary.<sup>51</sup>

Like many patent agents of the time, Van Winkle's formal training was in engineering rather than law. He was a graduate of Columbia University, and his diary records the pride with which he displayed his certificate of membership in the American Society of Mechanical Engineers, as well as the eagerness with which he sought positions

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<sup>49</sup> The Patent Office maintained a list of patent agents certified to practice before it, and small numbers of agents were from time to time disqualified. On the weakness of bar associations, see Bloomfield, "Law."

<sup>50</sup> For a more formal analysis of an analogous case, see Wolinsky, "Competition in a Market for Informed Experts' Services." See also Garmaise and Moskowitz, "Informal Financial Networks."

<sup>51</sup> Our main source for the following discussion is Van Winkle's 1905 Diary, but other relevant papers include "Accounts: Personal and Business 1904-1916" and "Reports on Patents, 1905-1907." See Edward Van Winkle Papers, Ac. 669, Rutgers University Libraries Special Collections.

in other engineering societies.<sup>52</sup> By contrast, Van Winkle’s legal education was quite casual. In 1905, he enrolled in Sprague’s Correspondence School, signed up for courses in contracts, agency, partnerships, corporations, and real property, studied the assigned texts during his spare time, took written examinations in these subjects, and received a Certificate of Law—all in the space of five months.<sup>53</sup>

As befitted his training, Van Winkle earned part of his living as an engineering consultant. For example, in 1905 he was employed by various parties to determine the horsepower needed for a hydraulic pump, design the hub of an automobile wheel, and calculate specifications for a twelve-story apartment house project.<sup>54</sup> By contrast, he did no legal work outside the area of patents, hiring other lawyers to represent his interests in lawsuits or to process incorporation papers.<sup>55</sup> Even in the area of patents, his knowledge of the law seems to have been limited. For example, he asked around and got the name of someone “who is very capable in foreign patent application work” and thereafter subcontracted much of this kind of business to him.<sup>56</sup> He also did relatively little of the more complex side of patent law, such as defending inventors’ rights in infringement proceedings. Like other patent lawyers, however, he had long-standing relationships with solicitors in other parts of the country. For example, he routinely used the Washington firm of Evans & Company to conduct searches of patent office records and preliminary

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<sup>52</sup> For example, his entry for 22 Jun. 1905 proudly recorded that the council of the Canadian Society of Civil Engineers “had passed upon my application for associate grade.”

<sup>53</sup> See entries for 4 Mar., 6 Mar., 9 Mar., 11 Mar., 3 Apr., 13 Apr., 17 Apr., 10 May, 15 May, 19 May, 10 Jul., 11 Jul., and 24 Jul. 1905, Van Winkle Diary.

<sup>54</sup> 6 Jan., 10 Jan., 18 Jan., 19 Jan., 27 Feb., 15 May, 16 May, and 22 May 1905, Van Winkle Diary.

<sup>55</sup> See, for example, 24 Jun., 26 Jun., and 30 Jun. 1905, Van Winkle Diary.

<sup>56</sup> 1 May 1905, Van Winkle Diary.

interviews with patent examiners.<sup>57</sup> As we will see, he also had extensive dealings with an agent in another city who was referenced in the diary only by his last name, Zappert.<sup>58</sup>

Van Winkle's engineering expertise enabled him to provide technical assistance to businessmen interested in purchasing patents. For example, Frank P. Parker and Frederick J. Bosse brought him a "non-refillable bottle" and several other devices invented by John L. Adams, and requested that he test the inventions and assess their patentability. When Van Winkle reported positively, the men engaged him to process Adams's patent applications and also papers assigning the patents to themselves.<sup>59</sup> Parker and Bosse seem to have invested in these patents with the aim of reselling them, for Van Winkle's diary includes a couple of entries noting visits by potential purchasers, including one businessman who indicated that, though his company did not want to take up the invention, he himself "would be interested to look at it."<sup>60</sup> It is unclear, however, whether Van Winkle had lined up these potential customers—that is, whether he was functioning as an intermediary in these instances—or whether he was simply providing information to prospective buyers contacted by Parker and Bosse.

On other occasions, however, Van Winkle clearly played the role of intermediary—sometimes on behalf of inventors and sometimes on behalf of purchasers of patents. He noted in his diary, for example, that inventor S. A. Davis "placed in my hands a matter of adjusting royalties + disposing of his drophead patent and said he

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<sup>57</sup> See, for example, 23 Mar. and 1 Jun. 1905, Van Winkle Diary.

<sup>58</sup> Zappert's city of residence is unclear, but was certainly not New York because the only contacts between the two men recorded in the diary occurred by letter. See 11 Mar., 27 Mar., 20 Apr., 28 Apr., 1 Jun., 2 Jun., and 12 Jun. 1905, Van Winkle Diary.

<sup>59</sup> See the diary entries for 12 Jan., 2 Feb., 22 Mar., 23 Mar., 29 Mar., 6 Apr., 20 Apr., 28 Apr., and 16 Aug. 1905. On 29 Dec. 1905, the same two men brought in a soap shaving machine invented by a Mr. Luis for Van Winkle to examine and evaluate.

<sup>60</sup> 29 Mar. 1905, Van Winkle Diary. See also 21 Jul. 1905

would give me half of what I collected.”<sup>61</sup> A businessman named Kendall dropped by Van Winkle’s office to discuss letting him “have the foreign patents in melting furnaces.” Later Kendall called again, and “we started the ball a rolling for sale of foreign pats of the Rockwell furnace.” Among the first steps Van Winkle took in marketing these patents was to forward information about them to Zappert, an agent in another city with whom he had ongoing contact.<sup>62</sup> Van Winkle also worked from time to time as an intermediary on behalf of parties in other cities. For example, after Zappert wrote and sent him “specimens + literature” about a dry adhesive photographic mounting process, he “took it around to Chas Walsh + he thought it would be a valuable thing to control, he is going to get ideas on the matter and see what he can do towards making some money out of the scheme [sic].”<sup>63</sup>

In some cases Van Winkle himself took a position in a patent as part of the deal. Thus an inventor named Pratt “agreed to let me have that patent [for a differential valve motion] on a shop right royalty of 10¢ and all over that sum I would have if I sold.”<sup>64</sup> Indeed, there is evidence that Van Winkle actively sought such participations. For example, he told one of the officers of the Davis, Redpath Company, that “I would sell him the Canadian patent for 5000<sup>xx</sup> + if he would assine [sic] me” (and do certain other things not specified in the diary entry), “[I] would be willing to go in with him.”<sup>65</sup> On still other occasions, he displayed an interest in investing in a new technology long before it got to the patent stage. After “Sol Katz called with a kite proposition,” he began to study

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<sup>61</sup> 5 Jun. 1905, Van Winkle Diary.

<sup>62</sup> 28 Apr., 9 May, 1 Jun., and 2 Jun. 1905, Van Winkle Diary.

<sup>63</sup> 27 Mar. 1905, Van Winkle Diary.

<sup>64</sup> 9 Jun. 1905, Van Winkle Diary.

