The Enterprises of the Siemens Brothers to 1889

General Survey

Beginning in 1866 the business of Siemens & Halske expanded considerably as a result of new orders. The company’s expansion began well before the business boom that followed the Franco-Prussian War and the unification of Germany in 1870. In the course of this enormous overall economic boom, which lasted to 1873, the workforce of the Berlin firm rose from 166 in 1866 to 628 in 1873. At the same time, the buildings of the factory at the Markgrafenstraße site in Berlin were considerably enlarged. Werner von Siemens had a second factory built in Charlottenburg, then a suburb of Berlin, and transferred the production of nontelegraphy articles—for example, the assembly of alcohol meters—to that new facility.

Several major orders were the reason for this upswing. The Indo-European telegraph line and the laying of the transatlantic cable in cooperation with Siemens Brothers in London were important projects for Siemens & Halske, as were orders from the Prussian military authorities triggered by the Franco-Prussian War (1870–71). The relationship between Siemens and the Prussian state telegraph authorities had improved after Nottebohm retired in 1857, and Siemens had reestablished co-
operative relations with Nottebohm’s successor, Colonel von Chauvin. Growth of Siemens & Halske accelerated substantially after 1875, moreover, when the new German Reich integrated the administration of the telegraph system into the comprehensive postal administration of the newly created empire, the German Reich. The office of the postmaster general, a position first held by Heinrich von Stephan—a great admirer and friend of Werner von Siemens—established a central, distinct authority for awarding major orders. Despite the tight
The Charlottenburg factory, ca. 1895

Activities of Siemens & Halske in Berlin, 1886
financial situation of the fiscal authorities of the empire during the so-called Founders Crisis (also called the Founder’s Folly) after 1873, von Stephan promoted the construction of a network of telegraph lines based on underground cables. Accordingly, in 1876 Siemens & Halske founded its own cable factory in Berlin, which, unlike the English facilities in Woolwich, met the requirements of the authorities of the Reich for domestic production. Thanks to these orders, Siemens & Halske was able to record continually rising business in the 1880s, as domestic German business offset setbacks resulting from the expiration of international contracts.²

Less important for the momentary fortunes of the firm, but of great significance for its future, was Werner von Siemens’s discovery in 1866 of the principle of the self-excited generator, a dynamo that permitted the efficient conversion of large amounts of mechanical energy into electric energy. Siemens’s invention of the self-excited generator made possible a “second industrial revolution” characterized by the use of electrical energy in transportation, lighting, and especially factory production. Siemens’s discovery replaced the inefficient steel magnets of the first generators with electromagnets, and allowed the harnessing of water or steam turbines to produce large amounts of electricity inexpensively. Paving the way for modern electric power technology, Werner obtained patents in Germany and England in 1867 and secured a major position for his firm in the age of electricity. By the end of the nineteenth century, cities and harbors would be illuminated with electricity, electric traction applied to streetcars, and electric motors used to drive machines inside factories.³

Siemens & Halske did not start the large-scale commercial exploitation of electrical power technology for over a decade, however. Full commercial development awaited other technical advancements, by Siemens and others. Until the end of the 1870s, Werner remained unconvinced that electric lights would replace the gas illumination already installed in city districts and individual homes. He concentrated on using electricity to
light large outdoor areas with arc lamps, rather than trying to employ lightbulbs using comparatively low wattage and fragile carbon filaments to produce relatively dim light.\(^4\)

The economic recession in 1873 and the resulting slowdown in the growth of the overall economy did not adversely affect either the electrotechnical industry or Siemens & Halske. Siemens & Halske benefited from the general expansion of electric power technology; it also received additional orders for laying maritime and overland cables, particularly via the London branch of the enterprise, which boosted profits. Nevertheless, the company lost much of the clear edge it had once enjoyed over competitors. This setback was not due to a lack of technological progress but rather was rooted in the specific structure of the firm's top management, which was strongly dominated by a comparatively small circle of indi-
individuals. When those individuals, as we shall see, began to pay less direct attention to the company's affairs, Siemens & Halske suffered.

Between 1864 and 1867 Werner diverted his attention more to science and politics than to business. He also suffered a personal crisis after the death of his first wife, Mathilde, in 1865. In 1867, recovering from his loss, Werner von Siemens rededicated himself with all his energy to business management. Approximately at the time of Halske's withdrawal from business and the death of William Meyer, Werner hired some technical assistants in addition to the accountant Haase. Especially noteworthy was the employment of the engineer Friedrich von Hefner-Alteneck in 1867, inventor of the slotted rotor with distributed windings, still used over a century later, and of the differential arc lamp. Then in 1869 Werner von Siemens lured the telegraph engineer Carl Frischen away from the national telegraph service to work first on the Indo-European telegraph line and afterward for Siemens & Halske. Finally, in 1873 the physicist Oscar Frölich was added to the staff. At first these key executives were allowed very little leeway, however. Werner harbored strong reservations about Frölich in particular, who sported a university education and an advanced degree.

