



Patenting in the United Kingdom and Japan: Subsystems That Determined MNEs' Patent Policy

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A comparison of GE's patent applications in the United States, the United Kingdom, and Japan shows that, by 1914, GE had applied for many patents in the first two countries, but that its patent applications in Japan were negligible. An essential condition for multinational enterprises to consider when filing a significant number of patent applications is whether they can develop a patent management organization and relevant capabilities in the local market. In the United Kingdom, patent management and controls were conducted by the GE Board, assisted by specific individuals, the patent department, law firms, and patent agents. The organization of patent management and controls by British Thomson-Houston Company, Ltd. (BTH) was done by key talent from GE. Indeed, many local resources existed that could be used for patent management and control; however, without an organization and the technologies that could combine them to serve as a patent management and control system, BTH would not have been able to take advantage of patents. In the case of BTH, the techniques were in part imported from GE at an early stage and then developed. In the case of Japan, GE's subsidiaries did not form a patent department until 1919.

Patent laws of host countries are known to affect the decisions of multinational enterprises to invest in foreign countries. For example, Mira Wilkins pointed out that the compulsory clause of patent laws forced U.S. electrical companies to build their factories in European countries in the

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late nineteenth century.¹ However, patent law is a subsystem of the patent system. The national patent system is made up of many subsystems, including the judicial system, the patent attorney or agent system, the corporate intellectual property system, and the organizational capability of patent control, as well as patent law. Did these components of the patent system have an effect on the policies of multinational enterprises? Which subsystem affected decisions on international patent applications, patent control, and foreign direct investment? Among such subsystems, this essay focuses on corporate patent control and the organization for such control.

There are many historical studies describing the relationship between the patent system and business development. H. I. Dutton and Christine MacLeod made clear the crucial role of the patent system in the British industrial revolution, whereas Zorina B. Khan considered contributions of the U.S. patent system to economic growth from the viewpoint of an international comparison between the United Kingdom and the United States.² These studies focused on the period until the nineteenth century; however, few studies exist on the twentieth century. In particular, almost no research addresses the evolution of corporate patent management in relation to the formation of big business in the United States from the late nineteenth to the early twentieth century.³ Catherine L. Fisk suggested that the role of patent law and the patent system changed at the turn of the century.⁴ By surveying a significant number of legal cases, she described the processes through which the judicial decisions in the 1870s that allowed employee inventions and knowledge within the workplace to be the possessions of employees as inventors gave way to decisions in 1920s that allowed employers and companies to control such inventions and knowledge. Institutionalization of employee inventions in companies is an essential subsystem used by modern corporations to take advantage of the patent system. This essay clarifies how modern enterprises managed and controlled their patents, and how they organized patent management.⁵

¹ Mira Wilkins, *The Emergence of Multinational Enterprises: American Business Abroad from the Colonial Era to 1914* (Cambridge, Mass., 1970), 55.

² H. I. Dutton, *The Patent System and Inventive Activity during the Industrial Revolution* (Manchester, 1984); Christine MacLeod, *Inventing the Industrial Revolution: The English Patent System, 1660-1800* (New York, 1988); B. Zorina Khan, *The Democratization of Invention: Patents and Copyrights in American Economic Development, 1790-1920* (2005; New York, 2009).

³ Alfred D. Chandler, Jr., *The Visible Hand: The Managerial Revolution in American Business* (Cambridge, Mass., 1977).

⁴ Catherine L. Fisk, *Working Knowledge: Employee innovation and the rise of corporate intellectual property, 1800-1930* (Chapel Hill, N.C., 2009).

⁵ About the evolution of patent control in U.S. companies, see Shigehiro Nishimura, "The Organization of Corporate Patent Management in U.S. Companies: A Case Study of the Thomson-Houston Electric Company," *Kansai University Review of Business and Commerce* 13 (March 2011): 41-63.

I have elsewhere clarified the evolution of patent management and control conducted by the General Electric Company (GE) and its subsidiary companies in Japan.⁶ However, the experience in Japan is merely one part of GE's international patent management and control. While the methods and organizations created by GE in the course of conducting foreign business varied by country, the cases in European countries can be viewed as more primitive and typical than the case in Japan. This essay describes GE's methods and organizations for patent management and control in the United Kingdom until 1914 by undertaking an international comparison with Japan.

The study is based on patent statistics collected from an Internet database and the official gazettes of the U.S. Patent and Trademark Office, the U.K. Patent Office, and the Japan Patent Office. In addition, information on old U.K. patents came from the database, "A Cradle of Inventions." The Marconi Archives were the primary archival source used.

This essay is organized as follows: first, GE's international business policy and patent applications in the United States, the United Kingdom, and Japan are described, and the differences among patenting processes in the United Kingdom and Japan are highlighted. Then, GE's patent management in the United Kingdom through the British Thomson-Houston Company Limited (BTH), a subsidiary of GE, is described.

Patenting in the United States, the United Kingdom, and Japan

The Foreign Business of General Electric

The General Electric Company was formed in 1892 through the merger of the Edison General Electric Company, the Thomson-Houston Electric Company, and its subsidiary, the Thomson-Houston International Electric Company.⁷ GE was already an international company, as it had engaged in foreign business before the merger. Although both Edison General Electric and Thomson-Houston Electric had over ten years of experience in international business, almost all foreign business that was handed over to GE was part of Thomson-Houston operations.⁸

Thomson-Houston began as the American Electric Company, founded in 1880 in New Britain, Connecticut.⁹ The company was established to

⁶ Shigehiro Nishimura, "International Patent Control and Transfer of Knowledge: The United States and Japan before World War II," *Business and Economic History On-Line* 9 (2011).

⁷ General Electric Company, *First Annual Report* (31 Jan. 1893).

⁸ Wilkins, *Emergence of Multinational Enterprises*, 58-59.

⁹ Regarding Thomson-Houston companies, see, Harold C. Passer, *The Electrical Manufacturers, 1875-1900: A Study in Competition, Entrepreneurship, Technical Change, and Economic Growth* (Cambridge, Mass., 1953); W. Bernard Carlson, *Innovation as a Social Process: Elihu Thomson and the Rise of General Electric, 1870-1900* (New York, 1991); Nishimura, "The Organization of Corporate Patent Management in U.S. Companies."

industrialize the arc lighting system of Elihu Thomson and Edwin Houston, who offered their patents, and other investors provided capital. As a result of the technology development activities conducted by Thomson and Houston, until 1881 the company's products consisted of a series of Thomson-Houston systems, such as a high efficiency power generator, an automatic current regulator, an air-blast non-sparking commutator, and a lightning arrester. In 1883, the American Electric Company was reorganized in Massachusetts and became the Thomson-Houston Electric Company with headquarters in Lynn. Thomson-Houston operated overseas from its early days. In 1885, the Lynn syndicate organized the Thomson-Houston International Electric Company to sell and install their systems abroad. This international entity was in charge of international business and patent exploitation in foreign countries and expanded its business in South America and Europe. It appointed agents in some countries and/or opened sales offices. In 1887, it designated Laing, Wharton and Down as its local agency in charge in England.¹⁰ In France, the company opened a sales office in 1884, and in 1886 incorporated the Compagnie Thomson-Houston. No evidence exists about the business conducted by this company, but it may have undertaken sales, installation, and patent control. Thomson-Houston also opened a sales office in Germany, but the company eventually realized that foreign business in industrialized countries could be developed only through local manufacturing, given patent laws and local sentiments.¹¹

The newly formed GE conducted new foreign business based on the International Company's organizations. The International Company may have been an active subsidiary of GE for a while, until it was absorbed into GE around 1900.¹² Therefore, GE's foreign strategy and business in the early days was conducted by the International Company's management.

In the United Kingdom. The predecessor of GE began business in the United Kingdom when its name was still the American Electric Company. In 1886, Laing, Wharton and Down was formed for U.K. sales of an apparatus of the Thomson and Houston system made by the American Electric Company. This company was reorganized as Laing, Wharton and Down Construction Syndicate, Ltd., in 1889 and acquired the business for

¹⁰ Gerard Swope, Jr., "Historical Review of GE's Foreign Business as Affected by U.S. Antitrust Laws" (31 Oct. 1972), 2-6, unpub. MS, Schenectady Museum & Archives, N.Y.; Wilkins, *Emergence of Multinational Enterprises*, 58; also see Shigehiro Nishimura, "Foreign Business and Patent Management before WWI: A Case Study of the General Electric Company," *Kansai University Review of Business and Commerce* 11 (March 2009): 77-97.