<sup>65</sup> 25 May 1905, Van Winkle Diary.

kites and flying machines and visit the shops of people who were experimenting with the devices. A month later he and Katz agreed jointly to put up money for the development of a promising invention.<sup>66</sup>

As one might expect, Van Winkle's work as intermediary sometimes put him in situations where there was a clear conflict of interest. For example, W. N. Richardson, one of the businessmen with whom he regularly dealt, wanted an option to buy out inventor Edward A. Howe's interest in some patents. Van Winkle recorded Richardson's offer as follows: "He will give \$3000 to 4000 for the last two patents and give me a commission of 10%. If I can get the patents for less, will receive a larger fee."<sup>67</sup> Van Winkle called on Howe and "had a hard fight to get Howe to accept terms." Ultimately, however, after a session that lasted two and a half hours, Howe agreed to accept Richardson's terms "provided R will give him a free hand in all future patents."<sup>68</sup> Somehow, throughout all of these negotiations, Van Winkle managed to be completely above board with the inventor about his interest in the deal. He maintained excellent relations with Howe, who continued to do business with him for the rest of the period of the diary. Indeed, after Richardson later decided not to take up the patents, Howe confided to Van Winkle that he had "only signed option so that I [Van Winkle] could collect my fee." Although this statement should probably not be taken at face value, it is an indication of the strength of the relationship that Van Winkle had been able to build with this inventor.

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<sup>66</sup> To Van Winkle's disappointment, the inventor later backed out of the deal. See 7 Jun., 16 Jun., 17 Jun., 18 Jun., 9 Jul., 17 Jul., 23 Jul., 3 Aug., 4 Aug., 19 Sept., 24 Sept., 12 Nov., 13 Nov., 21 Nov., 4 Dec., 18 Dec., 1905, Van Winkle Diary.

<sup>67</sup> 16 May 1905, Van Winkle Diary.

<sup>68</sup> 16 May and 17 May 1905, Van Winkle Diary.

That Van Winkle was able to cultivate relations of trust with a number of inventors is evinced by their willingness to come back to him again with new ideas. For example, the Adams who invented the non-refillable bottle subsequently approached him seeking “money on a tooth pick scheme. Saturated wooden toothpicks with spice flavors that are antiseptic auromatic [sic], etc.”<sup>69</sup> Previous work for Pratt involving elevator and escalator devices was what had led Pratt to return and suggest the deal for the differential motion valve.<sup>70</sup> Similarly, Katz had earlier used Van Winkle to file a patent for a shoe heel.<sup>71</sup>

Not surprisingly, Van Winkle devoted a great deal of his time to cultivating these kinds of personal relationships—not just with inventors but also with businessmen interested in investing in patents. Van Winkle’s diary shows that he spent the bulk of each day receiving visitors, calling on people, and talking business over lunch and dinner at the Columbia Club or other similar places. This constant round of face-to-face meetings helped Van Winkle build relationships of trust with parties on both sides of the market. In addition, these meetings became an important source of tips about potential buyers for inventions, new technologies for Van Winkle to explore, and clients he might attract to his practice. Thus when Van Winkle was handling an elevator safety invention for Pratt, he received information from a friend with whom he often dined “that C. L. C. Howe of the N.Y. Life Co was looking for a safety for Elevators.” Van Winkle called on Howe that very afternoon, noting in his diary that “There might be something doing

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<sup>69</sup> 28 Sept. 1905, Van Winkle Diary.

<sup>70</sup> 7 Feb., 17 Feb., 2 Mar., 23 Mar., and 27 Apr. 1905, VanWinkle Diary.

<sup>71</sup> 4 Feb., 5 Apr., and 22 May, Van Winkle Diary.

later.”<sup>72</sup> On another occasion, he lunched with Charlie Halsey, who “said he had some cigarette machine patents + papers which he would bring to my office and let me look over.”<sup>73</sup> A similar lunch with Robert E. Booream, an inventor whose work embraced electric bridge hoists, washers for gold mining, and methods of roadway construction, yielded the notation that the two men had “lightly touched on business. We will no doubt be associated.”<sup>74</sup> Van Winkle’s use of the word “associated” suggests that he envisioned his work with Booream to encompass more than simply filing patent applications,” and the diary entries show him later putting Booream in contact with a mining engineer.<sup>75</sup>

A few businessmen appeared over and over again in the pages of the diary as purchasers of, or investors in, patents. One of the most striking things about these men is the wide variety of technologies in which they displayed an interest. Richardson, for example, was involved in patents for hat-frame formers, rails for high-speed railroads, electric railroad systems, and pliers.<sup>76</sup> Another businessman, Arthur DeYoung, was in frequent contact to discuss technologies as diverse as coin counters, arc lamps, and dry mounting processes for photographs.<sup>77</sup> The most intriguing case is a man who is identified in the records only as Mr. Oliver, although he was closely associated with Van Winkle in a number of important deals. Oliver’s investments spanned the full gamut of

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<sup>72</sup> 31 Mar. 1905, Van Winkle Diary.

<sup>73</sup> 8 Aug. 1905, Van Winkle Diary.

<sup>74</sup> 24 Jan. 1905, Van Winkle Diary. See also 5 Mar., 7 Jun., and 12 Jun. 1905.,

<sup>75</sup> 7 Jun. And 8 Jun. 1905, Van Winkle Diary.

<sup>76</sup> See, for examples, 30 Jan., 16 Mar., 17 Mar., 1 Apr., 1 May, and 7 May 1905, Van Winkle Diary.

<sup>77</sup> See, for examples, 6 Jan., 28 Jan., and 13 Jun. 1905, Van Winkle Diary.

technologies, from envelopes to drills to arc lamps to sewing machines to signaling systems for railroads.<sup>78</sup>

The wide variety of technologies in which these men were interested suggests that they were not primarily manufacturers seeking to improve the efficiency of their enterprises or expand their product lines. Instead, they seem to have been investors eager to profit from purchasing the rights to promising new inventions, regardless of industry. How they meant to reap their returns is not in all cases clear, but they do not seem to have been functioning as what we would now call “trolls”—that is, they do not seem to have been accumulating patents that were often of dubious validity with the idea of extracting licensing fees from producers who had no idea they were infringing and who were likely to settle rather than bear the costs of litigation.<sup>79</sup> Indeed, there are no references at all in the diary to searching out infringers.

To the contrary, the men who appear frequently in Van Winkle’s journal seem to have been functioning more like modern day angel investors or venture capitalists than anything else. Richardson, himself an inventor, provided funds to help other inventors patent their devices in exchange for a share of the intellectual property.<sup>80</sup> Sometimes he also helped the inventor work out the technological details and sometimes got his name on the patent as a co-inventor.<sup>81</sup> De Young seems to have been primarily interested in participating in companies formed to exploit particular inventions, for example a coin-

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<sup>78</sup> See, for examples, 1 Jan., 4 Feb., 16 Feb., 23 Feb., 7 Apr., 11 May, 20 May, and 6 Sept. 1905, Van Winkle Diary. Oliver also financed the invention of a cloth guide for sewing machines by Van Winkle himself. See entries for 24 Aug. and 29 Aug. 1905.

<sup>79</sup> For an excellent discussion of trolls in the present day, see the episode “When Patents Attack!” of “This American Life,” <http://www.thisamericanlife.org/radio-archives/episode/441/when-patents-attack>.