Werner's aversion to delegating authority and his strong mistrust of anybody not belonging to the family turned out to be an increasing hindrance to the company's international business. In Berlin alone, Siemens & Halske expanded from an at most moderately sized enterprise with 192 employees in 1867 to a large enterprise with 2,125 employees in 1889, the year Werner von Siemens retired from active business. Including the Siemens enterprises abroad, the workforce in 1889 totaled 4,513.

Along with the expansion of the Berlin enterprise, business abroad increased also, but not at the same rate. The London enterprise was comparatively slow to engage in electric power engineering and relied more on the cable business. The relationship between Berlin and London continued to deteriorate, as Wilhelm declined to subordinate himself to the guidelines
from Berlin. Wilhelm increasingly turned his attention to his scientific studies in engineering, leaving the management of Siemens Brothers more and more to his brother Carl, who in 1870 had moved to London in order to support Wilhelm, and to his authorized officer, Ludwig Löffler. The tensions in the relationship with the parent firm in Berlin eased only when the London business was converted into a corporation after Carl had returned to Russia. Still, Werner regretted the reduction of his interests in London merely to financial affairs and the end of the close cooperation with the London enterprise.

The relationship between the Berlin and London firms was almost completely disbanded after Wilhelm’s death in 1883. Serious disputes broke out with Ludwig Löffler, to whom Wilhelm had left a sizable parcel of shares of Siemens Brothers, a stake in the company that Löffler increased by buying more shares. Cooperation between the two firms became increasingly difficult, all the more as Löffler in the long run intended to split Siemens Brothers away from the rest of the enterprise. Arrangements on the subdivision of the world market, guaranteeing free scope to the London firm throughout the British Empire, remained in effect, however. Until World War I the Siemens enterprises in Berlin and London did not compete with each other on the world market.

Following Carl’s return to Russia, business was reactivated there, although it never again assumed the decisive role it had enjoyed during the Crimean War. Carl was very open to the new electric power technology, and in St. Petersburg he sold huge illuminating installations (e.g., for lighting the magnificent Nevsky Prospekt and the Winter Palace), earning the company considerable prestige. Yet the renewed success in Russia did not last for long. After Werner’s withdrawal from business, Carl unsuccessfully tried to liquidate the St. Petersburg business, and he returned to the Berlin board of management after Werner’s death to support his nephews.

In addition to the branches in London and St. Petersburg, the Vienna branch also was finally successful, but another attempt to enter the market in Paris, this time in the field of lighting technology, failed. In 1878 the brothers rented rooms to
establish a workshop of their own and founded from London the affiliated company Siemens Frères, but in 1886 they had to liquidate the firm with heavy losses. Relying on his personal reputation in France, Werner von Siemens had underestimated the intensity of anti-German sentiment on the French market after the Franco-Prussian War.

In the further expansion of business abroad, additional subsidiaries were no longer founded. Unlike the situation during the first stage of Siemens & Halske’s activities, starting in the 1860s the volume of prefinanced government contracts decreased remarkably. In consequence, doing business as a contractor and developing a network of representative offices now turned out to be the two most important pillars of business abroad. Both forms of business were linked with some difficulties, however, as we shall see.

**The Contracting Business**

Doing business as a contractor became the most important arena in telegraphy after the 1860s. When Siemens & Halske functioned as a contractor, it either financed large facilities itself or set up a separate enterprise that would operate the telegraph system once it was built but that remained controlled by strategic decisions made in Berlin. The Indo-European telegraph line was the first big project handled by Siemens in this way.

**The Indo-European Telegraph Line**

The first telegraph line to India had been completed in 1860 by the Red Sea and India Telegraphy Company. During the period of cooperation between Siemens and Newall & Co., Werner von Siemens had personally participated in the installation of some sections as a testing engineer. The line suffered from numerous deficiencies, however. This was also true of two other lines routed overland, one via Persia and Russia, the
other via Persia and Turkey, which had been in operation since 1865. As the telegrams had to be keyed in again at some of the intermediate stations, where the Persian or Russian operators frequently could not understand the content of the messages, the telegrams often arrived at their final destination in a garbled form incomprehensible to the recipient. Besides, as a result of the repeated rekeying of the telegrams, the speed of transmission was very low for both lines.9

