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Foreign Business and Patent Management before WWI: A case study of the General Electric Company

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In the early era of international business, especially in the field of electrical lighting and apparatus, there existed patent management contracts between international companies. The contracts provided for either party to exchange rights for applying and exploiting patents in each other's exclusive territory, reciprocally. Although this kind of contract expanded, and played some decisive role in the internationalization of business, when did patent management contracts emerge? And how had they been developed? A case study of the General Electric Company makes it possible to examine typical contracts. This study shows the evolution of patent management contracts from the era of their initiation to World War I.

Keywords: International agreements; reciprocal flow of technology; law and patent department; research laboratory

I. Introduction

The aim of this study is to clarify international patent management before World War I by a case study of the General Electric Company (hereinafter, GE). I have already surveyed the international patent management agreement between GE and Tokyo Electric Company, Ltd., a Japanese company, and I pointed out that GE entered into this contract with Tokyo Electric after they had formed International General Electric Company (hereinafter, IGEC), a wholly owned subsidiary that engaged in foreign business after 1919; and that the transfer of GE's patent management method, as part of the agreement, brought about a remarkable improvement in Japanese patent management[1]. In this article, I attempt to clarify

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1) Shigehiro Nishimura, "General Electric's International Patent Management before World War II: The "Proxy Application" Contract and the Organizational Capability of Tokyo Electric," *Japanese Research in Business History*, Vol. 21, 2004, pp. 101-125.

when GE began entering into this sort of relationship, what kind of companies they made such contracts with, and how the international relationships of patent management evolved, from their beginning to the formation of IGEC.

It has already been pointed out that, before WWII, GE had concluded patent agreements with some major foreign electric companies and that, as the basis of those agreements, it was submitting patent applications in countries around the world[2]. However, previous studies have shed almost no light on patent management, which is a crucial function that a company carries out. If a patent is merely applied for and registered, that in itself produces no profits at all for the company; on the contrary, it imposes a cost burden on the patent owner in the form of application costs, an annual fee, and so on. To take advantage of the patent system and make a profit, a company must engage in patent management, an exercise that includes such things as application, safekeeping, seeking redress for patent infringements and guarding against infringements, patent agreements, and licensing agreements. In industrial nations in which a patent system is in place, the production and sale of goods that involve the use of technology, and that a patent owner holds the rights to, are regulated. Any analysis of business history must therefore shed light not only on production management and the management of distribution and marketing, but also on patent management.

International patent management and contracts seem to have passed almost unnoticed in the literature. John Cantwel and Tetsuo Tomita have drawn attention to its existence. Cantwel, in his survey of the Official Gazette of the United States Patent and Trademark Office, pointed out that the nationality of the inventors named in patents that GE acquired in the United States are spread across a large number of foreign countries, and he argued that multinational enterprises undertook international R&D activities in the 1930s[3]. Tomita's research involved a study of the Japanese situation using a similar survey of Japan Patent Office materials[4].

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2) See Hiroshi Itagaki, "1920nendai America no kaigai toshi" [U.S. overseas investment in the 1920s], *Kokumin keizai* no. 136 (1977); Tesuo Abo, *Senkanki Amerika no kaigai toshi* [U.S. overseas investment between the wars] (Tokyo: University of Tokyo Press, 1977); Masaki Yoshida, "1880nendai kara 1920 nendai ni okeru Amerika denki sangyo no kaigai shinshutu" [Overseas inroads of the U.S. electrical industry from the 1880s to the 1920s], *Mita shogaku kenkyu* [Mita Business Review] 30, no. 2 (June 1987); Masaki Yoshida, "Amerika oyobi Doitsu denki sangyo ni okeru karuteru keisei to sono kokusaika ni tsuite: senzen no GE o chushin ni mita tokkyo shihai to karuteru ni yoru shijo tosei" [The formation of cartels in the U.S. and German electrical industries and their internationalization: Patent domination and market control by cartels as seen by focusing on prewar GE], *Mita shogaku kenkyu* 30 no.4 (October 1987).

3) John Cantwel, "The Globalization of Technology: What remains of the Product Cycle Model?" *Cambridge Journal of Economics* 19 (1995), pp. 155-74.

4) Japan Patent Office, *Kogyo shoyuken seido hyakunen shi* [One hundred years of the industrial property rights system], vol. 1(Tokyo: The Japan Institute of Invention and Innovation, 1984), pp. 662-68; Tetsuo Tomita, *Shijo kyoso kara mita chiteki shoyuken* [Intellectual property rights seen from the perspective of market competition] (Tokyo: Daiyamondo Sha, 1993), pp. 101-110.

He discovered that the inventors of a large number of the Japanese patents acquired by Japanese electrical enterprises were non-Japanese. He pointed out that this shows that patent rights were transferred between cartel companies, and he proves that technological transfers were carried out via these cartels. Unfortunately, neither Cantwel nor Tomita explains why (i.e., for what purpose) patent rights were transferred, nor what effects such transfers had on the management of the companies involved.

This presentation will proceed in the following sequence. First, I will shed light on the evolution of the foreign business of GE's predecessors and on the functions of patents in their national and international strategy. Second, I will examine the international patent contracts into which GE entered in its early periods. Finally, I will consider the significance of the report of 1918 on foreign business, which suggested forming IGEC, by analyzing the ideas it presented, and the discussion of them by top managers.