<sup>80</sup> See, for examples, 3 Feb., 21 Mar., and 17 July 1905, Van Winkle Diary.

<sup>81</sup> See 30 Jan., 7 May, and 18 July 1905, Van Winkle Diary.

counting machine.<sup>82</sup> Oliver operated in a variety of different ways. In one transaction he agreed to provide Van Winkle himself with capital to develop an invention, presumably in exchange for a share in the patent.<sup>83</sup> He also bought patents outright, for example offering an inventor named Peters a note for \$100,000 in exchange for a patent for a wireless receiver that he planned to market to the U.S. government.<sup>84</sup> In addition, during the year of the diary Oliver worked with Van Winkle in at least two efforts to organize companies: the Simplex Machine Company and the Automatic Security Signal Company. Both efforts concerned inventions patented by the same inventor, William M. Murphy.<sup>85</sup>

These promotions show how the roles that patent agents played in the market for technology could extend far beyond simply matching inventors with potential buyers for their patents. Although Van Winkle did not handle the formal legal work associated with the incorporations, he did everything else: he brokered agreements between the inventor and the main investors, arranged for the inventor to assign his patents to the company, arranged for the application and sale of foreign patents, worked to find buyers for the companies' securities and customers for the companies' products, and even helped the inventor work out knotty technical details.<sup>86</sup> In exchange, he received payment in the

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<sup>82</sup> See 6 Jan., 28 Jan., and 21 Oct. 1905, Van Winkle Diary.

<sup>83</sup> See 24 Aug. 1905, Van Winkle Diary.

<sup>84</sup> See the diary entry for 20 May 1905. Oliver and Peters subsequently had some disagreement about the terms of the arrangement, and it is not clear from the diary whether the deal actually went through. See also 21 Jan., 24 Jan., 25 Feb., 28 Feb., 2 Mar., 13 May, 22 May, and 27 May 1905, Van Winkle Diary.

<sup>85</sup> See 27 Feb., 7 Mar., 8 Mar., 24 June, 26 June, 26 July, 6 Sept., 8 Sept., and 17 Nov. 1905, Van Winkle Diary. Disagreements developed in this case too between Oliver and the inventor. See, for example, 21 July, 31 July, 8 Aug, 17 Aug., 22 Nov. 1905, Van Winkle Diary.

<sup>86</sup> See 27 Feb., 22 Mar., 14 Apr., 20 Apr., 11 May, 12 May, 5 Jun., 15 Jun., 21 Jun., 26 Jun., 17 Jul., 8 Aug., and 14 Aug., 1905, Van Winkle Diary.

form of shares in the new company's stock. In the case of Simplex, for example, he received 25 out of 500 shares; Murphy received 175.<sup>87</sup>

Although we have no basis for assuming that Van Winkle was representative of the general population of patent lawyers, his diary nonetheless offers an intriguing window on the market for patented technology, allowing us to observe in close detail some of the ways in which patent attorneys might improve the efficiency of this kind of trade. The diary provides concrete evidence of the extensive investments that intermediaries had to make to cultivate the trust of participants on both sides of the market—the time and resources that had to be devoted to building personal relations with inventors and also with businessmen who were potential buyers of patented technology. The diary also highlights the very personal nature of many of the channels through which information about inventions flowed during this period. Despite the existence of publications that specialized in reporting new technological developments, the operation of the market for technology depended to a large extent on the circulation by word of mouth of details of new inventions that had not yet been fully worked out—details that patent agents and lawyers were uniquely well placed both to obtain and assess.

More interesting still, Van Winkle's diary illuminates a world in which businessmen who were operating in effect as venture capitalists eagerly purchased interests in patents, and where attorneys like Van Winkle not only helped them by assessing the investment potential of new inventions, but also played a vital role in bringing businessmen and inventors together in companies to exploit promising technologies. Patent agents, in other words, not only helped inventors who wanted to sell

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<sup>87</sup> See page inserted by the entry of 27 Jul. 1905, Van Winkle Diary.

off their intellectual property but also those seeking to exploit their patents in their own businesses. Although we lack other manuscript collections of similar richness, evidence from interference records and secondary sources of various kinds indicates that Van Winkle was by no means the only attorney functioning in this way. For example, sewing machine inventor Lansing Onderdonk and his patent attorney, Henry P. Wells, helped to organize a business in the early 1880s to exploit a combination plaiting and ruffling attachment for sewing machines.<sup>88</sup> The president of the Bonsack Machine Company, Demetrius B. Strouse, was none other than the patent attorney who had filed James A. Bonsack's original cigarette-machine patents.<sup>89</sup> To give a last, particularly suggestive example, patent lawyer Grosvenor Porter Lowrey played an important role in putting together financing for Thomas Edison's work in electric lighting. Lowrey was a partner in the firm of Porter, Lowrey, Soren & Stone and also general counsel for Western Union. In his latter capacity, he had handled a number of patents for Edison and had developed a close relationship with the inventor. Edison was thinking of working on electric lighting, but had put the idea aside because he could not see how to raise the funding he needed for the project. Lowrey came to his aid by assembling "a syndicate of his friends and closest business associates," including some of his own legal partners, colleagues from Western Union, and personal friends such as the Fabbri brothers, partners in Drexel, Morgan & Company. Financing from this group enabled Edison to create the primitive research lab at Menlow Park where he conducted his experiments with incandescent lighting. When the experiments provided successful, Lowrey

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<sup>88</sup> See "Deposition of witnesses examined on behalf of Lansing Onderdonk," 32-34, *Onderdonk v. Mack* (1897), Case 18,194, Box 2,521, Interference Case Files, 1836-1905.

<sup>89</sup> See "Testimony on behalf of Bonsack," 45-46, *Bohls v. Bonsack* (1893), Case 15,678, Box 2,159, Interference Case Files, 1836-1905.

convinced essentially the same people to organize the Edison Electric Light Company in 1878.<sup>90</sup>

### **How Intermediaries Improved the Market for Technology**

Ideally, we would want information on the activities of a broad sample of patent attorneys like Van Winkle so that we could document the ways in which they facilitated the sale or leveraging of patent rights. Although such extensive manuscript collections are extremely rare, we can obtain an overview of the activities of a large number of patent attorneys by analyzing the ledgers of patent assignments currently stored at the National Archives. In order for a transfer (assignment) of patent rights to be legally binding, the contract had to be deposited with the Patent Office in Washington. Clerks copied the contracts into huge ledgers called *libers* in the order they were received. So that they could readily find particular assignments, the clerks also maintained digests that contained summary details of each assignment contract, as well as references to the appropriate *liber* volume and page.

We exploit an intriguing feature of the digests—the inclusion in the summaries of the name and address of the person to whom all correspondence concerning the assignment was to be addressed. Although some of these correspondents may simply have handled the paperwork associated with drawing up and recording contracts for the sale of patent rights, many others likely functioned as intermediaries. We investigate this possibility by testing whether assignments handled by third parties differed in predictable ways from those handled by assignors or assignees. We are particularly interested in the

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<sup>90</sup> Taylor, *Mr. Edison's Lawyer*, 32-24; Israel, Edison, 173-79.

features of assignments handled by third parties who were registered patent agents or attorneys.<sup>91</sup> As Table 2.5 shows, the proportion of contracts handled by these specialists increased over time for all categories of assignments that were growing in importance in the late nineteenth century—primary assignments, national assignments, and assignments to companies. The proportion of primary assignments handled by registered patent agents increased from 34.4 percent in 1871 to 60.4 in 1891 to 79.0 in 1911, the proportion of national assignments rose from 40.2 percent in 1871 to 63.4 in 1891 to 79.7 in 1911, and the proportion of assignments to companies climbed from 34.4 percent to 59.3 to 79.9.