Werner von Siemens thought of solving these problems by laying a new line transmitting the telegrams per induced current in a fully automatic way. Such a plan had been cherished by the brothers ever since 1865, but the implementation turned out to be difficult. Before they could deal with the technical problems, political problems had to be solved first. The British government, for example, was afraid of increasing the power of the czarist empire by running a line through Russia. The British also opposed the formation of any supranational telegraph network using individual national systems as components. Then the Prussian-Austrian War in 1866 interrupted the negotiations of the Siemens brothers for concessions. After the end of the war their position was permanently improved, however, since two men with whom Werner von Siemens had maintained close contacts had won executive positions in the telegraph business. In Russia, General von Lüders, who had acted as an intermediary for Siemens & Halske in the first business deal with Russia, became the new director general of the telegraph system in October 1866, and the Prussian official Colonel von Chauvin was appointed in the same year as director of telegraphy for the North German Confederation. Following a meeting between the directors of telegraphy—Champain (of the English-Indian Telegraph Administration), Chauvin, and Lüders, in April 1867—the Siemens brothers won the Prussian and Russian licenses for the laying of line. It was not yet possible for Siemens to lay a special cable from the Continent to England as part of the line, however, as Prussia had signed a contract with the Electric Company in England, granting the company the exclusive right to lay cables across that distance for several years. A similar agreement existed
with the Reuter telegraph office for the former Hanoverian territory. Siemens finally succeeded in coming to terms with these two enterprises.

The negotiations with Persia, whose government made great efforts to avoid too great a dependence on Britain or Russia, proved to be particularly difficult. Moreover, the shah considered the telegraphy license a welcome source of income and tried to sell it at the highest possible price. As their negotiator, the brothers sent their second youngest brother, Walter, to Tehran. After the acquisition of the copper mine in Kedabeg, Walter Siemens had been employed in this "private business" by Werner and Carl, and had become familiar with eastern trading practices in Tbilisi. He was even appointed German consul in Tbilisi, and his brothers had allocated him 20% of the business in Kedabeg.\textsuperscript{10} He carried out his commission in Tehran with great tenacity and skill. After negotiations lasting several months, Siemens won a license for the construction and maintenance of a telegraph line from Dzhulfa to Tehran at the turn of the year 1867/68.

After these first obstacles had been removed, the financing of the route had to be arranged. The Indo-European telegraph line was expected to become an economic success, but the technical details were still at an experimental stage, and running the line across four different sovereign territories involved numerous uncertainties. Werner's original plan to procure the necessary capital through private channels proved to be impossible to implement. Negotiations with the banker Amschel Mayer Rothschild, who was supposed to contribute three-quarters of the sum required, and parallel talks with the bankers Abraham Schaffhausen and Gustav Mevissen did not succeed.\textsuperscript{11} The Siemens brothers finally decided to finance the project via the stock market. To raise the capital, on April 8, 1868, the Indo-European Telegraph Company (IET) was founded as a public company based on English laws with a capital of £450,000. The Siemens brothers and Siemens & Halske together bought 20% of the shares; the remaining 80% were offered for sale in two equal parts in England and on the Continent. In addition, the Siemens brothers contributed their
licenses and were in turn awarded the contract for the construction of the line for the lump sum of £400,000. For maintenance of the route Siemens was to receive £34,000 per annum. The sale of the shares proceeded swiftly in Germany but went slowly in England.

The Indo-European line was to be built by all branches of the Siemens organization. The facilities in Berlin and St. Petersburg would construct the line, while Siemens Brothers in London was to lay the maritime cables in the Black Sea and to supply the necessary materials. As the construction was to start on three sections simultaneously, aside from technical problems such as avoiding rekeying of telegrams, logistic problems in particular had to be solved. The paramount threat to the largest project Siemens had ever dared to undertake turned out to be a financial one, however. In summer of 1868 the World Telegraph Committee, founded in Paris three years earlier, met for a conference in Vienna to draw up technical regulations and the structuring of the fees. After Werner von Siemens’s departure from the conference, the fee for telegrams from England to India was reduced from 87.5 to 71 French francs by the votes of his competitors, but also without any objection from the Russian director general of the telegraph systems, von Lüders. Additionally, the Persian government was supposed to collect a fee of 5 French francs for the stage from Dzhulfa to Tehran, and for the stretch between Tehran and Büshehr the British-Indian telegraph authorities were to receive a fee of 8.5 French francs. These decisions knocked the bottom out of all the Siemens brothers’ calculations about the profitability of the line, since in the face of such high expenditures for the licenses the construction of the line would be a money-losing operation. Even the offer from the Russian telegraph authorities to reduce their license fees could not reverse the situation.

Werner saw only one way out of this dilemma: to start negotiations in Persia again to have the additional fees canceled, or at least reduced. Under these circumstances, the death of Walter Siemens from an accident in the early summer of 1868 was a doubly heavy loss. A new negotiator for Persia, one enjoying the full confidence of the senior partner of the enter-
prise, had to be sought. He was found in Georg Siemens—the son of Werner's cousin and previous partner—who at that time was active as the brothers' legal counsel. Georg Siemens proved to be a tough fighter: he stayed in Persia for eight months and ultimately threatened to sell the entire line to Great Britain. This threat finally achieved the desired result.