II. Foreign business of Predecessors

The General Electric Company was formed in 1892 by the merger of the Edison General Electric Company, the Thomson-Houston Electric Company and its subsidiary the Thomson-Houston International Electric Company.[5] As we can see, GE involved international company, having engaged in foreign business prior to the merger. First, we need to clarify the development of international business and management by Edison General Electric and Thomson-Houston.

1. Edison General Electric Company

Edison General Electric emerged from the Edison Electric Light Company (hereinafter, EEL), which had industrialized some inventions by Thomas Alva Edison. On October 17, 1878, the EEL had been incorporated by the investment of J. P. Morgan & Co. and others in a cluster of Edison's patent rights, and the authorized capital was 300,000 dollars[6]. The strong interest of investment bankers in patents tell us that patents and patent management must have played some decisive roles in corporate strategy and management at that time. Edison, however, had not been able to tolerate control company of the character of EEL. Having an

5) General Electric Company, *First Annual Report*, January 31, 1893.

6) A. A. Bright, Jr., *The Electric-Lamp Industry: Technological Change and Economic Development from 1800 to 1947* (New York: Arno Press, 1972), p. 60; Kesaji Kobayashi, *GE* (Tokyo: Toyo keizai shimpo sha, 1970), p. 10.

entrepreneurial nature, he had established the Edison Lamp Company in 1880, for the manufacture and sale of lamps, in a partnership with Charles Batchelor, Francis Upton, and Edward Johnson[7]. He had also set up several companies in 1881: the Edison Machine Works, a manufacturer of power generators; the Edison Tube Company, a manufacturer of power cables; the Edison Shafting Company, a manufacturer of axles; and Bergmann & Company, a manufacturer of sockets and fuses. These companies engaged in making certain apparatus and parts that together constituted Edison's incandescent lamp system. In 1886, the five companies noted above were consolidated into the Edison United Manufacturing Company, and in 1889 the United Company merged with EEL to become the Edison General Electric Company. Although Edison's firms had been divided into a patent holding company and the manufacturing companies en route to becoming EGE, they eventually became one of the largest electrical companies in both the United States and the world[8].

EEL had undertaken foreign business since its early days. Initially, it exported incandescent lamps from U.S. factories, following Edison's intentions. However, policy towards overseas production gradually changed[9]. One reasons for this change of strategy may have been that their foreign business was based on patents registered in each foreign country. According to the Edison Bulletin of June 1882, in France, "everything without exception must be manufactured in France so as to conform to the French patent law requirements"[10] of the time. German patent law also forced patent holders to implement in the country: that is, to manufacture patented products in Germany[11]. Therefore, a survey of the development of the international business of the Edison companies in England, France, and Germany is required.

In England, the Edison Electric Light Company, Ltd. was organized in 1882, with a joint capital supplied by English interests and US interests, including 50%

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7) In the annual report of 1882, they said "the policy of our company ... had always been ... that of merely paying the expenses of experiments and of taking out and holding patents and not of investing capital in the actual business of lighting." Harold C. Passer, *The Electrical Manufacturers 1875-1900: A Study in Competition, Entrepreneurship, Technical Change, and Economic Growth* (New York: Arno Press, 1972, originally published by Harvard University Press, 1953), p. 98.

8) *Ibid.*, pp. 93-103; also see Kobayashi, *op. cit.*, pp. 10-18, 26-28; Kazuichi Sakamoto, *GE no soshiki kakushin: 21seiki gata soshiki e no chousen* [Organizational innovation of GE: the challenges for organization of 21 century style] (Kyoto: Houritsu bunka sha, 1997), pp. 18-19.

9) Mira Wilkins, *The Emergence of Multinational Enterprise: American Business Abroad from the Colonial Era to 1914* (Cambridge: Harvard University Press, 1970), pp. 52, 54-55.

10) Gerard Swope, Jr., "Historical Review of GE's Foreign Business as Affected by U.S. Antitrust Laws," October 31, 1972, p. 1. This is a manuscript possessed by the Hall of Electrical History, Schenectady Museum & Archives, Schenectady, NY, United States of America.

11) Wilkins, *op. cit.*, p. 55.

by Edison. The functions of this firm were the sale and installation of electric light systems, and patent licensing to subsidiaries. The company was merged with Joseph Wilson Swan's company, which held several substantial English patents relating to the incandescent lamp, and it became the Edison and Swan United Electric Company, Ltd, "Ediswan".[12]

The French business was carried out through the Edison Electric Light Company of Europe, Ltd., which was organized in New York around 1880. This company managed the application and control of Edison's patents in the continental countries, including France, and it bore all the costs of patent application and management. In 1881, the company organized three French companies: La Compagnie Continental Edison, La Société Industrielle et Manufacturie Edison, and La Société Electrique Edison. Continental Edison was a controlling company that had the task of distributing the Edison system throughout the continental European countries in which they had been licensed. Edison assigned his patents in the continental countries to exploit it[13]. The second company manufactured in the suburbs of Paris, and Charles Batchelor, Edison's partner, directed it. The third company produced apparatus for isolated power plants. These three companies were funded by such banking capital as Seligman Frères & Co., Drexel, Harjes & Cie., Bank l'Escompte de Paris (Discount Bank of Paris), Banque Central (Central Bank of France), and Speyer Brothers. In the case of French business, Edison's dependence on this banking capital led to the forfeiture of Edison's interests and rights in continental Europe. The panic of 1884 in the United States made it necessary to transfer Edison's interests in the three companies to the French, and, as a result, the patents assigned to Continental Edison in the European countries were also moved to them[14].