By comparing the assignments handled by different categories of correspondents, we can explore the ways in which the use of patent agents as intermediaries improved the functioning of the market for technology. For example, if patent agents' networks enabled them better to match inventors and buyers over long distances, one would expect that registered patent agents would handle the greater part of the contracts involving patentees and assignees located in different places. This expectation is confirmed by the patterns in Table 2.6, which breaks the primary assignments down by correspondent type and whether the patentee and assignee resided in the same state. As the table shows, registered patent agents handled 50.0 percent of interstate assignments in 1891 (compared to 2.4 percent for assignors, 25.6 for assignees, and 19.5 percent for other third parties) and 67.9 percent in 1911 (compared to 3.7, 15.6, and 12.8 percent respectively for the other groups).

The use of registered patent agents seems to have improved the efficiency of the market as well as its geographic scope. Assignments handled by registered agents

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<sup>91</sup> That is, patent agents and attorneys who were authorized to conduct business with the Patent Office. For a description of the data, see Table 2.5.

occurred much more rapidly on average than those handled by parties to the exchange or by other third parties. Table 2.7 reports breakdowns of assignments by the interval of time that elapsed between the issue of a patent and the assignment and by the type of correspondent. Focusing again on primary assignments, we can see that registered patent agents handled the vast majority of the assignments that were contracted before the patent was issued—81.1 percent in 1891 and 89.3 percent in 1911—a result that is consistent with the agents’ advance knowledge of new technologies that would be coming on the market. For some contracts in the sample we have no information about when (or whether) the patent was issued, though we observe that registered patent agents handled a disproportionate number of these as well. After searching for some of the patents in the Lexis-Nexis patent database, we concluded that most of the contracts for 1891 that were missing this information involved patents that were never granted. For 1871 and 1911, however, it seems that they were more often than not assignments before issue, and the patent office simply neglected to go back and add the patent number to the record when the patent was later granted.<sup>92</sup> Regardless, these cases are useful reminders that assignees who contracted for patents before the date of issue could not be certain that the patent would ever be granted, which made the patent attorney’s assessments all the more important.

Of course, patent agents’ apparent efficiency in selling patents may simply have been a result of other advantages, for example their tendency to locate in cities and in regions where there were lots of inventors and also lots of manufacturers. The regressions in Table 2.8 examine this possibility. We restrict the analysis to primary

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<sup>92</sup> In the 1911 digests that assignments include annotations indicating that the patentee had “filed” or “applied” or even that he or she was “to apply.”

assignments recorded in 1891 and 1911 for which we know the identity of the correspondent. The dependent variable is a dummy for whether the assignment occurred before issue. The independent variables of interest are the dummies for the type of correspondent (the omitted category is the assignor—that is, the patentee). The other independent variables include dummies for the region in which the inventor resided (the omitted category is the Middle Atlantic) and for the degree of urbanization of the inventor's county (the omitted category is counties whose largest city contained less than 25,000 people). We also include a dummy for contracts that were recorded in 1911 because the Patent Office took longer to examine patent application in 1911 than in 1891. Finally, in the second and fourth columns we add two variables that aim to capture the extent to which the patentee had specialized in inventive activity. For each patentee involved in an assignment, we collected the number of patents he or she received in the two years before the year of the contract and the two years after (the omitted dummy is the patentee obtained less than two patents in these four years). The first two columns treat as assignments before issue cases where the date of issue of the patent is missing. In the second two columns we drop these observations from the analysis.

The estimations in Table 2.8 suggest that patent agents' advantage in securing buyers for patents in advance of issue did not derive exclusively from their locations. In all of the regressions, assignments before issue were strongly and significantly associated with using a registered patent agent, even after controlling for the region of the patentee, whether the patentee resided in an urban location, and also the year of the assignment. Although patentees who obtained more than three patents in the two years immediately before and after the date of the observation were more likely to assign their patents at

issue, perhaps because they were already well known to potential buyers, the agents' advantage persisted when we controlled for this characteristic. Indeed, the marginal effects suggest that the probability of assigning a patent before issue was about 30 percent greater if the assignment was handled by a registered agent than if was handled by a party to the transaction. This result, moreover, is not sensitive to whether we included in the analysis patents for which there are no issue dates in the dataset.

Another way in which patent agents and attorneys may have benefitted patentees was by securing them better prices for their inventions. Unfortunately, the data do not allow us to explore this possibility because when lawyers took charge of handling assignments, the contracts they recorded in the Patent Office became increasingly standardized and uninformative. Whereas earlier contracts had often contained detailed information about the remuneration paid to the patentee, now they typically specified that the assignment was in exchange for one dollar and other consideration.

Patent agents, of course, charged for their services, and one might wonder whether inventors' dependence on their assistance in selling patents enabled them to earn supra-normal returns at the patentees' expense. The number of patent agents increased so dramatically in the late nineteenth century, both in absolute terms and relative to the size of the population, that it is likely that whatever excess returns agents may have been able to extract in the early years of the market for technology were soon competed away. Certainly, no patent agent ever attained a dominance in the last quarter of the century comparable to that of Munn and Company in the years immediately following the Civil War. The top attorney in our 1871 sample accounted for only 5.5 percent of the patent assignments and the top four attorneys only 13.5 percent. Moreover, the numbers

dropped steadily over time until by the 1911 sample the top attorney handled only 1.3 percent of the assignments and the top four only 4.6 percent.

### **The Rise of the Specialized Inventor**

If patent attorneys who functioned as intermediaries improved inventors' ability to sell patents or obtain financing, one might expect that the prospect of greater returns would have induced the inventors who benefited from their services to increase their commitment to patenting (and to inventive activity more generally). We cannot test this expectation using the dataset from the *liber digests* because we do not have information about the careers of those inventors.<sup>93</sup> We can, however, use our longitudinal sample of inventors whose last names began with the letter B to explore the effect on an inventor's career of establishing a long-term relationship with a patent attorney. As Table 2.9 indicates, the impact seems to have been substantial. Even if we restrict our attention only to those inventors with patents in the previous five years, the increase in patenting was impressive. Nearly half of the inventors with 10 or more career patents obtained at least 100 percent more patents in the five years after they established a relationship with a patent attorney compared to the five years before. In the case of inventors with 20 or more career patents, 17.4 percent attained an increase of at least 300 percent.