The company successfully completed the line's construction at the end of 1870. The site supervisors along the different sections of the line were competent, and Werner von Siemens allowed them more or less free scope to complete their tasks. The newly hired telegraph engineer Carl Frischen and Carl Siemens were responsible and prudent in their overall coordination of the construction.

The line was not opened immediately because of the extremely cold winter and the inadequate training of the staff in the use of the new system. The new system involved inputting telegrams via previously punched paper tapes, combined with the use of magneto inductors. This system eliminated the need for manual keying. Meanwhile, however, the British cable-laying ship Great Eastern had repaired the original maritime cable connection to India, and the price of IET shares had dropped to an extent demanding prompt action. On April 12, 1870, Wilhelm Siemens was able to offer a sensational demonstration in London: in the presence of prominent invited guests, an
exchange of telegrams between London and Calcutta covering a distance of 12,000 kilometers was completed within a single hour.

Accordingly, Werner von Siemens had achieved his technical aim: "to establish a long distance standard line and to get it working to show the true capabilities of present telegraphy."¹³ Moreover, he had instantly become famous. Profitable operation of the Indo-European telegraph line was still by no means assured, however. On July 1, 1870, the maritime cable through the Black Sea was destroyed by an earthquake and
had to be replaced by a new line on the mainland. But after re-
opening in 1871, the line remained in operation until 1931,
except for the World War I years. From the construction of the
line, including repair and maintenance, the Siemens brothers
received approximately the amount of profit they had ex-
pected. Payments of dividends based on their considerable
monetary investment in the Indo-European Telegraph Com-
pany were initially few and far between, however. During the
first years of business, the earnings barely covered the costs.¹⁴
For this reason, the Siemens firms renounced for the time being
the payout due to them and consented to the suspension of the
dividends from their shares until the other stockholders had
been paid a dividend of at least 10% of the price of their
shares. In 1886 the dividend reached a level of 10%. In the
long run the investment in the operating corporation turned
out to be profitable; after the 1880s the telegraph company
continually showed excellent earnings.

The Eastern Telegraph Company, operating the competi-
tive line through the Mediterranean Sea, repeatedly tried to ac-
quire IET. Finally, in 1877, despite initial resistance from

![Paper-tape punching machine for the Indo-European line](image)
Prussia and Russia, a "joint purse arrangement" was set up, guaranteeing a preferred status for the Eastern Company and their undersea cables, while simultaneously assuring sufficient business for the Indo-European line. But as the undersea cables proved to be much more prone to defects, IET was several times in a position to transmit telegrams between Europe and India for months without any competition. This situation contributed considerably to IET's increased profitability.

Whatever the problems in financing and building the Indo-European line, Werner was committed to it for competitive reasons. As he explained to his brother Carl in the spring of 1870, before the project was finished: "Even if the shares should drop to half the price I paid for them, I nevertheless will invest all my disposable money in this project, since our fundamental strength is based on the exclusive concession for Russia and Prussia. The submarine lines will certainly get a punch."\textsuperscript{15} As events turned out, not only was the venture profitable over the years, but it also added enormously to the reputation of the Siemens enterprises. In every respect, Werner's perseverance and self-confidence had paid off.

\textbf{The Transatlantic Cable}

Even more daring as a business venture than the construction and operation of the Indo-European telegraph system was the principal business activity of the London branch of the Siemens enterprises during the 1870s: the laying of submarine cables. Establishing a telegraph link between America and Europe was of supreme economic and political importance for the entire Western world. A successful solution of the problem promised enormous prestige. As a preliminary step, in 1855 a British government official, Frederick Newton Gisborne, had connected the extreme northeast of the American continent, Newfoundland, to the American telegraph lines on the mainland. Just one year later, an attempt was made to establish communication to Europe from Newfoundland. Venture capitalists were excited about the prospects. In 1856 a group of investors founded the Atlantic Telegraph Company with a
capital base of £350,000. Cyrus Field, an American, bought £88,000 worth of the company's stock, and J. W. Brett, £12,000 worth; John Pender, later known as the "cable king," bought another parcel of stock for an undisclosed sum. The rapid sale of the stock indicated the urgency to establish such a line and the great willingness on both sides of the Atlantic to invest venture capital in it.

However, at that time the technology of laying cables was not at all perfected. Particularly in the field of deep-sea cables, development of the techniques to be used and of the design of the cables was still at an early stage, as the successful completion of such projects as well as the failures experienced by Newall & Co. and Siemens & Halske in the Mediterranean Sea proved. Likewise, the first attempts with a transatlantic cable had no lasting success, since the cable ruptured and sank. Nevertheless, the political interest in accomplishing the connection remained very strong, and the English Department of Trade and Commerce formed a commission that, with the help of a team of engineers from the Atlantic Telegraph Company, was to serve as troubleshooters. Wilhelm Siemens was one of the experts consulted in the matter.