¹¹ Swope, "Historical Review of GE's Foreign Business," 2-3.

¹² In some contracts before 1898, the International Company signed with GE. General Electric Company, "Report upon Foreign Business," 22 Nov. 1918, p. 105, in Owen D. Young Papers, box 59, folder 202A, St. Lawrence University, Canton, N.Y.

an arc lighting system and a high alternating current lighting system from Thomson-Houston. For a while, it imported the apparatuses and installed them in the United Kingdom and, after the formation of General Electric Company in 1892, it began considering a manufacturing business there. In 1894, Laing, Wharton and Down Construction Syndicate, Ltd., was reorganized as British Thomson-Houston, Ltd. (BTH Ltd.).¹³ In addition to local interests, organizers of this company included Thomson-Houston International, which had a 40 percent share, Compagnie Française pour l'Exploitation des Procédés Thomson-Houston (CFTH), and Allgemeine Elektrizitäts-Gesellschaft (AEG).¹⁴ BTH Ltd. was not merely the agent; it also had GE's British patents and secured manufacturing rights, although it never set up a manufacturing plant. Two years later in 1896, BTH Ltd. was discontinued, and the British Thomson-Houston Company, Ltd. (BTH) was newly organized. In the beginning, the chairperson was E. A. Lazarus, who was French, and the manager and secretary was James Devonshire, who was British. Although BTH had the right to manufacture, it had no manufacturing facilities; it operated a workshop and warehouse in London for unpacking and checking imported components, and it also installed tramway systems in cities in the United Kingdom.¹⁵ BTH began manufacturing electrical goods in Rugby in 1902.

One of the features related to GE's foreign business was that it allotted manufacturing subsidiaries in which the parent held a substantial minor interest and entered into agreements to exchange patents.¹⁶ GE and its subsidiary entered into reciprocal contracts for the management and control of its national patents in each territory. As of March 3, 1897, the contracts between GE and BTH contained clauses that provided for reciprocal patent management and control.¹⁷ First, the two parties agreed that GE was obliged to "assign all patents and patent rights for the United Kingdom and the British possessions in Europe; also patents of its controlled companies; also new patents, the British Company to pay expense of taking out new patents." Subsequently, the agreement noted that GE "will require all engineers in employ to assign all patents and will communicate such inventions to British Company." Finally, GE would

¹³ H. A. Price-Hughes, *B.T.H Reminiscences: Sixty Years of Progress* (London, 1946), 7-8.

¹⁴ Swope, "Historical Review of GE's Foreign Business," 3. C. Burrell and L. Thurnauer were directors from 1896 to 1917, representing French interests. The British Thomson-Houston Company, Limited, *Report of Directors*, 17 July 1897, MS Marconi 2900, Marconi Archives, Bodleian Libraries, Oxford University; British Thomson-Houston Co., Ltd., Board Minutes, 7 July 1896, MS Marconi 2880; Ian Charles Rayner Byatt, *The British Electrical Industry, 1875-1914: The Economic Returns of a New Technology* (Oxford, 1979), 33-34.

¹⁵ Price-Hughes, *B.T.H Reminiscences*, 9-13.

¹⁶ Wilkins, *Emergence of Multinational Enterprises*, 94-95.

¹⁷ The original contracts were concluded at the organization of BTH in May 1896.

“offer British Company any inventions or patents purchased.” In return, BTH had to fulfill certain obligations within other clauses. BTH would “assign all patents and patent rights in so far as they relate to the U.S.A. and the Dominion of Canada; also patents of its controlled companies; also new patents, the General Electric Company to purchase.” Furthermore, BTH had to “require all engineers in employ to assign all patents and will communicate such inventions to the General Electric Company.” Finally, in addition to its obligations to GE, BTH would “offer General Company any inventions or patents purchased.”¹⁸

In Japan. Business in Japan was set up somewhat later than the businesses in the United Kingdom and in the Continental European countries. However, Thomson-Houston appointed Osaka Dento as an agent in Japan as early as 1890, and exported apparatus through this entity.¹⁹ GE had not set up wholly owned subsidiaries in Japan, but it made substantial minor investments in affiliated companies and provided such companies with technology, patents, and know-how. GE tied in with the Tokyo Electric Company in the fields of electric lamps, radio tubes, and other light electrical appliances, and with Shibaura Engineering Works in the electrical equipment and apparatus sectors.

In 1905, Tokyo Electric concluded a contract with GE that covered capital participation and patent and technical tie-ins and began introducing foreign technology.²⁰ GE acquired a 51 percent share in Tokyo Electric, which effectively became a GE subsidiary. Tokyo Electric was awarded an exclusive license for GE’s patents in Japan and related technological knowledge. This agreement also enabled GE to supply Tokyo Electric with machinery and equipment to manufacture incandescent lamps; the company dispatched W. T. McChesney, an engineer, to install the machinery, oversee operations, and impart lamp-manufacturing expertise.²¹ Tokyo Electric’s personnel were also permitted to visit GE’s factories and receive technical training there.²² Shibaura then concluded a contract covering capital participation and technology sharing with GE in November 1909, mediated by Takashi Masuda of Mitsui & Company. GE invested money in Shibaura, purchasing approximately 30 percent of its

¹⁸ GE, “Report upon Foreign Business,” Exhibit A, Section 1-b, 28-29.

¹⁹ Swope, “Historical Review of GE’s Foreign Business,” 6.

²⁰ Shotaro Yasui, ed., *Tokyo Denki Kabushiki Kaisha 50 nen shi* [A Fifty-Year History of Tokyo Electric Company Limited] (Tokyo, 1940), 97-100.

²¹ Hoshimi Uchida, “Western Big Business and Adoption of New Technology in Japan: The Electrical Equipment and Chemical Industries 1890-1920,” in *Development and Diffusion of Technology: Electrical and Chemical Industries*, ed. Akio Okochi and Hoshimi Uchida (Tokyo, 1980), 155-57.

²² Yasui, ed., *Tokyo Denki Kabushiki Kaisha goju nen shi*, 113-14.

shares.²³ The main provisions of the contract provided for the following: the granting of patent licenses to Shibaura; the transfer of research and technological information to Shibaura; the training of Shibaura's employees in GE's factories and the dispatch of GE's professionals; offering blueprints of factory designs and supervision of factory construction; and guidance for corporate managers.²⁴

As in the United Kingdom, GE went into the Japanese market through a substantial minor investment in a subsidiary and the provision of technology and patent licenses. However, some differences existed between the British and Japanese cases. It was not until 1919 that GE, Tokyo Electric, and Shibaura Works concluded the specific contracts that provided for each entity's reciprocal patent management and control in each territory.²⁵ Therefore, some variations in GE's foreign policy existed in terms of the patent contracts and investment.

Patent Application Trends

During the period up to 1914, GE acquired patents in many countries including the United Kingdom, France, Germany, and Japan. At that time—as is true today—the concept of a “world patent” that covered all countries in the world through a single patent did not—and does not—exist. Furthermore, GE did not apply equally for patents in all countries. A comparison of patent applications in the United States, the United Kingdom, and Japan reveal the variations in GE's foreign business policy.