In Germany in 1883, Emil Rathenau organized the Deutsche Edison Gesellschaft in the incandescent lamp business. As the German Edison patents had been held by French companies, Rathenau had to be licensed by Continental Edison and Société Electrique Edison. In 1885, he bought the Edison patents in some European countries from Continental Edison, for 50 thousand marks. This settlement enabled Deutsche Edison to operate its business based on patent rights, without interference from the Edison Company of New York or from Continental Edison. In 1887, Deutsche Edison reorganized and became Allegemeine Elekricitäts-Gesellschaft,

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12) Wilkins, *op. cit.*, pp. 52-53.

13) Swope, Jr., *op. cit.*, p. 2.

14) Wilkins, *op. cit.*, pp. 53-56.

AEG. It also became a global player[15].

2. Thomson-Houston Electric Company

Thomson-Houston began as the American Electric Company, which was founded in 1880, in New Britain, Connecticut. This company was established to industrialize the arc lighting system of Elihu Thomson and Edwin Houston, who offered their patents, and some investors also offered capital. As a result of the technology development activities conducted by Thomson and Houston, until 1881 the company's products consists of a series of Thomson-Houston systems, such as a highly effective power generator, an automatic current regulator, an air-blast non-sparking commutator, and a lightning arrester. In 1883, the American Electric Company was reorganized by capitalists based in Massachusetts, and it became the Thomson-Houston Electric Company, with its headquarters in Lynn, MA[16]. Subsequently, Thomson-Houston started purchasing some companies that held essential patents. In the field of incandescent lighting, in 1884 they acquired the Consolidated Electric Light Company, which owned Sawyer-Man patents and its manufacturing subsidiary, Sawyer-Man Electric Light Co. Thomson-Houston also took over some companies operating in the arc lighting system segment, in which they also operated. In 1888, they acquired some patents and engineers of the American Electric Manufacturing Co., which went bankrupt after a patent trial with Thomson-Houston. The following year, Thomson-Houston purchased, or acquired control of the stock of the Schuyler Electric Co., the Fort Wayne Electric Co., and the Brush Electric Co., all of which held patents that would prove vital for the subsequent development of the arc lighting system. They also acquired some companies that had important patents for the electric tram. In 1888, Thomson-Houston purchased the Van Depoele Electric manufacturing Co., and it acquired the Bentley-Knight Electric Railway Co. the following year, thus entering the street railway business. Thomson-Houston had grown as a multiple electric manufacturer by merger of companies which had substantial patents[17].

Like Edison General Electric, Thomson-Houston had carried out overseas business from an early days. In 1884, they organized the Thomson-Houston International Electric Co. (hereinafter, THIE), and put it in charge of international business, and patent exploitation in foreign countries[18]. Although Edison's foreign companies

15) *Ibid.*, pp. 54-55, 57-58.

16) Passer, *op. cit.*, pp. 21-31; Kobayashi, *op. cit.*, pp. 38-43.

17) Passer, *op. cit.*, pp. 52-53; Sakamoto, *op. cit.*, pp. 20-27.

18) Swope, Jr., *op. cit.*, pp. 2-3; Wilkins, *op. cit.*, p. 58.

had begun manufacturing their goods in England, France, and Germany, THIE seems to have conducted only exporting business until 1892. They appointed agents in some countries and/or opened sales offices[19]. In 1887, they designated Lang, Wharton and Down as the local agency in charge in England. In France, they opened sales office in 1884, and in 1886 incorporated the Compagnie Thomson-Houston. There is no evidence of what kind of operation this company conducted, but it may have undertaken sales, installation and patent management. Thomson-Houston also opened a sales office in Germany. Like Edison's company, however, Thomson-Houston eventually realized that foreign business in industrialized countries could be developed only through local manufacturing, given the regulations regarding patent laws[20]. The movement toward manufacturing abroad began around 1892, when Thomson-Houston merged with Edison's company, to become General Electric.

III. International Agreements

1. Establishment of affiliated companies

Although both Edison General Electric and Thomson-Houston Electric had over ten years experience of international business, almost all the foreign businesses that were handed over to GE were Thomson-Houston's properties[21]. Edison had kept only the Ediswan business when GE was formed: the enterprises in France had been passed into other ownership, and AEG in Germany had been independently active. The then newly formed GE constructed some new foreign businesses that were based on the THIE organizations. THIE may have been an active subsidiary of GE for a while, until it was absorbed into GE around 1900[22]. Therefore, GE's foreign strategy and business in the early days was conducted by THIE management, which attempted to develop foreign manufacturing, as a way of overcoming some of the strategic limitations of depending on an agent and a selling office.

In 1894, THIE incorporated the British Thomson-Houston Co., Ltd. (herein-

19) Swope, Jr., *op. cit.*, pp. 3-6.

20) *Ibid.*, pp. 2-3.

21) Wilkins, *op. cit.*, pp. 58-59.

22) In some contracts at lease before 1898, THIE had signed with GE. Therefore, THIE may have been one of its subsidiaries at that time. On the other hand, the official report said that THIE had been absorbed in GE when it was organized. General Electric Company, "Report upon Foreign Business," November 22, 1918, p. 105. Owen D. Young Papers, Box 59, Folder 202A "Report of Foreign Business, November 22, 1918," St. Lawrence University, Canton, NY. The same report was also held by Schenectady Museum and Archives.

after, BTH) for business within Britain. BTH was organized by THIE and its agent Lang, Wharton and Down, with the former possessing 40% of its shares. BTH was the subsidiary that manufactured and sold incandescent lamps and other electrical apparatus[23].