Finally, in 1866 two cables were successfully connected to America. The project was financed by the successor of the Atlantic Telegraph Company, the Anglo-American Telegraph Company, in which Cyrus Field again had a decisive investment. In order to meet the demands of cable production, the cable manufacturer Glass & Elliot had consolidated with the Guttapercha Company to form the Telegraph Construction and Maintenance Company, with John Pender as chairman of the board. This company had subscribed to £315,000 of the estimated total cost of £600,000 for the production of the cables. Field chipped in the remaining £285,000. The two successful cable-laying operations had been preceded by a failed attempt, but efforts to salvage the cable that had sunk in 1865 were successful. At the beginning of the 1870s an additional cable was in operation, which extended from Brest in France via Newfoundland to Massachusetts, connected there in 1869 by the French Société du Cable Transatlantique Français.
Successful in this transatlantic venture, the Pender group sought to expand and began to move into a dominant position in the market. Pender tried several times to buy the Indo-European telegraph line. He bought facilities for the production of cables and expanded his influence over operating companies in order to secure for his trust, which he named Globe, a monopoly position wherever possible.

Carl Siemens proposed to his brothers to break the Pender monopoly by installing a transatlantic cable of their own. Carl was ending a period of mourning following the death of his wife, Marie, on February 1, 1869, and resolved to join in his brothers' London-based activities with full energy. The result was Siemens's decision to found a separate company to construct and operate a new transatlantic telegraph line. The contract for the venture would of course go to the Siemens brothers, just as it had with the Indo-European line. Unlike the existing cables routed via Newfoundland, Carl's plans called for a direct cable between Europe and America. For this reason, the company was to be called, in English, the Direct United States Telegraph Company (DUS). Because of the admittedly mixed experiences the Siemens enterprise had encountered in the laying of deep-sea cables, Werner von Siemens at first shied away from Carl's proposal for a new transatlantic venture. Wilhelm was also initially hesitant, as he had lost considerable amounts of money in conjunction with the attempt to lay a cable at North Africa between Cartagena and Oran. However, since Carl offered to dedicate all his energy to this project and also to supervise the laying of the cables himself, the brothers finally agreed. Again they founded a public company based on English laws. The shares of IET had sold slowly in England in 1868, and this time, owing to the enormous economic leverage of Pender's Globe, the prospects for attracting English capital were even smaller. The operating company was intended to be based on a capital of £1.3 million. The Siemens brothers themselves subscribed to a considerable number of shares. The Deutsche Bank in Germany, founded in 1870, went to great lengths to place the remaining stock. Georg Siemens, the successful negotiator in Persia, was
now a director of the Deutsche Bank, an advantageous situation for the Siemens company. Georg Siemens strongly endorsed the project and even pledged to be liable with his own personal fortune for any transgression of the limit in funds he was authorized to commit. His pledge allowed the project to be funded and to go forward.

The work on laying Siemens's first deep-sea cables across the Atlantic started in 1873. The company planned to extend the cable from Ballinskelligs Bay in Ireland to Torbay in Nova Scotia. From there it would lay another leg to Rye Beach in New Hampshire, there connecting to the American lines on the mainland. The Woolwich factory, which under Carl's management had been expanded into a complete cable-producing plant, would manufacture the submarine cables. (Before 1871, work there had been limited to the stranding and armoring of cables, the final steps of cable production.)

Wilhelm designed a special ship for the most difficult part of the project, the actual laying of the cable. The cable-laying steamship *Faraday*, named on February 17, 1874, by Wilhelm's wife, Anne Siemens, soon entered service. The ship had 5,000 gross rated tonnage, was 360 feet long, and had a draft of 36 feet. The rear hold of the ship was large enough to accept 1,700 miles of cable.

The laying of the cables turned out to be an adventure. Many years later, Werner vividly recollected the various episodes and described them in several pages of his memoirs, written in 1891–92. Wilhelm Siemens and his manager personally participated in the project, as did Carl Siemens, who, as the head of the entire project, bore the brunt of the responsibility. Even Werner von Siemens traveled from Berlin to Ireland and Ballinskelligs Bay in order to supervise the first stages of cable laying.¹⁶ There were many incidents during the laying of the cables. The first effort to lay the cable had to be aborted. Acts of sabotage and hoaxes, presumably staged by their competitor Globe, turned the operation into a nerve-racking affair. Carl claimed: "I can count the five years [in London] as ten lost years of my life. I have become a mental and physical wreck here."¹⁷
Cables laid in the North Atlantic by the Faraday

The cable-laying ship Faraday
As in the case of the Indo-European telegraph line, the brothers were ultimately able to deliver a technically perfect job: the Siemens transatlantic cable operated reliably and with a high rate of transmission. The business also proved profitable for Siemens Brothers in London. Despite numerous calls for improvements in the cable, the earnings of the London branch were reasonable, and a number of follow-up contracts in the wake of the success continued to assure a good outcome.¹⁸