Of course, one might expect the number of patents obtained by a productive patentee to rise over the course of his or her career, so it is not clear how much of this increase should be attributed to improved access to the market. Table 2.10 makes a

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<sup>93</sup> Although we could in principle collect this data, we did not think it worth the effort because the resulting dataset would suffer from severe sample selection biases that would limit its more general utility.

modest attempt to correct for the inventor's career trajectory by comparing the increase in the number of patents obtained in the five years after finding the preferred attorney relative to the five years before with 1) the increase in patents obtained in the five years before meeting the attorney relative to the five years prior to that, and 2) the increase in patents obtained in the period six to ten years after meeting the attorney relative to the first five years. For fully 50 percent of the most productive category of inventors, the increases associated with establishing a long-term relationship with an attorney were the largest of the three.<sup>94</sup>

Over time, as intermediaries helped such productive patentees become even more productive, the distribution of inventors became increasingly bimodal. In the years immediately following the Civil War most inventors were able to assign relatively few of their patents by the time of issue, regardless of how many patents they obtained over their careers. A substantial majority of the inventors in our 1870-71 cohort of B patentees (ranging from 76.9 percent of those with 1 to 2 career patents to 57.1 percent of those with 20 or more) had lifetime assignment rates of less than 25 percent (see Table 2.11). By the 1910-11 cohort, however, the situation was very different. Whereas 81.0 percent of the inventors with only 1 to 2 career patents still assigned less than a quarter of their patents, fully half of those with 20 or more patents assigned at least three quarters of them by the time of issue. Inventors with career assignment rates of less than 25 percent accounted for the bulk of the patents generated by members of the 1870-71 cohort, but the modal category for the 1910-1911 cohort was inventors with assignment rates of 75 percent or greater (Table 2.12). Nearly half the patents obtained by members of that

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<sup>94</sup> We will provide a more formal analysis in the future after we increase our sample size and collect some additional control variables.

cohort went to inventors with career assignment rates of at least 75 percent, with most going to patentees in the most productive category.

Although there is no way definitively to prove causation, the increased ability in the late nineteenth century to contract for patented technology in the market seems to have been associated with the emergence of a class of highly productive inventors. This group consisted of men like Thomas Edison and Elmer Sperry, who were famous enough to become household names, but it also included hundreds of others whose achievements are remembered today, if they are remembered at all, only by specialists. As we will see in the next chapter, these productive inventors did not flourish in all regions the country, but rather were concentrated in the parts of New England, the Middle Atlantic, and the East North Central where it was easiest for them to sell off rights to their intellectual property or, if they preferred, to obtain financing for startup enterprises. The next chapter will make the case that the location of inventive activity was less dependent on the location of production than it was on access to the market for technology.

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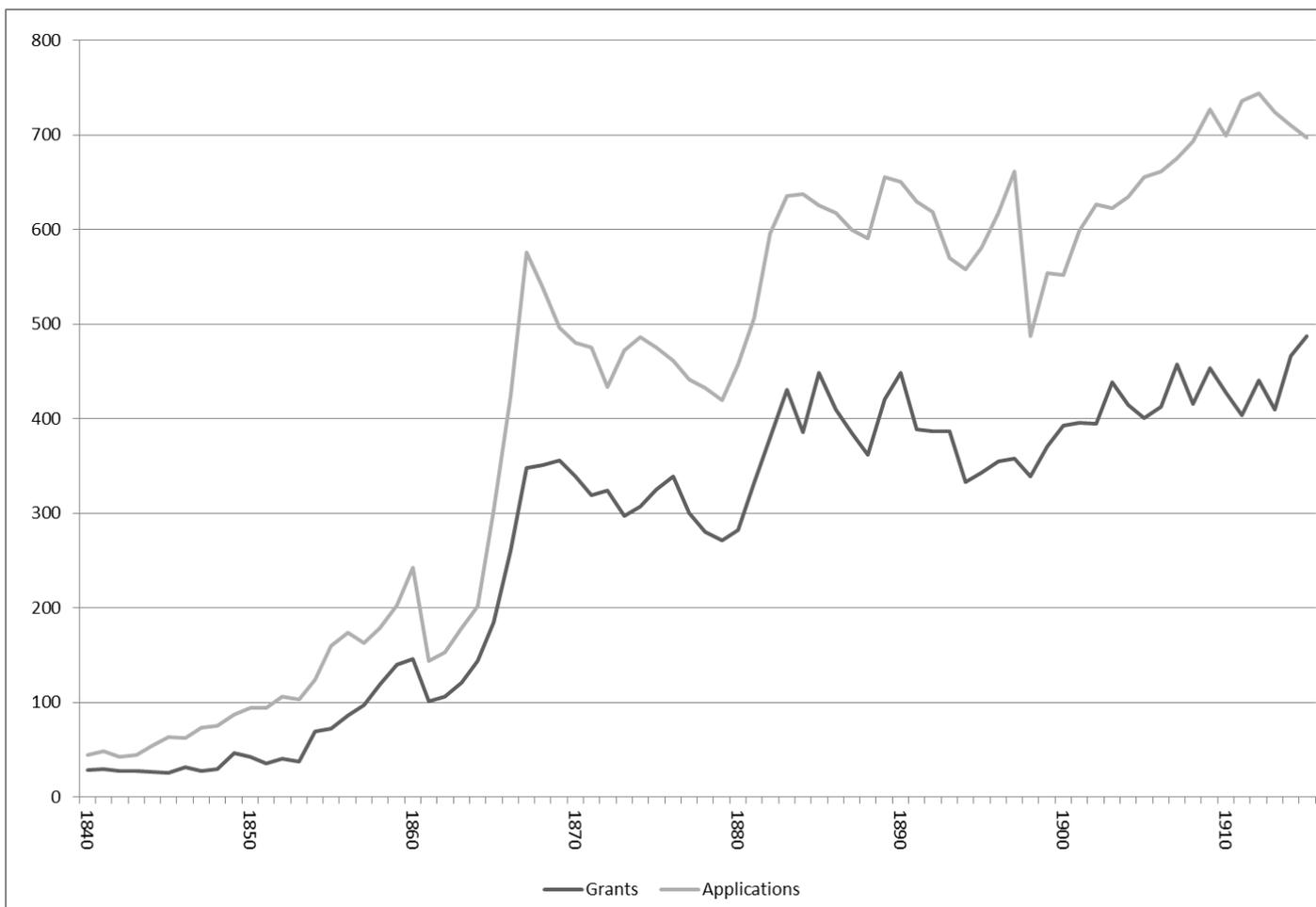
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Figure 2.1. Patent Grants and Applications in the United States Per Million People, 1840-1915



*Source:* Carter et al., *Historical Statistics of the United States*, Vol. 1, 28-29 and Vol. 3, 426-27.

*Notes:* The figures include applications by, and grants to, residents of foreign countries and also design patents. Foreign residents accounted for about 2 percent of patent grants in 1850 and 9 percent in 1915. Design patents accounted for about 9 percent of patent grants in 1850 and 3 percent in 1915.

Table 2.1. Trends in Types of Patent Assignments

	1851	1871	1891	1911
Percent of assignments that were geographic	71.4	22.8	4.6	1.2
Percent of assignments that were secondary	43.6	27.8	16.4	12.0
Percent of assignments made after issue	88.0	72.2	44.1	36.5
Total number of assignment contracts	133	794	1,373	1,869

*Source:* Our sample consists of all assignment contracts filed with the U.S. Patent Office by assignors resident in the United States during the months of January 1851, January 1871, January 1891, and January 1911. These contracts are recorded in “Liber” volumes stored in the National Archives, Record Group 241, Records of the Patent and Trademark Office. Geographic assignments are grants of patent rights that are limited to specific subregions of the United States. Secondary assignments involve patent rights that have previously been assigned to the assignor.