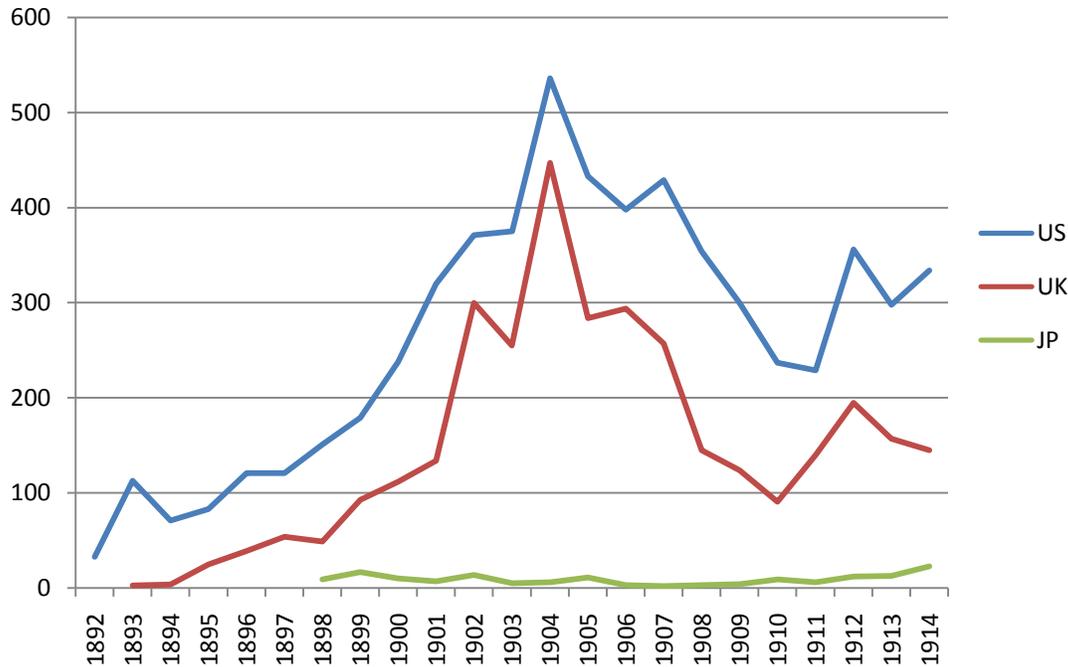
Figure 1 shows the trends in patent applications in the three countries from 1892 to 1914. This figure includes the patents, as described in this essay, assigned to local subsidiaries and acquired in their names, and those that were applied for through agents, as well as those that were applied for in GE's name. In the United States, applications increased during the late nineteenth century and peaked in 1904. The trend in the United Kingdom is similar, as patent applications by GE grew after the nineteenth century and peaked in 1904. The similarity of trends in applications continued until 1914. The number of patent applications in the United Kingdom was always below that in the United States. As a whole, GE acquired 3,347 patents in the United Kingdom, which was slightly more than half the number of patents acquired in the United States, 6,080. In contrast, GE's patent applications in Japan were much lower, consistently and overwhelmingly, than in the other two countries.

²³ Yasukazu Kimura, ed., *Shibaura Seisakusho 65 nen shi* [A Sixty-Five-Year History of Shibaura Engineering Works Limited] (Tokyo, 1940), 53.

²⁴ Uchida, “Western Big Business and Adoption of New Technology in Japan,” 154.

²⁵ Shigehiro Nishimura, “General Electric's International Patent Management before World War II: The ‘Proxy Application’ Contracts and the Organizational Capability of Tokyo Electric,” *Japanese Research in Business History* 21 (2004): 101-25.

Figure 1 GE Patent Applications in the United States, the United Kingdom, and Japan, 1892-1914



Sources: U.S. patents issued and assigned to the General Electric Company from 1892 to 1945; sorted by application date. British patents included GE patents issued in the name of affiliated companies, filed from 1892 to 1915. Japanese patents included GE patents issued in the name of affiliated companies, issued from 1898 to 1915, sorted by application date.

During the same period, only 154 patents were applied for in Japan, approximately 2.5 percent of the number applied for in the United States.²⁶ These statistics show that a close and synchronized relationship existed between the patent application trends in the United States and the United Kingdom, but no such relationship existed between the trends in the United States and Japan. What were the factors that caused such a differential in GE's behavior?

First, let us examine the patent laws. Although the British patent system can be traced back to the fifteenth century in England, the country's modern patent system was instituted in the nineteenth century.²⁷

²⁶ The numbers for the United States and Japan indicate the number of patent applications later registered. The number for the United Kingdom indicates the number of applications. Even after taking this difference into consideration, the number for Japan is much lower than those for the other two countries.

²⁷ Neil Davenport, *The United Kingdom Patent System: A Brief History* (Hampshire, England, 1979), 20-22; Khan, *The Democratization of Invention*, 38.

The Patent Office was established in 1852, followed by the Patent, Designs and Trade Marks Act of 1883. The 1883 act can be regarded as the “beginning of modern patents administration,” and provided the establishment of patent examination and a significant reduction in application costs and renewal fees that formerly burdened the applicant with “prohibitively high costs.”²⁸ However, examination for novelty was included as part of the patent approval process only after 1902, and such an examination was conducted in practice only after 1905.²⁹

On the other hand, the British patent system could be used by foreigners from the early days. Because the patent law was instituted to promote British industrial development, from the sixteenth century the term “true and first inventor” represented the person who could apply for a patent, which included both the person who invented new products or manufacturing processes and the person who imported new technology from foreign countries.³⁰ The “communication application” was formalized as application form “A1,” which contrasted with form “A” used for inventions in the United Kingdom.³¹ In 1884, the number of applications for British patents was 17,110, of which 2,607, or about 15 percent, were from foreign countries.³² Furthermore, in 1884 the United Kingdom joined the International Convention for Protection of Industrial Property, the procedures for foreigners to follow when applying for patents.³³

With respect to administration, in 1888 the Register of Patent Agents was instituted.³⁴ Although professional patent agents had existed since the early nineteenth century, their quality varied. To ensure that the skills of patent agents for applications remained above an appropriate level, the Institute of Patent Agents was established in 1882, an organization essential to the British patent system.³⁵ Institution of the 1888 act virtually enforced this movement, as it called for patent agents to be chartered by the Board of Trade, and individuals not chartered were prohibited from doing business as a patent agent. The number of registered patent agents was 222 in 1889 and 267 in 1910, and averaged approximately 250 until 1914.³⁶ The number of patent applications filed in 1885 was 16,101,

²⁸ Klaus Boehm, *The British Patent System: 1. Administration* (Cambridge, England, 1967), 30; Khan, *The Democratization of Invention*, 31.

²⁹ Boehm, *The British Patent System*, 31; Davenport, *The United Kingdom Patent System*, 22.

³⁰ Davenport, *The United Kingdom Patent System*, 26.

³¹ Great Britain Patent Office, *Report of the Comptroller General of Patents, Designs and Trademarks 1* (London, 1884).

³² *Ibid.*, 3 (London, 1886).

³³ Davenport, *The United Kingdom Patent System*, 22-23.

³⁴ *Ibid.*, 28-29.

³⁵ In 1891, the Institute obtained the Royal Charter.

³⁶ Great Britain Patent Office, *Report of the Comptroller General of Patents, Designs and Trademarks*, several issues.

including applications communicated from abroad, of which 12,461, or approximately 73 percent, were through patent agents; approximately 27 percent of applications were filed directly with the Patent Office by inventors and the person concerned with them.³⁷

Although the institution of patent laws in Japan occurred later than that in the United Kingdom, the Japanese modern patent system began as early as 1885. The modern patent system in Japan began with the Statute of Monopolies of 1885. However, at that time, foreigners could not apply for patents for their inventions.³⁸ Not until 1899, when Japan joined the Paris Convention for the Protection of Industrial Property, were foreigners allowed to file and register their patents.³⁹ To modify the patent system to comply with the Convention, the government of Japan amended its Patent Law, which stipulated that a non-Japanese must nominate a patent attorney who is a resident of the Japanese Empire. Under the same law, provisions relating to applications claiming priority were prepared, providing for institutions at which foreigners could file and register patents in Japan. In addition to the Patent Law, the Utility Model Law came into effect in 1905. The technological level of Japanese inventions at that time was so low that many inventors could not protect their inventions under the Patent Law, whereas those invented by foreigners were registered.⁴⁰

In addition to the institutions designed to protect inventions, a patent attorney system was enforced under the Regulation for the Register of Patent Representatives of 1899. Although agents for patent applications existed before that, the regulation added a key subsystem that embodied the patent system within the whole. By December 31, 1899, 138 patent agents were registered, consisting almost entirely of attorneys-at-law. The initial members included three foreigners, one of whom was British solicitor John Frederick Lauder. Agents such as Seiichi Kishi, who represented many foreigners and foreign companies, were included. Furthermore, a certification examination was introduced from 1902 to improve and maintain the quality of patent attorneys.⁴¹ The population of patent attorneys grew from 138 in 1899 to over 1,000 by 1918, 2,666 by 1930, and peaked at 4,389 in 1937.⁴² In this way, administration of patent applications in Japan developed gradually.

³⁷ Great Britain Patent Office, *Report of the Comptroller General of Patents, Designs and Trademarks* 3 (London, 1886).

³⁸ Tokkyo Cho [Japan Patent Office], *Kogyo Shoyuken Seido 100 nen shi* [One Hundred-Year History of the Industrial Property Rights System] 1 (Tokyo, 1984), 150-51.

³⁹ Tokkyo Cho, *Kogyo Shoyuken Seido 100 nen shi*, 1: 201-5.

⁴⁰ *Ibid.*, 1: 184-91, 192.