The results for the operating firm were another story. The Direct United States Telegraph Company enjoyed no lasting success. Even a reorganization of the company, converting it into the Direct United States Cable Company, was unable to save the firm. The competition from the Pender trust turned out to be too strong and powerful. The operating firm ultimately had to concede and sell out to Pender. Georg Siemens suffered serious financial losses, as he had assumed personal responsibility for a considerable part of the stock issued by the company. Consequently, for some time the Globe group held a monopoly in the telegraph traffic between Europe and America, since in 1876 the French cable became inoperative.
Business as a contractor had therefore proved to be extremely risky for the telegraphy branch of the Siemens enterprise. With respect to the Indo-European telegraph line, the capital invested paid in the long run; as far as the DUS cable was concerned, losses had to be accepted. Werner von Siemens was well aware of the elements of instability in such projects. Contrary to his former partner Halske, however, he was willing to take such risks, not least in order to demonstrate the high level of technical proficiency of his enterprise. The projects involving submarine cables in particular remained risky for the time being. French and American companies formed as competitors to the Pender group and, following the successful laying of the DUS cable, awarded contracts to Siemens Brothers. These orders met with mixed results. The Siemens enterprise had serious difficulties in laying a cable off the Brazilian coast in 1874 and during the laying of a French Atlantic cable in 1879, a project personally supervised by Ludwig Löffler.

Cable laying was an arduous business. His experience with it moved Carl Siemens to observe that anybody active in the cable business would have to deal a lot with “hustlers and similar rascals.” The problems meant that the brothers were becoming sick of cables. With the conversion of Siemens Brothers into a public company in 1880 and the transfer of Carl Siemens back to Russia, the intensive involvement of the brothers in the cable business came to an end.

Cable laying continued under the direction of Ludwig Löffler, however, who took over the management of the London branch in 1883 after Wilhelm’s death. Löffler successfully completed several further cable-laying contracts. In 1881 the firm was awarded a contract by the American “railway king” Jay Gould and in 1884 another contract by the Americans MacKay and Bennett, both for the laying of transatlantic cables. The transformation of the London branch into a public company owned mainly by the family but in which Löffler occupied a dominant position aggravated the existing conflict between London and Berlin. As discussed above, the roots of this conflict, which had appeared during Wilhelm’s manage-
ment of the London firm, lay in Werner von Siemens's perception of himself as the supreme head of the enterprise. This conflict, which was settled toward the end of the 1880s, will be dealt with in more detail in the next chapter.

Marketing Strategies in the Field of Electric Power

In the meantime, Werner von Siemens's main interest had shifted to the commercial use of electric power technology, where the business problems were very different from those encountered in telegraphy. His dynamomachine gradually became more efficient and dependable thanks to the inventions of Théophile Gramme and those of his own chief designer, Friedrich von Hefner-Alteneck. Illumination for military purposes and for the protection of coastal shipping (by lighthouses) were the only applications for this technology during the early years.20 Around 1878 the technology had developed to a point where Siemens and other businessmen saw the feasibility of electricity's use in private and civilian markets. Lighting technology, electric railways, and electric motors useful in many fields began to offer wide areas for the application of electric power. In contrast to the telegraph business, a great number of small enterprises quickly entered the field of electric power technology, competing with Siemens & Halske in their individual specialties. Siemens and later AEG were the only "universal enterprises" in Germany active in all types of electrical technology. Another difficulty arose from the fact that different forms of application were competing with each other. Would electricity be delivered to customers as direct current or as alternating current? Indecision about the final choice of power delivery persisted for quite some time.

The absence of an agreed-upon technical standard was most evident in the field of lighting technology. First electric light had to face competition from gas light, and then the electric arc and the incandescent light competed with each other.
Initially, Werner von Siemens had placed all his confidence in the arc light, for which Siemens & Halske had carried out development work of its own. With his differential lamp Hefner had once more improved the arc light, which had become marketable on the base of advancements made by Pavel Yablochkov, a Russian living in Paris. Even before this further development of the technology, Siemens & Halske had in 1878 taken up negotiations with the Société Générale d'Electricité, founded by Yablochkov, in order to obtain the concession to erect arc light plants based on the Yablochkov principle. Siemens would have liked to enter the French market again by establishing a branch there, in order to get the full benefit of French patent protection. After Hefner's invention, Werner von Siemens was starting to doubt whether a contract with the Société would still make sense; yet in the middle of 1878 he signed a contract securing the French company half of the profits resulting from the installation of such plants and tying Siemens & Halske to their terms with respect to the price structure.