In 1892, in France, THIE jointly organized the Compagnie Française de l'Exploitation des Procedes Thomson-Houston (hereinafter, CFTH), along with Etienne Siry and George Renard. CFTH was also the affiliated company responsible for the production and sale of electrical goods, and initially THIE acquired 10% of the interest[24].

In Germany, in 1892, THIE had formed the Union Elektricitäts Gesellschaft (hereinafter, UEG), which succeeded the German sales office that had operated since 1884. Half of UEG's share was held by THIE. The aim in creating UEG was to exploit the Thomson-Houston system in the continental European territory designated by the contract. At the foundation of the business, THIE assigned the patents it held in Germany and the Scandinavian countries to UEG[25].

Regarding the other European countries, the Compagnie d'Electricite Thomson-Houston de la Mediterranean was organized in 1898. The Mediterranean company, founded in Belgium, was a joint company of THIE, GE, CFTH, and UEG[26]. One objective of this company was to exploit the Thomson-Houston system in Italy, Egypt, Greece, Spain, and Portugal. It was because some arrangement of the division of territory was necessary that CFTH and UEG participated in the joint company. The Mediterranean company, however, did not continue for long, and it was absorbed by CFTH in 1909[27].

2. Patent management agreements

After 1892, those affiliated companies incorporated in England, France, and Germany developed their business through certain international agreements with THEI, and later with GE. Next, we must review the contents of certain contracts between THIE (GE) and the European affiliated companies. Each contract principally consisted of the parts relating to the division of territory, patent dealing, and technology dealing. Table 1 shows an outline of GE's contracts that concluded before 1919.

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23) Swope, Jr., *op. cit.*, p. 3.

24) *Ibid.*, pp. 3-4.

25) *Ibid.*, pp. 4-5.

26) *Ibid.*, pp. 2-5.; General Electric, "Report upon Foreign Business," Exhibit A, Section 1-b, p. 32.

27) Swope, Jr., *op. cit.*, p. 5.

Table 1: Foreign Contracts between GE and major electrical companies

Company	Date of Contracts*	Term	Territory	Patent Exchange (management agreement)
Canadian General Electric Toronto, Canada	Aug. 30, 1892	Perpetual	Dominion of Canada, including Newfoundland	Unilateral
British Thomson-Houston London, England	May 3, 1897	After three months notice	United Kingdom of Great Britain for Exclusive	Reciprocal
Cie. Francaise Thomson-Houson Paris, France	Dec. 31, 1892	Duration of existence of French Company	France and its colonies; Spain, Portugal, except their colonies	Unilateral
Allgemeine Elektricitate Gesellshcaft Berlin, Germany	Oct. 19, 1903	After three years notices or June 16, 1919	Germany, Luxembourg, Austria-Hungary, European and Asiatic Russia, Finland, Holland, Belgium, Sweden, Norway, Denmark, Switzerland, Turkey, Balkan States	Reciprocal
Wseobschaya Electritschetwa Komplania Petrograd, Russia	April 11, 1917	After one year notice	European and Asiatic Russia, except Finland	Reciprocal
Tokyo Electric Company Tokyo, Japan	April 20, 1918	To November 19, 1929	Japan, including Korea and Formosa and southern half of Saghalien	Unirateral (no provision on Tokyo's application)
Shibaura Engineering Works Tokyo, Japan	July 13, 1918 (draft)	To November 19, 1929, or after two years notice	Japan, including Korea and Formosa and southern half of Saghalien	Unirateral (no provision on Shibaura's application)

*Date of contracts that referred by committee member.
Source: GE, "Report upon Foreign Business," Exhibit A, Section 1-b, pp. 27-45.

(a) British Thomson-Houston

The agreement between General Electric and British Thomson-Houston, dated May 3, 1897, set out the exclusive territories for BTH[28]. The exclusive territory was certain markets in which BTH could do business exclusively, and which GE could not enter. The territories of BTH were the United Kingdom of Great Britain and Ireland and the British possessions in Europe. GE secured the United States and Canada as its exclusive territory. Regarding market division, the agreement also denoted the non-exclusive territories. These were territories that BTH could enter on certain conditions, and they included East India, Australia, South Africa and so on[29].

Patent agreements had been provided as follows[30]. At first, it had been provided 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 "offer British Company any inventions or patents purchased."

In return, BTH owned some obligations by other clauses[31]. BTH would "assign all patents and patent rights in so far as they relate to the United States 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, as well as the obligations for GE, BTH would "offer General Company any inventions or patents purchased."

The obligations to each other provided in the agreement had been almost in parallel. In particular, it was important for both companies that the agreement provided the assignment, not only of patents that they held at that time, reciprocally, but also those that they would invent or acquire in future. In this way, GE and BTH built a long-term relationship on the international exchange of patents[32]. In detail, the agreement stipulated that, for future patents, BTH would apply for

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28) In relation to territories, see GE, "Report upon Foreign Business," Exhibit A, Section 1-b, pp. 28-29.

29) The understandings of non-exclusives had been revised in 1896, 1897, 1904, and 1905 before the report compiled.