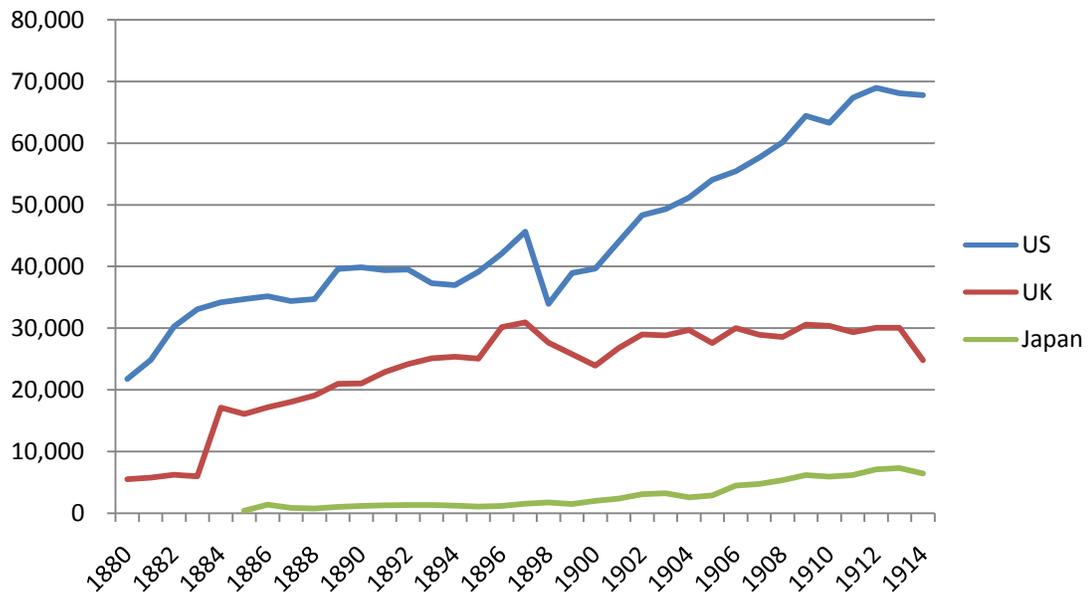
⁴¹ Nihon Benrishi Kai [Patent Attorney Association], *Benrishi Seido 100 nen shi* [One Hundred Years of the Patent Attorney System] (Tokyo, 2000), 22-25.

⁴² Nihon Benrishi Kai, *Benrishi Seido 100 nen shi*, 256-59.

As is shown, both the United Kingdom and Japan developed a modern patent system as of the late nineteenth or early twentieth century. Although some differences existed, such as the United Kingdom's long experience with a patent system and acceptance of foreign inventions, Japan joined the Convention and developed systems for foreign applicants after 1899, and the institutional and administrative circumstances under which GE or other foreign entities could apply for patents existed in both countries by the early twentieth century. In other words, the modernization of patent-related laws was a necessary but not a sufficient condition for international patent applications by multinational enterprises such as GE.

Next, the macro trend of patent applications in the United States, the United Kingdom, and Japan is examined. Figure 2 shows the trend of patent applications in the three countries from 1880 to 1914. The number of application in the United States grew during the last two decades of the nineteenth century to approximately 40,000 per year in 1900; this number continued to grow even after the turn of the century, and approximately 68,000 patents were applied for in 1914. In the United Kingdom, patent applications jumped up just after the institution of the

Figure 2 Patent Applications in the United States, the United Kingdom, and Japan



Sources: USPTO, *U.S. Patent Statistics Report*; Great Britain Patent Office, *Report of the Comptroller General of Patents, Designs and Trademarks*, several issues; Tokyo Cho, *Kogyo Shoyuken Seido 100 nen shi*, separate vol. (Tokyo, 1985), 130-32.

1883 act, from approximately 6,000 per year to about 30,000 per year in 1900. However, in contrast to the trend in the United States, the number did not increase in the early twentieth century and remained at approximately 30,000 per year until World War I. On the contrary, although the number of patent applications in Japan grew gradually and constantly, the absolute number was significantly below that in the other two countries, and ultimately reached 7,359 in 1913. Thus, the comparison with Anglo-American circumstances shows that the Japanese patent climate before 1914 was considerably less mature with respect to patent applications, even though patent laws were well instituted in the country.

Presumably, patent applications by multinational enterprises were affected by the patent climate within a country, as represented by the level of technological development and of inventive activities, and by the patent application, protection, and enforcement conditions, as well as patent laws. What then is a necessary and sufficient condition to enable multinational enterprises to keep up with the number of international patent applications? To clarify such conditions, we have to analyze and describe how multinationals managed and controlled their patents in foreign countries and how they organized such activities. The next section focuses on GE's patent management and control in the United Kingdom, namely BTH's patent management and control.

Patent Management and Control at BTH

Primitive Stage: Patent Application and Administration

In observing the development of patent management and control, it is useful to grasp the formation of a patent department or the appointment of a person in charge of patent affairs. The Patent Department of BTH was organized in late 1897. Patent management and control up to 1897 is first examined. Table 1 shows patent applications by GE's affiliated individuals and companies until 1897.

The first application was filed on October 29, 1879. The patent was titled, "Generating, storing, and applying electricity for lighting, telegraphic, and plating purposes," and was invented by Elihu Thomson and Edwin Houston; the applicant was Henry H. Lake.⁴³ Lake was a solicitor of Haseltine, Lake & Company, a law firm; thus, they appeared to administer patent applications and other procedures on behalf of Thomson and Houston. By 1893, the patents for many inventions developed by engineers of Thomson-Houston, including Thomson, Houston, Edwin W. Rice, Jr., R. M. Hunter, Herman Lemp, and W. P. Potter, were applied for in the name of the law firm that administrated their patent affairs.

⁴³ British Patent No. 4,400 of 1879.

Table 1 Patent Applications by GE and Its Affiliates, 1879-1897

	Number of Applications	Name of Applicants				Patent Agents		
		External Agents	Individual	J. Devonshire	BTH	External Agents	None	Not Available
1879	1	1				1		
1880	2	2				2		
1881								
1882	2	2				2		
1883	2	2				2		
1884	1	1				1		
1885								
1886	3	3				3		
1887	2		2					2
1888	7	4	3			4		3
1889	16	9	7			9		7
1890	12	10	2			12		
1891	5	4	1			4		1
1892	4	1	3			4		
1893	7	3	4			6		1
1894	3			2	1	1	2	
1895	26	2		22	2	16	8	2
1896	39	2		23	14	38		1
1897	54				54	53		1
Total	186	46	22	47	71	158	10	18

Note: BTH includes British Thomson-Houston, Ltd., and British Thomson-Houston Company, Ltd. This table includes the patent applications of Thomson-Houston and its engineers, but excludes that of Thomson Electric Welding.

In 1890, the communicator and applicant for the patent application of Thomson-Houston International Electric Company was Lake, the company's agent. In 1893, the same agent filed an application communicated from General Electric. Two patent applications covering inventions of Elihu Thomson and with applicant James Devonshire, secretary of BTH Ltd. were filed in the same year. Those applications were signed only by Devonshire and not by any patent agent. Apparently, patent applications of this type were administered in-house. The number of applications soared to twenty-six in 1895; during the first half of the year, patent applications communicated by GE were filed in the name of Devonshire and were under in-house administration, but during the latter half of the year, such patents came under the administration of J. C. Chapman, Chartered Patent Agent. In 1894 BTH Ltd. applied for a patent (application number 14,113), whose applicants were Alfred George Cooper

and BTH Ltd. Cooper was a Board member of BTH Ltd., and G. G. M. Mardingham, a Chartered Patent Agent, administered the patent application. Different from patents communicated from GE, this type of patent application covered British inventions.

Patent applications in 1896 could be divided into two classes: patents with applicants that were individuals or law firms and patents filed in the name of BTH Ltd. or James Devonshire. In the early days, not all patent applications were assigned to BTH and its predecessors, but some patents were assigned and others were under the direct control of GE. This division was provided by contracts between GE and British companies. For example, the trolley tramway system in 1891 between Sheepscar and Roundhay, which was taken over by Leeds Corporation in 1894, was installed directly by Thomson-Houston International Electric, not by their agent Laing, Wharton and Down Construction Syndicate. This occurred because Thomson-Houston did not assign patents relating to tramway systems and instead controlled them directly. Not until 1896 did GE assign patents relating to tramways to its British subsidiary.⁴⁴

A reorganization of the company to British Thomson-Houston Company, Ltd. (BTH) altered the situation. Just after the setup of the new company, its patents were applied for in the name of BTH; before then, applications were in the name of Devonshire as secretary.⁴⁵ This change was provided for in the contract between GE and BTH, as described earlier. However, not all of GE's patent applications were in the name of BTH. Some applications were filed in the name of GE. Only from 1905 onward were all of GE's patent applications filed by and in the name of BTH. Administration of patent applications in 1896 and 1897 was conducted by J. C. Chapman, Chartered Patent Agent. Furthermore, during and after 1896, the newly established company concentrated some patents already filed in the name of law firms, James Devonshire, and BTH Ltd., as well as patents in the name of individual engineers such as C. W. Wharton and H. F. Parshall, by transferring them to BTH.