Mobile electrical lighting system, 1873
The success of Hefner’s differential lamps meant that Werner was inclined to distance himself from the Yablochkov company, even though Yablochkov declared its willingness to employ generators made by Siemens & Halske instead of those made by its competitors. Werner was very keen to go into business dealing both with lamp production and with the production of generators for illuminating plants. The first experimental installation of arc lamps in Berlin in 1879 was successful, and Siemens secured follow-up contracts for the enterprise. Throughout, no central power plants were constructed, but individual generators were delivered and installed for each project. Consequently, financing via operating companies proved unnecessary for the time being.

*Competition in the Electric Power Business*

Preceded by a great publicity campaign, the incandescent light developed by Edison was demonstrated to the public in Paris in 1881. This presentation marked the end of the arc light era. Even Werner von Siemens ultimately could not shut his eyes to this development, although at first he had commented very critically on the incandescent light.  

Thomas Alva Edison marketed his inventions mainly by issuing licenses. His New York–based agency for issuing licenses in Europe was the Edison Electric Light of Europe Company, which in turn had four European subsidiaries. These branch companies were the Edison Light Company in London, holding the patent rights for England, and the Compagnie Continentale Edison in Paris, holding the rights for the rest of Europe. The task of the third company, the Société Electrique Edison, was the construction of central power plants; while the fourth company, the Société Industrielle et Commerciale, was in charge of the production of Edison’s lightbulbs, machines, and other equipment. The latter companies were also located in Paris.

In order to take advantage of Edison’s technology, Werner von Siemens became involved with Emil Rathenau (1838–1915), a businessman with great ambitions in the German
electrical industry. Rathenau saw the incandescent light at the First International Electrical Exhibition in Paris in 1881. Deeply impressed, he promoted the idea of establishing a new German company to bring the Edison light to the German and European market. In 1882, with the help of many banks, Rathenau organized a commission to conduct experiments with Edison’s illumination technology and to study its commercial introduction. Rathenau and his supporters soon realized that it would be desirable to convert the commission into a business holding the Edison licenses for Germany and operating systems for generating and distributing electricity to individual consumers. Rathenau did not think of this new enterprise as a competitor of Siemens & Halske, and he invited Werner von Siemens to participate in founding the new firm. The result was the creation of the German Edison Company for Applied Electricity (Deutsche Edison-Gesellschaft für Angewandte Elektrizität) (DEG), founded in March 1883. Siemens thought of DEG as a buyer of Siemens & Halske products and as a firm working for Siemens as an “installation agency.”

These expectations turned out to be a complete miscalculation, however. Siemens and Rathenau were pursuing fundamentally different business strategies, and the two men proved incompatible in bringing Edison illumination to the German market. Siemens & Halske was oriented more toward technical perfection than to earning the highest profits. Werner von Siemens, as we have seen, was cautious about expanding the business, and he always sought to do so in a way that maintained the control by family members. Emil Rathenau, in contrast, was an aggressive promoter who envisioned expanding into every aspect of electrical technology, and he was unwilling to accept a role as merely a buyer of Siemens & Halske products. Very quickly Rathenau sought to shake off the image of DEG as an installation agency for Siemens & Halske. He proceeded to take over the operation of the Berlin Electric Power Plants (Berliner Elektrizitätswerke), which soon served as a base for further expansion in the industry. He sought to enter or enlarge the presence of DEG in almost every field of electrical technology.
The consequence of these maneuvers was the appearance in the German market of a major rival to Siemens & Halske, Rathenau's General Electric Company (Allgemeine Elektricitäts-Gesellschaft) (AEG), as DEG was called after 1887. AEG at first engaged primarily in marketing licenses for the Edison patents for incandescent lamps.  

In addition to AEG, there was the firm Schuckert & Co., founded by Sigmund Schuckert (1846–95) in 1873, which developed from a small specialty enterprise for the production of floodlights to a concern with worldwide importance in power technology. In 1883 Schuckert recorded production of 233 generators and more than 1,000 arc lamps. In 1887 Schuckert began the erection of the first central electric power stations. Sigmund Schuckert proved to be a serious competitor. He had begun his career in the United States working with Edison, but he lacked that inventor's astuteness. Schuckert did not have the broad vision or the capacity for abstract thinking that Werner von Siemens enjoyed, nor did he have the entrepreneurial courage of Emil Rathenau. What distinguished Schuckert was a great knowledge of technology and a realistic view of the possibilities of marketing electricity and electrical products. The result was that in the 1880s Schuckert & Co. was the most important large enterprise in the field of electric
power engineering besides Siemens & Halske. In 1888 the Schuckert enterprise was reorganized into a limited partnership (Kommanditgesellschaft) and in 1893 into the public corporation Electricitäts-AG (EAG). In the 1890s the firm built and commissioned more central electric power plants (a total of 120 stations) than Siemens & Halske and AEG put together.26

Werner von Siemens was not altogether successful in responding to the appearance of these competitors. He reacted to the altered market situation by establishing capital companies intended to assure the future sale of Siemens & Halske products. He was unable, however, to win over German banks or financiers for a company named German Electrical Power Stations (Deutsche Elektrizitätswerke), designed to construct central electrical power plants abroad. Siemens & Halske offered to contribute one million marks to the capitalization of such a company, but this was not sufficient to entice further financing. Rathenau’s strategy of buying a share in lighting companies seemed more promising to financiers. With the success of AEG, Siemens & Halske lost more and more ground in the lighting business in the second half of the 1880s.