30) GE, "Report upon Foreign Business," Exhibit A, Section 1-b, p. 28.

31) *Ibid.*, p. 29.

32) In the original contract, there was no arrangement on terms. The contract was modified in 1905 to "expire after three months written notice by either party." *Ibid.*, p. 28.

patents, in its own cost and name, invented by GE in England, and that in the United States and Canada GE would apply for patents, in its own cost and name, developed by BTH. These dealings in patents refer to the patent management contract; in each territory, they managed and controlled clusters of patents that they assigned to the counterpart, as their own rights.

In the case of technology contracts, GE's obligations to its counterpart were in parallel to BTH's obligations, and to the clauses of the patents[33]. According to the agreement, either party would "furnish all patterns, drawings, special tools, designs, machinery and other requisites for manufacturing, at actual cost price." And, they "would furnish every reasonable facility for examination of methods and processes, also technical assistance and instruction in methods and processes of manufacture," and bear the expense mutually. These full-scale technology exchange contracts corresponded to the patent contracts mentioned above. They established a certain legal scheme, by which they acknowledged reciprocal patent rights in each territory, by a full-scale exchange of patents between parties, under which they could undertake a wide range of technology transfer internationally.

(b) Compagnie Française Thomson-Houston

In the case of the agreement between GE and CFTH, the original contract that was concluded by Siry, Renard, and THIE on December 31, 1892 might have been effective for some time[34]. This contract had no expiration date[35]. Regarding market division, the contract designated as the exclusive territories for CFTH France and its colonies, Spain, and Portugal, excluding their colonies, and the non-exclusive territory was Italy. It did not appear in the materials, but the exclusive territories for THIE, and later for GE, could have been assigned in the United States and Canada. So far as the patent contract is concerned, the agreement stated solely the obligations of THIE. That is, first, THIE would "grant exclusive right of manufacture and sale of apparatus and machines of Thomson-Houston system; exclusive right of exploitation of all patents, of which it is owner in the territories named." Second, it would grant "right to take and to own patents for France and its colonies, Spain and Portugal, but not their colonies, for all future inventions to which the T-H.I.E. Co. may have the right, except where the T-H.I.E. Co. may have to acquire these inventions by purchase," and so on. In this way,

33) *Ibid.*, p. 29.

34) *Ibid.*, pp. 30-31.

35) The term of this contract was "duration of existence of French Company." *Ibid.*, p. 30.

relating to technology transfer, the contracts provided a one-way flow; THIE had to "put at the disposal of the French Company all special engineers, as well as technical assistance, which may be demanded, the French Company to pay all expenses." The contracts arranged a one-way flow of patent rights and technology, and there was no provision relating to the backflow from the French to the American company. Even so, we can see that the contract has certain international patent management arrangements, by which CFTH could apply inventions, for which THIE held the patents, within its territories.

(c) Allegemeine Elekricitäts-Gesellschaft

As mentioned above, the agreement between THIE and UEG included the assignment of patent rights in Germany and the Scandinavian countries to UEG. After that, however, UEG was reorganized.

AEG had been the recipient of patents in European countries from the Continental Edison Company in France. Thus AEG conducted not only domestic business, but also international business based on the patents, independently. Such a situation forced GE to conclude certain new contracts with AEG, because, in order to govern the international electrical goods market, GE had to obtain control of the companies that had made technological advances and showed potential. The GE-AEG agreements of 1903 created a division of territories, and the exchange of patent rights and technology[36].

The agreement stated that the exclusive territories for AEG were Germany, Duchy of Luxembourg, Austria-Hungary, European and Asiatic Russia, Finland, Holland, Belgium, Sweden, Norway, Denmark, Switzerland, Turkey, Balkan States, Spain, and Portugal, but in this last only through their interests in the Mediterranean Company[37]. GE secured the territories of the United States and Canada, as well as the same sort of contracts. Non-exclusive territories for AEG were provided in Japan and in the Central and South American countries. In respect to patent exchange, the agreement stated that GE might "assign all patents, excepting these hereafter purchased from other than employees," and AEG had the reciprocal obligations to GE. This clause may have helped GE to strengthen its technological competitiveness. GE was eager to obtain some kind of German electrical tech-

36) Shin Hasegawa, "Competition and Cooperation in the Japanese Electrical Machinery Industry," in Kudo, Akira and Hara, Terushi, eds., *International Cartels in Business History* (Tokyo: University of Tokyo Press, 1992), p. 166.

37) In relation to some clauses of the GE-AEG Agreement, see GE, "Report upon Foreign Business," Exhibit A, Section 1-b, pp. 34-35.

nology exclusively[38], and for that purpose GE arranged the exchange of technology backed by a reasonable patent assignment. The assignments of patents reciprocally meant that the patent management agreement was executed in each territory, as were other contracts. Following this agreement, AEG merged with UEG in 1904, and GE simultaneously acquired a substantial share in AEG[39].

In the features pointed out in the review above, there are some things that we should recall about GE's agreements with BTH, CFTH, and AEG in the early years. First, each contract was constructed based on patent dealings as regal ground. The provisions relating to territorial divisions were also based on the territorial principle of patent rights. Second, the contracts of technology exchange were in accordance with the allocation of patents. Patent contracts arranged the regal scheme for technology transfer and interchange. Thus, international contracts between companies at that time were based on the possession or assignment of patents. Finally, and consequently, it had been a reasonable means for GE and its affiliated companies to conclude patent management agreements. In fact, however, when GE decided to license its patent to BTH in Britain, it did not apply for a British patent to the Patent Office itself, and then license it out. Instead, GE assigned only the rights for application to BTH, which then took out its own British patents, and used them in its territory.