Patent Management and Board Control

To clarify BTH's patent management and control, we focus on the organization and some of its activities, such as purchasing, licensing, and enforcement.

Until the formation of the Patent Department, patent management and control were conducted directly by the board. Although no single person held the title of patent manager or similar, management and control were undertaken substantially by James Devonshire, manager and

⁴⁴ Price-Hughes, *B.T.H Reminiscences*, 10-11.

⁴⁵ Patent applications in the name of the company began on May 26. In the minutes of meetings dated after September 9, 1896, all application forms and documents on which the company seal was affixed were to be approved at a board or executive meeting.

secretary at BTH, Horace Field Parshall, an engineer from GE, and law firms and patent agents. Among these, Parshall actually acted as patent manager until 1897. He was an engineer born in the United States and was at one point chief designing engineer at Edison General Electric Company and chief of the Technical Department at GE, developing traction systems and power machinery. After arriving in England, he installed the lighting systems in the East London district.⁴⁶ His service contract with GE demonstrates his importance to the company. During the renewal of his service contract in 1897, GE paid him \$15,000 per year, and, because the prime beneficiary of his services was BTH, they paid \$12,500 to GE.⁴⁷ His salary of \$15,000 was very high, even compared with that of the directors of BTH. From management's viewpoint, patent control at BTH was conducted by a GE person and not by local talent.

One form of patent control is evaluation, which is a fundamental function for all types of patent management control. In 1896, Devonshire submitted a patent report at the board meeting every month. Those reports were titled "Report on British Patents," "Proposed Applications For and Renewal of British Patents," or "Report on Application for Patents," which actually discussed patent application and maintenance.⁴⁸ In 1897, Parshall also submitted these types of reports every month until the formation of the Patent Department.⁴⁹ At the board meetings, directors deliberated on patent applications, renewals, or abandonment and decided on policies and strategies as suggested by the reports.

The evaluation and investigation of patents held by others was conducted by Parshall. At the first BTH board meeting held on May 19, 1896, Parshall was instructed to investigate the advisability of purchasing patents of Nikola Tesla and Mikhail Dobrovolski and report to the board.⁵⁰ At the same meeting, Devonshire was also instructed to ask Professor Sylvanus P. Thompson to evaluate the Dobrovolski patent and deliver a report, making it apparent that the board decided on cases of purchase or making offers based on information collected through multiple channels. Furthermore, in February 1897, the board decided to postpone the assignment of a certain patent of E. Wilson from the old company to BTH until Parshall submitted the advisability report on the patent. At the

⁴⁶ Price-Hughes, *B.T.H Reminiscences*, 8; Byatt, *The British Electrical Industry*, 143-44; Marcus Palmén, "Bristol Tramways Power Stations, 1895-1941: The Story of the Counterslip Power Station and the Designers, Architect William Curtiss Green—Engineer Horace Field Parshall," *Supplement to the Histelec News* (Aug. 2009), 2-3, in South Western Electricity Historical Society, S42 (URL: <http://www.swehs.co.uk/tactive/sparkhome.php>).

⁴⁷ BTH, Board Minutes, 18 May 1897, MS Marconi 2880.

⁴⁸ *Ibid.*, 2 June, 3 and 10 Nov. 1896.

⁴⁹ *Ibid.*, 18 Jan. 1897.

⁵⁰ *Ibid.*, 19 May 1896. Von Dovilo Dov(b)rowolski was an the chief engineer of AEG. Byatt, *The British Electrical Industry*, 68.

following board meeting, the board decided to go ahead on the advice of Parshall.⁵¹

Parshall controlled licensing and was the person in charge, with participation from external law firms and patent agents. The Johnson-Lundell patent case is a good example. In July 1896, the report prepared by Dr. J. Hopkinson and Parshall on the Johnson-Lundell electric tramway patent, which related to a surface contact system, was submitted to the board. After consideration, the board decided to open negotiations to purchase the patent.⁵² This patent would be a British patent for “Surface Contact System for Electric Railways” of the Johnson-Lundell Electric Company, N.Y.⁵³ Negotiation would be conducted by the board members, and the verbal contract, which was not for a purchase but for a license, with Johnson-Lundell was reported and confirmed at a meeting in August. The essence of the terms of contract was that, for the right to the controlling system for electrical traction in the United Kingdom and its colonies, BTH would pay £2,500 for the option and a £7,500 license fee two months after practical demonstration of the system.⁵⁴ However, Parshall’s role did not end with that, as he obtained new information on the Johnson-Lundell patent from GE when he temporarily went back to the United States in the autumn. The information that he brought back to the United Kingdom contained questions about the validity of the licensor’s patent; Parshall was instructed to reinvestigate the patents relating to the date of registration and report back to the board.⁵⁵ Importantly, the case shows that patent information was exchanged between GE in the United States and BTH in the United Kingdom as early as the late nineteenth century. The Board decided to extend its option for the Johnson-Lundell surface contact system patent for another year at a board meeting during the following year.⁵⁶

A Thomson meter patent case relating to the infringement of meter patents by Chamberlain & Hookham, Ltd., provides an example of enforcement. Chamberlain & Hookham had stated in its circular of May 1, 1897 that BTH had infringed on its patents.⁵⁷ Devonshire submitted a report on the matter prepared by Haseltine, Lake & Co. at the board meeting in May. Haseltine, Lake & Co reported that BTH had not infringed on any meter patents of Chamberlain & Hookham, and recommended that BTH obtain an additional opinion from an attorney involved in other Chamberlain & Hookham patent cases.⁵⁸ On this advice, Devonshire

⁵¹ BTH, Board Minutes, 10 and 17 Feb. 1897, MS Marconi 2880.

⁵² *Ibid.*, 7 July 1896.

⁵³ U.S. Patent No. 646229.

⁵⁴ BTH, Board Minutes, 18 Aug. 1896, MS Marconi 2880.

⁵⁵ *Ibid.*, 10 Nov. 1896.

⁵⁶ BTH, Board Minutes, 7 Dec. 1897, MS Marconi 2881.

⁵⁷ BTH, Board Minutes, 18 June 1897, MS Marconi 2880.

⁵⁸ *Ibid.*, 25 May 1897.

obtained the opinion of Fletcher Moulton Q. C. regarding this case and submitted the opinion at the board meeting in June. Moulton supported the opinion of Haseltine, Lake & Co. and stated that BTH had not infringed on any Chamberlain & Hookham patents. Furthermore, the board decided to obtain an opinion from W. R. Bousfield Q. C. as recommended by Ashurst Morris Crisp & Co., a law firm.⁵⁹ The letter from Ashurst Morris Crisp & Co. enclosing the opinion of Bousfield was submitted to the board; the letter stated that BTH should send a letter to Chamberlain & Hookham informing them that their circular interfered with the business of BTH and “asking them either to state that the circular is not intended to refer to the Thomson Meter or to test the matter by at once bringing an action.”⁶⁰ The board decided to send the letter and soon thereafter received a reply. Their letter and reply, as drafted by Bousfield, were submitted to the board together. At the board meeting, it was resolved that the draft should be reviewed and revised by Parshall and then returned to Bousfield for final decision. Furthermore, the board decided to let Ashurst Morris Crisp & Co. ask Chamberlain & Hookham “to consider the possibly serious consequences of inviting litigation in the matter.”⁶¹ The letter to Chamberlain & Hookham, finally revised by Bousfield, was approved at the board meeting in July and sent to Chamberlain & Hookham. Eventually, Chamberlain & Hookham sued BTH by accusing it of infringement of Chamberlain & Hookham patents.

During this period, BTH had to address litigation other than that for the meter patent. Sometimes, BTH’s parent company assisted in such litigation. For example, in November 1896 the board decided to sue the Leeds Corporation for infringement of a BTH patent after completion of a tramway that it had built. Simultaneously, the board decided to consult with Blodgett, manager of GE’s Patent Department in Schenectady, to shape its legal strategy.⁶² In this way, patent enforcement was conducted in part by talent at the parent company.