Table 2.2. “B” Inventors’ Occupations and Assignment Patterns

Panel A: Inventors’ Occupations (Percent of Total Number of Inventors in Row)						
No. of Career Patents	No. of Inventors	Principals	Employees	Others		
1-2 patents	226	0.9	0.0	99.1		
3-9 patents	187	5.9	5.9	88.2		
10-19 patents	73	21.9	12.3	65.8		
20 or more patents	73	26.0	4.1	69.9		
Total	559	8.6	4.1	87.3		

Panel B: Number of Assignees per Inventor (Percent of Total Number of Inventors in Row)						
No. of Career Patents	No. of Inventors	0	1	2 to 3	4 to 5	6+
1-2 patents	226	77.4	22.1	0.4	na	na
3-9 patents	187	48.1	30.5	17.1	3.7	0.5
10-19 patents	73	27.4	28.8	27.4	13.7	2.7
20 or more patents	73	5.5	12.3	41.1	15.1	26.0
Total	559	51.7	24.5	14.8	5.0	3.9

Panel C: Whether Inventor Assigned More Than 40 Percent of Patents to One Assignee (Percent of Total Number of Patents in Row)						
No. of Career Patents	No. of Patents	0	1	2 to 3	4 to 5	6+
1-2 patents	300	0.0	100.0	100.0	na	na
3-9 patents	931	0.0	21.1	28.1	14.3	0.0
10-19 patents	1005	0.0	33.3	30.0	10.0	50.0
20 or more patents	3711	0.0	33.3	43.3	45.5	15.8
Total	5947	0.0	52.6	34.9	25.0	18.2

*Sources and Notes:* The “B” sample was constructed by taking three random cross-sectional samples of patents from the *Annual Reports of the Commissioner of Patents* for the years 1870-71, 1890-91, and 1910-11, selecting all the patentees in the cross-sections whose last names began with the letter B, and then collecting the patents that each of them obtained in the twenty-five years before and after they appeared in the cross-section. If the patent was assigned at issue, we recorded the name(s) and address(es) of the assignee(s). We also recorded the residence of the patentee and used that information to locate the inventor in the manuscript U.S. Census and in city directories, our sources of

occupational information. Panel A records the inventors' occupations at the time they appeared in our cross-sectional samples. An inventor was classified as a principal if the firm bore his surname or if he was listed as an officer, director, proprietor, or partner of the firm. The other category includes independent inventors, those who could not be classified because their occupational titles did not convey enough information, and those for whom we could not find occupational information. Panel B records the number of different assignees to whom inventors transferred their patents at issue over their careers. It potentially understates the number of assignees with whom the inventor dealt because patents that were not assigned at issue could be assigned later on. Panel C records the percentage of patents awarded to inventors in each category who assigned more than 40 percent of their patents at issue to a single individual or firm. All the panels pool inventors from the three cross-sections.

Table 2.3. Registered Patent Agents by Region

Region	1883	1889	1910
Panel A: Number of Registered Patent Agents Per Million People			
New England	22.4	89.3	99.2
Middle Atlantic	18.6	112.4	116.5
East North Central	8.8	72.8	76.7
West North Central	2.1	51.2	61.0
West	4.0	29.7	79.1
District of Columbia	715.0	1,072.1	2,386.2
Delaware and Maryland	4.6	39.6	40.1
Other South	0.2	10.1	16.3
United States	10.7	61.5	74.5

Panel B: Regional Distribution of Registered Patent Agents (Column Percent)

New England	16.7	10.9	9.5
Middle Atlantic	36.2	37.0	32.9
East North Central	18.4	25.5	20.4
West North Central	2.4	11.8	10.4
West	1.3	2.3	7.9
District of Columbia	23.6	6.4	11.5
Delaware and Maryland	0.9	1.2	0.9
Other South	0.6	4.8	6.6
United States	100.0	100.0	100.0

*Notes and Sources:* U.S. Patent Office, *Roster of Registered Attorneys* for 1883, 1889, and 1907, and *Attorneys Admitted to Practice from 1907 to 1910*. State population figures are from the U.S. *Census of Population, Reported by States* for 1880, 1890, and 1910. New England includes Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont; the Middle Atlantic New Jersey, New York, and Pennsylvania; the East North Central Illinois, Indiana, Michigan, Ohio, and Wisconsin; the West North Central Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, and South Dakota; the West Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming; and the Other South Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia.

Table 2.4. Loyalty of Inventors to Preferred Patent Agents

No. of Career Patents	No. of Inventors	Number of Attorneys the Inventor Tried Before Finding the Preferred Attorney (percent of total inventors in row)			Percent of Patents Handled by the Preferred Attorney after the Inventor Found Him (percent of total inventors in row)			Average Percent of Inventor's Patents Handled by Preferred Attorney
		0	1-2	3+	< 50	$\geq 50$ and < 75	$\geq 75$	
1-2 patents	55	92.7	7.3	0.0	0.0	10.9	89.1	89.1
3-9 patents	65	58.5	40.0	1.5	12.3	30.8	56.9	64.2
10-19 patents	27	40.7	44.4	14.8	22.2	25.9	51.9	55.2
20+ patents	33	27.3	39.4	33.3	18.2	24.2	57.6	61.1
Total	180	60.6	30.6	8.9	11.1	22.8	66.1	69.9

*Notes and Sources:* The inventors in this table are patentees from our 1890-1891 cross-sectional sample whose last names began with the letter B (see Table 2.2). We collected all of the patents these inventors obtained in the twenty-five years before and after 1890-91 and then retrieved the name of the patentee's attorney from the drawing submitted with the patent. The preferred attorney is defined as the attorney who handled the largest fraction of the patentee's inventions.

Table 2.5. Categories of Assignment Contracts Broken Down by Type of Correspondent  
(Column Percent)

Type of Correspondent	Total Contracts	Primary Assignment	Secondary Assignment	National Assignment	Geographic Assignment	Assigned to Company	Assigned to Individual
<b>Panel A: 1871</b>							
Assignor	3.9	4.6	2.9	4.3	3.8	4.9	3.6
Assignee	31.7	30.3	38.6	23.9	57.7	19.7	35.0
Registered patent agent	28.5	34.4	8.6	40.2	6.4	34.4	26.9
Other third party	28.9	28.7	31.4	31.0	32.1	24.6	30.0
Unknown	7.0	2.1	18.6	0.5	0.0	16.4	4.5
<i>Total no. of contracts</i>	<i>284</i>	<i>195</i>	<i>70</i>	<i>184</i>	<i>78</i>	<i>61</i>	<i>223</i>
<b>Panel B: 1891</b>							
Assignor	3.4	2.8	5.8	4.3	0.0	4.2	2.9
Assignee	21.6	21.8	21.7	18.8	50.9	13.8	26.9
Registered patent agent	53.9	60.4	30.4	63.4	23.6	59.3	50.2
Other third party	14.1	13.1	17.4	13.2	25.5	14.4	13.9
Unknown	7.0	1.9	24.6	0.3	0.0	8.4	6.1
<i>Total no. of contracts</i>	<i>412</i>	<i>321</i>	<i>69</i>	<i>325</i>	<i>55</i>	<i>167</i>	<i>245</i>
<b>Panel C: 1911</b>							
Assignor	2.3	2.4	4.3	2.4	6.1	3.3	1.3
Assignee	8.3	8.6	17.0	7.9	33.3	8.7	7.8
Registered patent agent	66.8	79.0	55.3	79.7	24.2	79.9	53.9
Other third party	9.9	9.7	23.4	9.7	36.4	7.7	12.1
Unknown	12.7	0.2	0.0	0.2	0.0	0.3	24.8
<i>Total no. of contracts</i>	<i>605</i>	<i>453</i>	<i>47</i>	<i>493</i>	<i>33</i>	<i>299</i>	<i>306</i>