IV. Organizations relating to patent management

1. Law and patent Department

When GE conducted foreign business effectively through international agreements with affiliated companies based on patents, it had to fully equip certain organizations internally for patent management, and for research and development. However, at the time of its foundation, GE did not have a fully developed system and organization to control patents and to promote research. The establishment of those organizations in GE must therefore be examined.

I have already described how patent control and management played a decisive role in the path of development of the predecessor companies. Edison Electric Light Co., which was formed by Edison along with his bankers, was operated as the management company for certain patents that were based on his inventions.

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38) Many GE scientists were trained in Germany. For example, Willis R. Whitney, chief of General Electric Laboratory, had engaged in scientific research in Germany. After the foundation of the Laboratory, GE pursued interchange with German scientists. See George Wise, *Willis R. Whitney, General Electric, and the Origins of U.S. Industrial Research* (New York: Columbia University Press, 1985), pp. 234-238.

39) Wilkins, *op. cit.*, p. 94.

Thomson-Houston also enforced its patent rights to defeat competitors by lawsuit, or it bought out its competitors completely, and acquired their patents to strengthen its own competitiveness. The consolidation of those companies of 1892 also meant the consolidation of substantial electrical patents. Combined into GE were patents relating to such items as the incandescent lamp, which included Edison's carbon filament, the feeder and main power supply system, the electric railway, Van Depoele's trolley, the arc lamp, and important patents that covered the alternating current system, etc.

To manage and control these patents, GE had had a Law Department in its organization since its foundation[40]. Among its officers, Frederick P. Fish was the General Counsel. Fish was a lawyer who had opened his law office in Boston in 1878. He specialized in intellectual property rights, and he advocated on behalf of both Edison and Alexander Graham Bell, the inventor of the telephone. In 1885, Fish became general counsel to Thomson-Houston, and, as an advisor, he helped to found GE[41]. Fish, who was concerned deeply with the combination of patents, then took a position in which he was responsible for patent management. The Law Department, with Fish in charge, was set up with the same rank as the selling department, the accounting department and the manufacturing department. The department contained two assistant counsels, Robert P. Clapp and Hinsdill Persons, both of whom were lawyer with professional legal skills.

The activities, developments, and results in the early years were reported each year in the annual report[42]. In 1892, the Supreme Court sustained Edison's fundamental incandescent lamp patent, which had previously been fought over. In the same year, GE aggressively conducted some patent suits against infringers in electric railways, lighting and power apparatus. The "feeder and main" patents had been sustained in 1893, and in 1894 the patent for the Edison type of socket was sustained by the courts. Regarding the patents that covered Van Depoele's inventions, litigation began around 1894, and in 1896 the position became that "substantially all manufactures of infringing trolleys and switches are under injunction[43]." In the report of the next year, however, it was shown that one of his patents had

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40) GE, *First Annual Report*, January 31, 1893; GE, *Second Annual Report*, January 31, 1894; General Electric Company, *Professional Management in General Electric, Book One: General Electric's Growth*, 1953, Fig. 17.

41) Jay P. Pederson eds., *International Directory of Company History*, Vol. 54 (Farminton Hills: St. James Press, 2003), p. 109.

42) The progress of the patent suits is described in GE, *Annual Report*, dated January 31, 1893, January 31, 1894, January 31, 1895, January 31, 1896, January 31, 1897, and January 31, 1898.

43) GE, *Fifth Annual Report*, January 31, 1897, p. 7.

Table 2: Organization as of 1900

Executive officer	
President	C. A. Coffin
First Vice-President	Eugene Griffin
Second Vice-President	Joseph p. Ord
Third Vice-President	E. W. Rice, Jr.
Fourth Vice-President	Hinsdill Persons
Secretary	M. F. Westover
Treasurer and Assistant Secretary	Henry W. Darling
Second Assistant Secretary	I. S. Keeler
Assistant Treasurer	H. P. Schuyler
General Auditor	Edward Clark
Sales Department (in charge of First Vice President)	
Manager, Foreign Department	W. J. Clark
Manager, Power and Mining Department	J. R. McKee
Manager, Lighting, Railway, and Supply Department	J. R. Lovejoy
Treasury, Accounting, Collection and Credit Department (in charge of Second Vice President)	
Collections	Henry W. Darling
Credits	H. P. Schuyler
Accounting	Edward Clark
Manufacturing and Engineering Department (in charge of Third Vice-President)	
Manager, Schenectady Works	G. E. Emmons
Manager, Lynn Works	W. C. Fish
Engineer, Harrison Works	J. W. Howell
Law and Patent Department	
General Counsel	Frederick P. Fish
Counsel	Hinsdill Parsons
Counsel	Albert G. Davis
Assistant Counsel	Howard C. Levis

Source: General Electric Co., Ninth Annual Report, January 31, 1901.

been denied by the Court of Appeals for the Second Circuit, which estimated that the "adverse decision in this case will have but slight effect upon the business" of GE[44]. Being sensitive, GE spent large amounts of money to pursue these aggressive

44) GE, *Sixth Annual Report*, January 31, 1898, p. 8.

patent suits. In 1896 it spent 349,919 dollars on the acquisition of new patents and court cases[45]. It could be said that in the 1890s GE executed aggressive patent management to protect its substantial rights and business at any cost.