Organization of the Patent Department

BTH and former British subsidiaries of GE had not engaged in manufacturing businesses during this period. Their business was to import electrical apparatus and products manufactured by the U.S. parent company or by affiliated companies in continental Europe and install them in the United Kingdom. Even when they did not make products, they controlled their patents to compete with local companies in the British market; as is shown, a substantial portion of board meeting deliberations was allotted to patent matters. The BTH manufacturing business affected the management and control of patents.

⁵⁹ Ibid., 1 June 1897.

⁶⁰ Ibid., 18 June 1897.

⁶¹ Ibid., 29 June 1897.

⁶² Ibid., 24 Nov. 1896.

The feasibility of entering into a manufacturing business was considered carefully by BTH. Establishment of their manufacturing businesses in the United Kingdom began in 1899 when E. A. Lazarus, chairman of the board, went to Paris and Berlin and consulted with BTH's affiliated companies, CFTH and UEG, about setting up a factory and increasing the capital of BTH.⁶³ In January 1900, BTH bought 25 acres of land in Rugby for £10,000 to construct a manufacturing factory.⁶⁴ GE provided BTH with almost all of the technology for the factory. To become an electrical manufacturer, management was reorganized; in August 1901, Charles A. Coffin and Edwin W. Rice, Jr., president and vice-president of GE, respectively, took positions as directors of BTH.⁶⁵ In particular, Rice was in charge of establishing the Rugby factory.⁶⁶ After the factory was completed, almost all staff was moved from London to Rugby in October 1901, and the factory began operations on March 14, 1902. The factory manufactured components and apparatus for tramways, generators, meters, lighting systems, incandescent lamps, and so forth.⁶⁷ In 1903, they gained the rights and organized a new subsidiary named Warwick Machinery to manufacture Curtis steam turbines.⁶⁸

Consideration of reinforcing patent management and control began far before the establishment of the Rugby factory. In July 1896, when Parshall and A. M. Tanner submitted a report related to patent issues, Parshall was instructed to consider "the matters of retaining our own expert in London for patent matters," to "communicate with Mr. Blodgett (of the General Electric Co.) on this subject," and to report his suggestions to the board.⁶⁹ In September, Parshall submitted a letter that recommended that the board appoint "an Advisor on Patent"; however, the matter seems to have been postponed.⁷⁰

Establishment of the Patent Department was decided in November 1897. At the board meeting, Parshall's letter related to patent issues and a letter from Tanner were submitted and deliberated on. Tanner's proposal, which suggested that he act as head of the Patent Department, was approved.⁷¹ The terms of the proposal made to Tanner included a payment by BTH of £40 per month, including the salary of his assistant, and stipulated that Tanner would be a contractor and not an employee. At the board meeting held in December, a letter from Tanner accepting the

⁶³ BTH, Board Minutes, 17 Jan. 1899, MS Marconi 2881.

⁶⁴ Price-Hughes, *B.T.H Reminiscences*, 14.

⁶⁵ BTH, Board Minutes, 26 Aug. 1901, MS Marconi 2882.

⁶⁶ *Ibid.*, 23 Sept. 1901.

⁶⁷ Price-Hughes, *B.T.H Reminiscences*, 14-17.

⁶⁸ *Ibid.*, 20.

⁶⁹ BTH, Board Minutes, 21 July 1896, MS Marconi 2880.

⁷⁰ *Ibid.*, 13 Oct. 1896.

⁷¹ BTH, Board Minutes, 30 Nov. 1897, MS Marconi 2881.

arrangement was submitted and approved; Tanner was then in charge of the Patent Department of BTH.⁷²

The Patent Department was reorganized in 1902 when the Rugby factory began its operations. One of the reasons for reinforcement of the Patent Department in the London office was the prediction that the volume of patent applications to be managed would increase. In March 1902, A. M. Tanner's salary was increased from £480 per annum to £500, which included the salary of Arnold J. Tanner, his assistant.⁷³ As is shown later, Arnold J. Tanner was in charge of administration of patent applications on behalf of BTH. Another fact of the reorganization was that John Gray, private assistant and secretary for Lord Kelvin at the University of Glasgow, joined BTH and became manager of the Patent Department.⁷⁴ In July, Gray was appointed as a patent agent to conduct patent administration on behalf of BTH, and a notice to that effect was sent to the Patent Office.⁷⁵ In 1903, C. Burgess was employed as an assistant to Gray.⁷⁶ At the time, the organization of the Patent Department in which John Gray was central figure was established; Gray was manager of the Patent Department for 33 years until his death in 1935.⁷⁷

The institution of rules for employee inventions was accompanied by the establishment of the Patent Department. The question of treatment of employee inventions was deliberated at the same board meeting at which they considered setting up the Rugby factory in September 1901. C. A. Coffin and E. W. Rice, Jr., also attended the meeting, held in London. They considered "the question of the assignment to the Company of Inventions of Patents made or taken by the employees of the Company," and placed this matter into the hands of the committee including W. J. Clarke, managing director of GE, H. R. Monks of BTH, and Rice.⁷⁸ Although no information exists on their suggestions, a contract with Frank Holden relating to employee inventions was approved at the board meeting (Executive Committee) in October. Holden was formerly an engineer in GE's Lynn factory, and he came to the United Kingdom to be in charge of the Meter Testing Department of BTH.⁷⁹ Rice undertook to arrange with Holden "with a view to securing that all inventions made by Mr. Holden shall be for use of the Thomson-Houston interests," where interests means all Thomson-Houston companies around the world.⁸⁰ A two-year contract

⁷² Ibid., 7 Dec. 1897.

⁷³ Before the increase, £192 was paid to A. J. Tanner as salary. BTH, Executive Committee Minutes, 6 March 1902, MS Marconi 2888.

⁷⁴ Price-Hughes, *B.T.H Reminiscences*, 56.

⁷⁵ BTH, Executive Committee Minutes, 31 July 1902, MS Marconi 2888.

⁷⁶ Ibid., 4 June 1903.

⁷⁷ Price-Hughes, *B.T.H Reminiscences*, 82.

⁷⁸ BTH, Board Minutes, 16 Sept. 1901, MS Marconi 2882.

⁷⁹ Price-Hughes, *B.T.H Reminiscences*, 13.

⁸⁰ BTH, Executive Committee Minutes, 4 Oct. 1901, MS Marconi 2888.

with Holden provided that BTH pay him £75 for the expenses of the patent, of which £50 was borne by GE and £25 by BTH.⁸¹ This division was based on the condition that BTH had no rights other than in the United Kingdom and its colonies. Following the contract with Holden, many engineers who contracted their services to BTH also concluded a patent assignment contract. In July 1903, BTH entered into a service contract with K. O. Ahlquist, a turbine engineer, that accompanied a patent assignment contract.⁸² After that, the service and patent assignment contracts concluded with the engineers became commonly accepted and reinforced the corporate patent system by securing all inventions developed in the Rugby factory under control of BTH as a corporate property.

Patent Application by Patent Department

This section examines patent applications filed after the formation of the Patent Department. Table 2 shows the trend in patent applications from 1898 to 1914 and their administration. After 1898, almost all GE patents communicated from the United States were, in principle, applied for by BTH. Before that time, external patent agents or law firms administered patent applications. After the formation of the Patent Department, applications were filed directly with the Patent Office. A review of patent specifications shows merely the signatures of directors and the secretary with the company seal. However, in 1901, the patent applications were conducted by J. C. Chapman, a patent agent. In 1902, 126 patent applications were communicated from GE in the name of Lake and administrated by Haseltine, Lake & Co. Furthermore, more than 300 patent applications were made in the name of Edgar A. Carolan, manager of the London Office of the General Electric Company until 1905. These patent applications were divided into three groups from the viewpoint of administration: applications administered by Arnold J. Tanner, which means they were conducted by the Patent Department; those administered by John Gray, which means the same; and those administered by Haseltine, Lake & Co., which means they were conducted by an external patent agent. The period from 1901 to 1905, as seen in Figure 1, was when GE filed numerous applications for U.S. patents. In contrast, the period also saw most of BTH's energies poured into setting up a manufacturing business, and in 1901 most of the staff moved to Rugby for the 1902 factory opening. Therefore, on behalf of BTH, GE administered some portion of BTH's patent applications that BTH could not afford to deal with.