*Notes and Sources:* The sample consists of all assignment contracts recorded in the assignment digests of the U.S. Patent Office (stored at the National Archives in Record Group 241, Records of the Patent and Trademark Office) during the first three months of 1871, 1891, and 1911 for inventors whose surnames began with the letter “B.” The table includes only patents granted to U.S. residents. We classified each assignment contract (and the patents it included) by the identity of the correspondent. We first distinguished those contracts for which the correspondent was a party to the contract—that is, either the patentee (or other assignor) or the assignee. Then, working with lists of patent agents and lawyers authorized to conduct business with the Patent Office for 1883, 1889 and 1907-10 (see Table 2.3), we categorized the correspondents we found on these lists as a separate class of intermediaries. A third category consisted of correspondents who were not parties to the contract but who did not appear on any of the lists of registered agents. Finally, we included in an “unknown” category cases where no correspondent was reported in the digest. Not all contracts could be classified as involving primary versus secondary assignments or national versus geographic. Contracts that were missing this information are excluded from the breakdowns. The 1871 panel understates the role of registered patent agents because we were not able to find a list of agents close to the date of the sample. For definitions of the types of assignments, see Table 2.1.

Table 2.6. Assignment Contracts Broken Down by Type of Correspondent and Location of Patentee Relative to Assignee (Column Percent)

Type of Correspondent	No. of Contracts	Address of Patentee and Assignee		
		Same State	Different State	Missing
Panel A: 1891				
Assignor	2.8	3.1	2.4	2.1
Assignee	21.8	21.4	25.6	17.0
Registered patent agent	60.4	65.6	50.0	57.4
Other third party	13.1	8.9	19.5	19.1
Unknown	1.9	1.0	2.4	4.3
<i>Total (row percent)</i>	<i>100.0</i>	<i>59.8</i>	<i>25.5</i>	<i>14.6</i>
Panel B: 1911				
Assignor	2.4	2.3	3.7	1.2
Assignee	8.6	6.1	15.6	7.3
Registered patent agent	79.0	83.2	67.9	80.5
Other third party	9.7	8.4	12.8	9.8
Unknown	0.2	0.0	0.0	1.2
<i>Total (row percent)</i>	<i>100.0</i>	<i>57.8</i>	<i>24.1</i>	<i>18.1</i>

*Notes and Sources:* For a description of the sample and definitions of the various types of correspondents, see Table 2.5. This table includes only primary assignments and only those made in 1891 and 1911 because the dataset lacks addresses for assignors other than the original patentee and lacks the patentees' addresses for 1871. All of the assignors in this table are patentees.

Table 2.7. Assignment Contracts Broken Down by Type of Correspondent and Timing of the Assignment  
(Column Percent)

Type of Correspondent	Primary Assignment					Secondary Assignment				
	Missing Date of Issue	Before Issue	Within 5 Years of Issue	6+ Years After Issue	Number of Contracts	Missing Date of Issue	Before Issue	Within 5 Years of Issue	6+ Years After Issue	Number of Contracts
<b>Panel A: 1871</b>										
Assignor	2.4	33.3	5.0	11.1	4.6	0.0	0.0	3.4	0.0	2.9
Assignee	7.2	33.3	49.0	33.3	30.3	0.0	0.0	39.0	44.4	38.6
Registered patent agent	60.2	0.0	16.0	11.1	34.4	100.0	100.0	6.8	0.0	8.6
Other third party	30.1	33.3	27.0	33.3	28.7	0.0	0.0	32.2	33.3	31.4
Unknown	0.0	0.0	3.0	11.1	2.1	0.0	0.0	18.6	22.2	18.6
<i>Total no. of contracts</i>	<i>83</i>	<i>3</i>	<i>100</i>	<i>9</i>	<i>195</i>	<i>1</i>	<i>1</i>	<i>59</i>	<i>9</i>	<i>70</i>
<b>Panel B: 1891</b>										
Assignor	0.0	1.6	4.2	3.6	2.8	0.0	0.0	5.3	10.0	5.8
Assignee	18.5	10.7	28.5	39.3	21.8	0.0	16.7	28.9	15.0	21.7
Registered patent agent	55.6	81.1	48.6	35.7	60.4	0.0	66.7	26.3	35.0	30.4
Other third party	14.8	6.6	17.4	17.9	13.1	0.0	0.0	23.7	15.0	17.4
Unknown	11.1	0.0	1.4	3.6	1.9	100.0	16.7	15.8	25.0	24.6
<i>Total no. of contracts</i>	<i>27</i>	<i>122</i>	<i>144</i>	<i>28</i>	<i>321</i>	<i>5</i>	<i>6</i>	<i>38</i>	<i>20</i>	<i>69</i>
<b>Panel C: 1911</b>										
Assignor	0.0	2.1	4.4	8.0	2.4	0.0	0.0	4.2	12.5	4.3
Assignee	6.7	4.7	15.4	28.0	8.6	0.0	0.0	29.2	12.5	17.0
Registered patent agent	86.5	89.3	54.9	40.0	79.0	83.3	88.9	37.5	50.0	55.3
Other third party	5.8	3.9	25.3	24.0	9.7	16.7	11.1	29.2	25.0	23.4
Unknown	1.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0
<i>Total no. of contracts</i>	<i>104</i>	<i>233</i>	<i>91</i>	<i>25</i>	<i>453</i>	<i>6</i>	<i>9</i>	<i>24</i>	<i>8</i>	<i>47</i>

*Notes and Sources:* For a description of the sample and definitions of the various types of correspondents, see Table 2.5.