On the other hand, GE not only took legal action against competitors, but also concluded patent agreements with them to arrange the rights. By 1896, GE had more than 300 patent cases against its largest competitor, the Westinghouse Electric & Manufacturing Co[46]. To end these fierce conflicts in the courts, in 1896 the two companies concluded certain patent pool contracts. The aims of the contract were to obtain advantages "in eliminating much costly patent litigation, and in the important relations of co-operation in engineering and manufacturing method[47]."

In accordance with its intensive litigation and extensive dealings with Westinghouse in the 1890s, GE expanded its legal department in charge of patent management. The Law Department changed its name to Law and Patent Department in 1897, and was headed by F. P. Fish as General Counsel. The department consisted of H. Persons and George R. Blodgett, both as Counsel, and later Howard C. Lavis and T. J. Johnston as Assistant Counsel, thus increasing the staff to 5, including Fish. Subsequently, in 1898, G. R. Blodgett was succeeded by Albert G. Davis, patent attorney, as Counsel. Table 2 shows GE's organization as of 1900. H. Persons succeeded Fish as an officer of GE, and became Vice-President and Counsel in charge of patent management[48].

2. Research Laboratory

The organization for patent management expanded rapidly in the 1890s, but it was not until 1900 that an organization for technological development was provided, by the foundation of the GE Research Laboratory. This section surveys the features of technology development in the 1890s.

At consolidation, GE had substantial patents that it had taken over from its predecessors, but it had few institutions for independent research and technology development. The strategy for technology in that decade was to acquire the technology and patents developed by other companies or individuals, as well by its predecessors. Such a strategy might be affected by competition with a rival. Westinghouse had a strategy by which "they purchased patents and short-term

45) GE, *Annual Report*, dated January 31, 1897 and January 31, 1898.

46) Kobayashi, *op. cit.*, p. 100.

47) GE, *Fourth Annual Report*, January 31, 1896, p. 7.

48) GE, *Annual Report*, dated January 31, 1897, 1900 and 1901.

consulting services from independent inventors." Indeed, they purchased some key technologies and patents for alternating current from Nikora Tesla[49]. Confronted by Westinghouse, GE purchased, from Charles Bradley, patents and consulting services for the rotary converter, which changes alternating current to direct current, and used the consulting services of Ernest Danielson and Louis Bell in order to develop an induction motor[50].

The strategy of purchasing the patents and technology of others might have been effective in a field where there were some alternative technologies, such as the power generator or motor. However, when Westinghouse purchased the patents and technology of the Nernst lamp, which had been developed in Europe, there were no patents left for GE to purchase. The Nernst-type lamp was a new metal filament lamp that seemed to take the place of the carbon filament lamp, which Edison had developed. For GE, whose only lamp technology was the carbon one, the acquisition of new technology by its rival was a great shock[51].

E. W. Rice, Jr., vice-president, and engineer, and A. G. Davis and some others had been aware for some time, that the new technology brought from Europe, such as the Nernst Lamp, was produced by engineers who had a scientific background, and had been trained[52]. In 1900, Charles P. Steinmetz, the chief consulting engineer, proposed the establishment of a certain laboratory in GE, as he had already done twice before. This time, since the officers had become conscious of the need for the company to acquire new and innovative incandescent lamp technology, and since the proposal was consistent with the logic that a laboratory was needed to develop the lamp technology, his proposal was accepted. A. G. Davis and Elihu Thomson expressed their support for the proposal. The plan formally proposed to Charles A. Coffin, the President, by E. W. Rice, Jr., was to organize the GE Laboratory in 1900[53]. The uniqueness of the GE Laboratory lay not only in its aim of applying new scientific principles to commercial uses, but also in its aim of discovering new scientific principles itself. Although there had, before 1900, been some laboratories that aimed at the commercial application of science, the GE Laboratory was the first industrial laboratory to engage in pure scientific research work[54]. Subsequently, the GE Laboratory created the new incandescent lamps and

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49) Wise, *op. cit.*, pp. 69-70.

50) *Ibid.*, p. 70.

51) *Ibid.*, p. 75.

52) *Ibid.*, p. 68.

53) *Ibid.*, pp. 75-78.

54) *Ibid.*, p. 78.; Leonard S. Reich, *The Making of American Industrial Research: Science and Business at GE*

vacuum tubes for the radio, and produced several Nobel Prize winners.

V. Reconsiderations of foreign contracts

The enhancement of its technological capability through the establishment of GE Laboratory, and the internalization of R&D activities, forced GE to reconsider international patent contracts, as a result of World War I.

On August 15, 1918, the Advisory Committee of GE decided to set up a special committee to consider international strategy after the war. The aims of the special committee were "to investigate and report upon the foreign business of this Company, and to make recommendation as to the best method of dealing with foreign business, keeping in mind particularly, conditions at the close of the war." C. E. Patterson and M. A. Oudin were appointed as commissioners[55]. The committee compiled the "Report upon Foreign Business," dated November 1918, and submitted it to E. W. Rice, Jr., who was then president. The report emphasized mainly that GE had to revise its international agreements extensively and urgently, and had to create certain separate companies to engage intensively in foreign business.