As for patent applications communicated from abroad, BTH obtained some patents from several affiliated companies after 1904. In February 1904, BTH concluded an agreement with CFTH of France for the exchange

⁸¹ Ibid., 10 Oct. 1901.

⁸² Ibid., 29 July 1903.

Table 2 Patent Applications by GE and Its Affiliates, 1898-1914

	Number of Applications		Name of Applicants				Patent Agents				
		Invented in the U.K.	BTH	External Agents	E. A. Carolan	Warwick	None	A. J. Tanner	J. Gray	External Agents	Not Available
1898	49		49				47				2
1899	93	5	93				90				3
1900	112	3	112				111				1
1901	135	8	133	1	1		4	126		1	4
1902	300	16	100	126	74			69	71	95	65
1903	255	12	83		156	16		66	115	1	73
1904	448	25	334		60	54		18	260		170
1905	284	35	255		2	27			185		99
1906	292	34	268			24			211		81
1907	255	36	230			25			157		98
1908	144	38	137			7			96		48
1909	124	27	112			12			87		37
1910	91	26	76			15			55		36
1911	140	23	121			19			93		47
1912	195	35	181			14			152		43
1913	157	25	145			12			115		42
1914	145	27	136			9			117		28
Total	3,219	375	2,565	127	293	234	252	279	1,714	97	877

Notes: BTH includes H. C. Levis, who was the managing director of BTH; applications in the name of Ateliers Thomson-Houston and CFTH were excluded; almost all of "not available" were caused by abandonments of applications.

of inventions and patents invented by engineers of each company.⁸³ During March of the next year, BTH entered into the same kind of agreement with AEG in Germany.⁸⁴ In June 1905, an arrangement was concluded between two parties in which GE assigned to BTH all British patents that they applied for in their own name, namely in the name of Carolan or their patent agents.⁸⁵ This contract also provided that GE

⁸³ BTH, Executive Committee Minutes, 18 Feb. 1904, MS Marconi 2888.

⁸⁴ BTH, *Report of Directors*, 15 Sept. 1906, MS Marconi 2900.

⁸⁵ BTH, Executive Committee Minutes, 7 June 1905, MS Marconi 2888. In this arrangement, a payment of \$22,950 by BTH to GE was provided, which covered patent expenses paid by GE.

would continue to assign all patents for the United Kingdom and Ireland, excluding turbine patents, to BTH. Furthermore, in December, the contracts with Ateliers Thomson-Houston, a French company, were combined through a mutual patent exchange agreement between BTH and CFTH.⁸⁶ These networks among subsidiaries of GE were the fundamental basis of the synchrony of patent applications in the United States and the United Kingdom visible in Figure 1.⁸⁷

Although the number of patent applications of BTH grew, almost all administration was conducted internally by the Patent Department.⁸⁸ Signatures shown in patent specifications show that applications were administered by A. J. Tanner until about 1903, and after that by John Gray. There was an inclination to internalize the administration for applications and not use external law firms or patent agents. Patent applications were conducted by a company's own department because of the role of the Patent Department under the international agreement.

The patent register used in the Patent Department appropriately showed the role of the organization. The register for one patent consisted of four pages; the front page was for entries such as docket number, British patent number, dates, name of applicants including inventor's name, and title. From the second to the fourth page, the names of the countries and regions and the terms of the patent were listed in columns; within each row, patent numbers, date, taxes, and working, among other information, were noted. Although the portfolio of the names of countries and regions somewhat varied each year, in 1909 there were 104 names in the columns, from Argentina to Zanzibar, in alphabetical order.⁸⁹

The patent for the ductile tungsten lamp filament invented by William D. Coolidge of GE Laboratory is examined as an example. This patent, which has thirty-four claims, was filed and registered as no. 1,082,933 in the United States. In the United Kingdom, this patent was divided into two isolated patents; one was no. 23,499 of 1909, titled "Improvements in and relating to Treatment of Tungsten to Facilitate Working" and had five claims; another was no. 8031 of 1910, titled "Improvements relating to Tungsten and the Manufacture thereof" and had ten claims. The register showed that the former patent was registered in Japan as no. 20894 and the latter was registered in Austria, Canada, Chile, and many other countries, including in Japan, where it was assigned patent no. 18961.⁹⁰

⁸⁶ BTH, Executive Committee Minutes, 20 Dec. 1905, MS Marconi 2888.

⁸⁷ By a patent exchange agreement, GE obtained many patents from BTH, CFTH, and AEG, among others, and applied for patents in the United States.

⁸⁸ Turbine patents of Warwick Machinery were also administered by the Patent Department of BTH.

⁸⁹ Patent Register 1904-1927, MS Marconi 2905.

⁹⁰ However, in the register of those two patents, there was no entry in the space for the U.S.A. The reason for this is unclear.

The second example is the basic patent for a radio tube developed by Irving Langmuir of GE. The British patent covering this invention was no. 15,788 of 1914, which had ten claims and was titled, "Improvements in and relating to Electrical Discharge Devices." The register clearly showed that this British patent contained several components invented by others, because ten docket numbers were written on the front page, corresponding to inventions by William C. White or Ernest F. W. Alexanderson, as well as Langmuir. This patent was filed in many countries and regions; in Japan, the invention was registered as No. 27,285, which became a powerful basic patent for radio tubes.⁹¹ In the United States, the corresponding patents were nos. 1,273,783, 1,558,436, and 1,558,437 of Langmuir and no. 1,159,307 of White.

These examples show that the BTH Patent Department surveyed and considered not only the patent situation in the United Kingdom and Ireland, but also that of more than a hundred countries and regions. Note that when BTH applied for a British patent communicated from the United States, it did not file the patent as U.S. specifications but divided or combined some patents in consideration of the competitive conditions within the British territory, making its patent portfolio suitable for their strategies. Actually, the patent situation of each country or region varied. For tungsten filament, the Just-Hanaman patent was an essential patent, in contrast to Coolidge's ductile tungsten patent in the United States.⁹² On the other hand, in Japan, the same patents as the U.S. Just-Hanaman patent were not registered; instead, the Coolidge patent no. 20,894 became the basic patent that Tokyo Electric used for concentrating on the Japanese lamp industry.⁹³ In the United Kingdom, mutual license agreements between BTH and its local competitors were based on the British Just-Hanaman patents.⁹⁴ Therefore, an essential role of the Patent Department was to respond to various local conditions, as in these cases, and each company was to develop appropriate patent portfolios in its respective countries. Incidentally, GE and BTH did not file for patents under the Paris Convention.

Licenses

After formation of the Patent Department, the organizational structure for patent management and control was unchanged as a whole. The board decided patent policies and strategies and executed them, assisted by the

⁹¹ Shigehiro Nishimura, "Essential Patent of a Dominant Company and Venture Business: Case Study on Patent Management in the Vacuum Tube Industry," *Keizai Ronso* [Kyoto] 180 (2) (Aug. 2007): 19-40, in Japanese.

⁹² Arthur A. Bright, Jr., *The Electric-Lamp Industry: Technological Change and Economic Development from 1880 to 1947* (New York, 1949), 271-80.

⁹³ Nishimura, "General Electric's International Patent Management before World War II," 110-15.

⁹⁴ BTH, Executive Committee Minutes, 26 Jan. 1911, MS Marconi 2889.

Patent Department and external law firms or patent agents. Before the formation, Parshall's department had reported to the board; its functions were organized and conducted by the Patent Department.

The products manufactured by BTH became more complex and the product line expanded, as the company had more opportunities to buy patents, to obtain licenses from others, or to license its patents. In electrical industries, many patent transactions were practiced internationally. In November 1901, BTH entered into a contract with the Mica Insulator Company, GE, Westinghouse Electric and Manufacturing Company, and their British subsidiaries for a license covering insulating materials. The contract was signed by Rice and H. R. Monks.⁹⁵ In 1904, BTH began negotiations with AEG to purchase their Winter-Eichberg patents, which covered single-phase alternating current railway equipment, and they concluded the purchasing contract the following year.⁹⁶ Furthermore, in February 1910, BTH entered into an agreement with General Electric Company, Limited (British) and Osram Lamp Works to exchange licenses for their British patents covering metal filament lamps; BTH was in a dominant position because it held the Just-Hanaman patent.⁹⁷ In 1912, Siemens Brothers, Siemens Brothers Dynamo Works joined this agreement, and Ediswan joined the following year.⁹⁸ Although this license agreement was contained within British territory, it was part of the global licensing network of GE.