Table 2.8. Regressions on Whether Patents Were Assigned Before Issue

	(1)	(2)	(3)	(4)
	Observations		Observations	
	Missing Date of		Missing Date of	
	Patent Grant Treated		Patent Grant	
	as Assignments		Excluded from	
	Before Issue		Analysis	
Year is 1911	0.194 (4.51)***	0.219 (4.97)***	0.194 (4.17)***	0.217 (4.53)***
Correspondent was assignee	-0.043 (0.30)	-0.039 (0.27)	-0.127 (0.85)	-0.125 (0.82)
Correspondent was registered patent agent	0.337 (2.52)**	0.337 (2.48)**	0.308 (2.26)**	0.305 (2.21)**
Correspondent was other third party or unknown	-0.104 (0.71)	-0.087 (0.59)	-0.225 (1.48)	-0.216 (1.40)
Patentee's county had city with population $\geq 25,000$ but $< 100,000$	0.151 (2.31)**	0.107 (1.58)	0.109 (1.47)	0.060 (0.79)
Patentee's county had city with population $\geq 100,000$ but $< 250,000$	0.132 (1.86)*	0.082 (1.10)	0.120 (1.52)	0.065 (0.80)
Patentee's county had city with population $\geq 250,000$	0.086 (1.47)	0.034 (0.56)	0.048 (0.76)	-0.005 (0.08)
Patentee resided in the West	-0.004 (0.05)	-0.001 (0.01)	-0.006 (0.06)	-0.006 (0.06)
Patentee resided in the West North Central	-0.153 (1.90)*	-0.134 (1.63)	-0.171 (1.93)*	-0.150 (1.66)*
Patentee resided in the East North Central	0.083 (1.53)	0.078 (1.42)	0.097 (1.63)	0.095 (1.57)
Patentee resided in New England	0.100 (1.51)	0.093 (1.39)	0.124 (1.71)*	0.123 (1.67)*
Patentee resided in Delaware or Maryland	-0.197 (1.37)	-0.218 (1.51)	-0.134 (0.91)	-0.154 (1.04)
Patentee resided in the District of Columbia	0.228 (1.57)	0.224 (1.54)	0.286 (1.82)*	0.285 (1.83)*
Patentee resided in the Other South	-0.151 (1.56)	-0.120 (1.25)	-0.113 (1.10)	-0.083 (0.81)
Patentee obtained 2-3 patents in the two years before and after		0.072 (1.34)		0.060 (1.01)
Patentee obtained $> 3$ Patents in the two years before and after		0.188 (3.60)***		0.187 (3.26)***
Number of observations	634	634	568	568

*Notes and Sources:* \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%. Absolute value of z statistics in parentheses. The estimates are probits, and the reported

figures are marginal effects. For a description of the sample and definitions of the various types of correspondents, see Table 2.5. For definitions of the regions, see Table 2.3. We include only primary assignments from the 1891 and 1911 samples in the analysis and drop observations that did not include information about the identity of the correspondent. The dependent variable is a dummy variable that takes a value of 1 if the assignment occurred before the patent was issued. The omitted categories are: for the correspondent dummies, that the correspondent was the assignor (patentee); for the urbanization dummies, that the patentee's county did not have a city of at least 25,000 people; for the regional dummy, that the patentee resided in the Middle Atlantic; and for the inventor's patenting record, that the inventor had one or zero patents in the two years before and after the sample year. We collected the patent counts by looking up the patentee in the *Annual Reports of the Commissioner of Patents* for the two years before and after the sample observation.

Table 2.9. The Impact of Establishing a Relationship with a Patent Attorney

No. of Career Patents	No. of Inventors	Percent Change in the Number of Patents Obtained in the Five Years after Finding the Preferred Attorney Compared to the Five Years Before (Percent of Inventors in Row)			
		$\leq 0$	1 to 99	100 to 299	$\geq 300$
Panel A: All Inventors					
1-2 patents	55	85.5	0.0	14.5	0.0
3-9 patents	65	24.6	3.1	49.2	23.1
10-19 patents	27	11.1	11.1	33.3	44.4
20 + patents	33	12.1	24.2	36.4	27.3
Total	180	38.9	7.2	33.9	20.0
Panel B: Inventors with at Least One Patent in the Five Preceding Years					
1-2 patents	3	100.0	0.0	0.0	0.0
3-9 patents	16	56.3	12.5	31.3	0.0
10-19 patents	11	27.3	27.3	45.5	0.0
20 + patents	23	17.4	34.8	30.4	17.4
Total	53	35.8	24.5	32.1	7.5

*Notes and Sources:* For a description of the sample, see Table 2.4. The table excludes the first patent for each inventor that was handled by the preferred attorney. Patents are classified into periods according to the date on which the patent application was filed. To avoid dividing by zero we always added 1 to the patent count of the earlier period, so the figures in the table understate the relative increase in the second five-year period, with the effect being greatest for inventors with small numbers of patents.

Table 2.10. The Change in Patenting in the Five Years after Finding a Preferred Attorney Relative to Other Five-Year Comparisons

Number of Career Patents	Number of Inventors	Percentage of Inventors in Row for which the Increase in Patents after Finding the Preferred Attorney was Greater than the Increases in Other Comparisons
1-2 patents	4	0.0
3-9 patents	24	8.3
10-19 patents	14	28.6
20 or more patents	26	50.0
Total	68	27.9

*Notes and Sources:* See Table 2.4 and 2.9. Only those inventors who obtained at least one patent in the ten years before establishing a relationship with a preferred attorney are included in the table. Because the number of patents obtained by a productive patentee might be expected to rise over the course of his or her career, the table compares the increase in the number of patents obtained in the five years after finding the preferred attorney relative to the preceding five years with 1) the increase in patents obtained in the five years before meeting the preferred attorney relative to the five years prior to that, and 2) the increase in patents obtained in the period six to ten years after meeting the attorney compared to the first five years after the meeting. We classify patents into periods according to the filing date of the application.

Table 2.11. Distribution of “B” Inventors by their Total Number of Inventions and Career Assignment Rate  
(Percent of Inventors in Row)

Cohort	No. of Career Patents	No. of Inventors	Career Assignment Rate			
			0-24%	25-49%	50-74%	≥75%
1870-71	1-2 patents	52	76.9	0.0	9.6	13.5
	3-9 patents	55	72.7	20.0	5.5	1.8
	10-19 patents	20	70.0	15.0	10.0	5.0
	20 or more patents	14	57.1	35.7	7.1	0.0
	Total	141	72.3	13.5	7.8	6.4
1890-91	1-2 patents	58	70.7	0.0	6.9	22.4
	3-9 patents	65	50.8	15.4	18.5	15.4
	10-19 patents	27	51.9	11.1	29.6	7.4
	20 or more patents	33	24.2	24.2	12.1	39.4
	Total	183	52.5	11.5	15.3	20.8
1910-11	1-2 patents	116	81.0	0.0	5.2	13.8
	3-9 patents	66	56.1	24.2	10.6	9.1
	10-19 patents	26	42.3	11.5	23.1	23.1
	20 or more patents	26	19.2	19.2	11.5	50.0
	Total	234	62.8	10.3	9.4	17.5

*Sources and Notes:* See Table 2.2.

Table 2.12. Changes in the Distribution of Patents by “B” Inventors’ Total Number of Patents and Career Assignment Rates  
(Percent of Total Patents Awarded to Inventors in Each Category in Row)

Cohort	Total No. of Patents	Number of Career Patents				Career Assignment Rate			
		1 to 2 Patents	3 to 9 Patents	10-19 Patents	≥ 20 Patents	0-24 Percent	25-49 Percent	50-74 Percent	≥ 75 Percent
1870-71	1083	6.6	25.5	26.1	41.8	63.4	22.9	11.1	2.6
1890-91	2505	3.1	13.4	14.8	68.7	30.6	19.5	13.5	36.5
1910-11	2359	6.4	13.6	14.9	65.1	28.4	15.6	9.1	47.0
All three	5947	5.0	15.7	16.9	62.4	35.7	18.5	11.3	34.5

*Notes and Sources:* See Table 2.2.