The revision of contracts that was set forth in the report focused especially on relations with European companies. This was necessary because, on the one hand, a gap had opened up between the exclusive territories of each company, as provided by contracts, and the actual political dominions created by the expansion of the French and Italian colonies, and the loss of German territories, as a result of the war. It was necessary to adjust the exclusive and non-exclusive territories to match the actual political arrangements.

On the other hand, there was also the resulting imbalance of international patent contracts. In the report, some officers had discussed the problems of international patents and technology interchange in relation to international strategy. Specifically, during the hostilities between countries, the international patent management contracts and their implementation had been the subject. At that time, there were relationships or contracts, and "in the ordinary course, any applications that we file are communicated to England, France, Russia, Italy, and Canada, leaving it to those countries to determine which of the applications shall

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and Bell, 1876-1926 (New York: Cambridge Univ. Press, 1985), pp. 1-3.

55) GE, "Report upon Foreign Business", p. 5.

be filed[56]." A. G. Davis of the Law and Patent Department questioned whether "our practice of sending copies of applications...to the various foreign countries" should be continued[57].

In 1918, certain discussions related to the report began. Owen D. Young, then vice-president, insisted that "a conference should be held of all those who knew everything about the foreign-company contract situation[58]." Davis and Peck of his department intensively collected all the contracts between GE and its predecessors and foreign companies, and reviewed in particular the contracts relating to France, Italy, Spain, and Portugal. In particular, Davis expressed the view, in relation to the contract with France Thomson-Houston, CFTH, that "there is enough doubt as to the obligation of the General Electric Company to continue its present extremely liberal practice of turning over inventions, to warrant us in demanding a substantial interest in these various companies." He also insisted that "there should be a new deal all along the line and that our relations with these various companies should be put on somewhat the same basis as our relations with the B.T.H., namely, the contracts should be reciprocal so far as concerns the exchange of information, inventions, etc., and should be limited in time, say to fifteen years, from the date of execution[59]."

On the background of Davis's recognition that things now differed greatly from the 1890s, when GE had merely acquired patents and inventions developed by others, GE had already instituted facilities for research and development. The maintenance of its "extremely liberal" custom regarding European companies might force GE to lose its advantages. On the other hand, GE had to control over the competitive technologies developed by foreign companies. On this point, the report said that it was often that "a not infrequent difference in the quality of the foreign article–not always possible of detection save by an expert or by chemical analysis–creates a competitive condition too often beyond the power of our manufacturers to meet[60]." GE had organized the Laboratory to do scientific research and development work progressively, but in the electrical industry, which featured keen competition for innovations, there were a few substantial competitors, especially those German companies that had accumulated original techniques and experiences in developing power generators and other electrical apparatus ever since the

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56) Charles Neave to O. D. Young, December 6, 1917.

57) A. G. Davis to O. D. Young, December 19, 1917, ODY Papers, Box 67, Folder 212.

58) A. G. Davis to E. W. Rice, Jr., August 14, 1918.

59) *Ibid.*

60) GE, "Report upon Foreign Business," p. 13.

early 19th century.

Therefore, the Committee recommended that GE should review and revise not only the agreements with German, French, and Italian companies, but also all contracts that GE had concluded with companies around the world. However, the report did not suggest what clause should be included in new contracts, or how to negotiate, but it did insist that the new agreements to build up an international strategy should be concluded by the newly formed corporation. That corporation was the International General Electric Company, Inc., IGEC, established in 1919.

VI. Conclusion

Both, Edison General Electric and Thomson-Houston, which merged in 1892 to become GE, patents and patent management played a critical role in the process of their foundation and growth. Edison's company, organized by Morgan and others, invested in the cluster of patents that Edison had invented; and Thomson-Houston was also formed by a combination of patents and capital invested by bankers in Connecticut. Both companies managed their own patents, but they also attacked the legitimacy of competitors' patent rights, or otherwise bought them out. Although Edison's international business had fewer successes, the two companies operated foreign business based on patents held in several countries.

After the reorganization, GE promoted international business via international agreements with BTH in England, with CFTH in France, and with AEG in Germany. These contracts were based on patent rights, and provided for the interchange of patents and technology, and territorial division, and so on. It is important that those international contracts were also patent management contracts, and that either party could take out and control patents transferred from the counterpart in its own name and at its own costs, in each territory. BTH, CFTH, and AEG managed patents developed by GE in their exclusive territories, where they were responsible for themselves. Conversely, in the United States and Canada, GE managed and exploited patents that covered inventions developed by counterparts. The contracts between GE and BTH and AEG created reciprocal obligations regarding the transfer of patents and technology, but the contract with CFTH was unilateral: it provided a one-way flow of patents and technology from the US to France. The international agreements in the early years had been not uniform.

When GE was founded, it had no facility to research and develop new technology. In 1900, the GE Laboratory was organized to conduct scientific research and its application to devices. After that, a system was established in which the

Laboratory created innovative technologies, and the Law and Patent Department controlled and managed such innovations as patent rights. As a result of organizational development, GE strengthened its competitiveness in technology; however, the old agreements with European companies, especially with CFTH, could have been a danger to GE's advantages. After 1918, GE began revising its unilateral contracts, and it concluded new contracts with many leading electrical companies globally. It was by using the process by which GE generalized reciprocal patent management contracts in many countries that the Japanese companies, Tokyo Electric and Shibaura Engineering, concluded this kind of patent contract with GE.

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