One of the roles of the Patent Department in licensing and taking over patents was to give advice to the board. In January 1901, A. M. Tanner advised the chairman of the board that the company should purchase H. S. Meyer's patent covering motor starting devices, which it did following board approval for a price of £30.⁹⁹ At another board meeting held during the same month, Tanner reported that purchasing Samuelson's patent covering trolley standards was desirable, and it did so for £100.¹⁰⁰ Furthermore, a letter from the Patent Department submitted at a board meeting in October 1906 recommended that BTH should license a patent by Alfred Swan for a blowing-off machine used in lamp manufacturing in the Rugby factory; the board decided to pay £100 for a non-exclusive license.¹⁰¹

The board sometimes asked the Patent Department for its opinion. In September 1903, C. A. Coffin proposed by cable the purchase of Sprague's patents relating to train control. The board requested the Patent

⁹⁵ Ibid., 12 Nov. 1901, MS Marconi 2888.

⁹⁶ Ibid., 20 Oct. 1904 and 22 March 1905; BTH, *Report of Directors*, 15 Sept. 1906, MS Marconi 2900.

⁹⁷ BTH, Executive Committee Minutes, 23 Feb. 1910, MS Marconi 2889.

⁹⁸ Ibid., 28 Feb. 1912.

⁹⁹ BTH, Board Minutes, 7 Jan. 1901, MS Marconi 2881.

¹⁰⁰ Ibid., 28 Jan. 1901.

¹⁰¹ BTH, Executive Committee Minutes, 10 Oct. 1901, MS Marconi 2888.

Department to offer a preliminary opinion. On the advice of the Patent Department that “the B.T.H. patents ante-dated those of Sprague” and that the proposed price was high, the board cabled Coffin that “it was not wise to make the purchase.”¹⁰² In return, Coffin noted the results of an interview with Sprague and that BTH could dominate the multiple-unit system area by purchasing the patents. After deliberation at a board meeting attended by Sprague, in October of the same year the board eventually decided to purchase Sprague’s patents. The price was \$100,000 for patents covered in the United Kingdom, Ireland, and other countries except for the United States, Canada, and continental Europe, of which \$50,000 was borne by GE.¹⁰³ In summary, the Patent Department assisted the decisions of the board by investigating patent situations and their positions, reporting them to the board, and recommending licensing and purchasing activities.

Enforcements

Similar to the case of licensing, the organizational structure for enforcement was unchanged. Administration of enforcement was conducted by the board, which was assisted by the Patent Department and external resources such as law firms and patent agents.

The conflict with Chamberlain & Hookham, Ltd., which accused the company of infringement of the Thomson meter patents, continued. In February 1898, Managing Director Monks and Tanner of the Patent Department were instructed to report on the value of BTH’s patents from a legal and technical viewpoint.¹⁰⁴ In other words, the board asked the Patent Department to evaluate the company’s patents and the advisability of defending them. After Chamberlain & Hookham sued BTH, the chairman reported on the status of the litigation from time to time.¹⁰⁵ The legal procedures were conducted with Ashurst Morris Crisp & Co.; during the first half of 1900, BTH obtained a favorable judgment. “In recognition of their service,” the board decided to give Frank Holden 150 guineas and A. M. Tanner 100 guineas as a fee.¹⁰⁶ This remuneration to Tanner shows the essential role of the Patent Department.

Similarly, the Patent Department carried out an important role in a suit brought by the Electrical Construction Company, Ltd. In December 1898, Electrical Construction sued Imperial Tramway Company for infringement of motor suspension patents by its subsidiary, Middlesbrough Stockton-on-Tees & Thornaly Electric Tramway, Limited. Because BTH was a contractor to this subsidiary, Monks asked Tanner to

¹⁰² *Ibid.*, 25 Sept. 1903.

¹⁰³ *Ibid.*, 9 and 23 Oct. 1903.

¹⁰⁴ BTH, Board Minutes, 8 Feb. 1898, MS Marconi 2881.

¹⁰⁵ *Ibid.*, 2 May 1899.

¹⁰⁶ *Ibid.*, 28 May 1900; BTH, *Report of Directors*, 13 July 1900, MS Marconi 2900.

investigate the patent position, and entered into a contact with Godfray, a solicitor for Imperial Tramway.¹⁰⁷ BTH got involved in this litigation, and the court eventually decided in favor of BTH and Imperial Tramway; the decision was upheld on appeal. Again, the board decided to give A. M. Tanner 100 guineas as a fee “in recognition of his service.”¹⁰⁸

Enforcement was usually combined with license agreements or patent pools to realize more profitable transactions. In 1903, BTH entered the steam turbine business with fair excitement. It endeavored to set up a turbine business by importing technology from the United States to manufacture efficient steam turbines; simultaneously, patent management and control such as defense and licensing were administered. In the beginning, few competitors existed in the United Kingdom, but after a certain period, several companies entered into the turbine field. Williams & Robinson, Limited, was one of the companies engaged in the business. Although they had patents covering their turbines, in September 1909, the board authorized Monks to “take all necessary steps, both legal and otherwise to prevent Messrs. Williams & Robinson from infringing” BTH turbine patents.¹⁰⁹ After negotiations for a year, Williams & Robinson agreed “not to do anything which would infringe” BTH’s turbine patents.¹¹⁰ This was a case of defense. On the other hand, BTH negotiated with Richardson Westgarth & Co. for a license to manufacture under patents for a Curtis steam turbine. In October 1909, the license was approved at the board meeting. Subsequently, chairman of the board Howard Levis made specific arrangements with Monks and John Gray, manager of the Patent Department, and then executed contracts with them.¹¹¹

Conclusion

Institution of a patent system is indeed one of the conditions for multinational enterprises when deciding to enter foreign markets. Modern patent laws, qualified patent agents to administer patent applications on the behalf of the enterprises, and well-trained lawyers and legal systems for enforcement are all necessary conditions for international patent applications by multinationals and foreign businesses. However, these are not sufficient conditions. Even if patent systems are instituted, they would not cause huge volumes of direct patent applications. A comparison of GE’s patent applications in the United States, United Kingdom, and Japan by 1914 showed that GE applied for many British patents, a trend identical to that in the United States, but GE’s patent applications in Japan were

¹⁰⁷ BTH, Board Minutes, 6 Dec. 1898, MS Marconi 2881.

¹⁰⁸ Ibid., 14 Nov. 1899; BTH, *Report of Directors*, 13 July 1900, MS Marconi 2900.

¹⁰⁹ British Patent No. 18,104 of 1908, “Improvements in Turbines”; BTH, Executive Committee Minutes, 30 Sept. 1909, MS Marconi 2889.

¹¹⁰ Ibid., 14 Sept. 1910.

¹¹¹ Ibid., 14 Oct. 1909.

negligible in that period. One of the essential conditions for multinational enterprises to file large volumes of patent applications is whether they can develop patent management and organization in local markets.

In the United Kingdom, GE assigned their patent rights to BTH and exploited them in specific territories. Patent management and control by BTH was conducted by the board during the early days. In particular, managing director James Devonshire and H. F. Parshall were in charge of patent affairs. Administration of patent applications, purchasing, licensing, and enforcement were conducted by the board, assisted by law firms and patent agents. The BTH Patent Department was formed at the end of 1897, and was reorganized and reinforced when John Gray joined the company and became manager of the department in 1902. The Patent Department administered patent applications for communicated inventions and the company's own inventions. Rules for employee inventions were provided, which called for patents invented by employees to come under the control of the company as corporate property. Patent management functions such as application, purchasing, licensing, and enforcement continued to be conducted by the board, assisted by the Patent Department and external resources such as law firms and patent agents.

Organization of patent management and control by BTH was undertaken by key persons from GE. Parshall, who was in charge of patent affairs before the formation of the Patent Department, was an engineer from GE. The necessity of the employee invention rule was pointed out and discussed by E. W. Rice, Jr., but not by local officers. Rice and W. J. Clarke, a managing director from GE, developed the rule. However, administration was handed over to local talent, including John Gray, a Scotsman who was manager of the Patent Department until his death in 1935.

Indeed, many local resources were used for patent management and control, including excellent British law firms, well-trained patent agents, great scientists such as Lord Kelvin, and many local engineers. However, unless the techniques and organization could be combined into effective patent management and control, BTH would not have been able to take advantage of these resources and of the patent system. The BTH techniques were in part imported from GE at an early stage and subsequently developed. In the case of Japan, it was not until 1919 that GE's subsidiaries formed a patent department.