The development of the telephone at about the same time also brought to the fore a potentially huge competitor to Siemens’s telegraph business. The German postal service controlled telephone franchises in a way similar to its control of telegraphy. The postal service sought to foster competition in telecommunications, wanting a broad base of suppliers and favorable terms for equipment procurement. This policy meant that other rivals to Siemens & Halske appeared, including, in 1879, the firm Mix & Genest, and a few years later the forerunner of the German Telephone Works and Cable Industry (Deutsche Telephonwerke und Kabelindustrie AG).27

The Electrical Railway and the Construction of Power Plants

The successful electrification of the railways proved to be a difficult business problem. In 1867, shortly after the discovery
of the electric dynamo, Werner had spoken out in support of electric streetcars as a worthwhile field for electrical locomotion. Electric traction in mines also seemed promising to him, because electric motors required no air supply and had no exhaust. At the Berlin industrial exhibition in 1879, Siemens & Halske presented the first electric locomotive, pulling several cars equipped with seats. While the locomotive met with great public interest, the sale of electric railways was another matter. For one thing, the technology demonstrated in 1879 was impractical. The locomotive received its power from a third central rail, grounded through the wheels on the other two rails. The exposed rails were hazardous: people and horses ran the risk of electric shocks. Municipal authorities imposed safety regulations to prevent shocks, and many projects did not materialize because of the technological limitations. The overhead pantograph power pickup was later developed in the middle of the 1880s by Frank Sprague in the United States, and it turned into a resounding success for him and for electric traction.

The financing of such projects was another problem. While Siemens & Halske was willing to participate in operating companies for electric railways, as it had done in the telegraph business, finding partners to finance electric street railways proved difficult. Efforts of Werner von Siemens to win the support of the Deutsche Bank for the founding of a German-Austrian railway company, intended to serve as a financing agency for Siemens & Halske, failed. Siemens offered to participate in this company and to sign over the revenue from the railway patents for Germany, Austria, Italy, and possibly also Russia, but to no avail.

By the 1880s the basic laws and principles for the use of electrical power technology had been discovered and developed, and the electrical industry considered the situation advanced enough to make electrical energy available throughout entire cities by means of block and central power plants. The companies active in this field, however, soon discovered that new forms of business were necessary to implement their far-reaching plans. The electrical industry faced a special problem:
Horse-drawn bus, Berlin, ca. 1850

Berlin streetcar, Spandauer Berg line, 1882
it had to create a demand for products that used the new technology. Usually, equipment suppliers, seeing the possibilities offered by inventions, developed products using advanced technology. It was then their task to make customers aware of their potential need for these new products. For almost all basic innovations a market had to be developed. This proved to be particularly difficult in this case, as electricity by itself is not a consumable commodity. Because of the novelty of electricity and their lack of experience in gauging its economic impact, municipal authorities held back on the allocation of contracts and agreed only to grant permission for the construction of electric power plants. Since the construction of power plants constituted a long-term tie-up of considerable amounts of capital, the involvement of financing and operating companies seemed the appropriate solution to financing problems. Such a company would operate separately, yet be under the influence of the parent firm.28

The trend in the German electrical industry, after ambitious men like Rathenau saw the possibilities of introducing Edison illumination, was for a firm to work simultaneously on several fronts. An electrical enterprise would function as the manufacturer of electrical equipment, as the supplier of electrical energy, and as a financing company. AEG pioneered this strategy, which other firms copied and took even further. This so-called contractor business, placing enormous demands on capitalization, promised huge profits from the expected future increase in the consumption of electrical energy.29 Stimulated by the opportunities offered by the contractor business, the number of electric power plants in Germany increased between 1895 and 1900 from 180 to 774. Over the same period the number of electric railways rose from 47 to 156.30

In the long run, the conduct of the electrical business fell into a pattern. The large firms like Siemens & Halske supplied equipment to the municipal utilities on credit, receiving securities in return. The manufacturer then sold the securities at a profit. If everything turned out satisfactorily, the electrical equipment manufacturer earned its first profit with the delivery of the equipment, then an additional profit from the sale of
the securities. The manufacturer frequently profited also from the operation of the newly erected power plants. Not all suppliers, of course, were in full command of such a complicated and risky financing business. Heavy losses forced many enterprises to submit to the control of banks or to merge with other, mostly larger, partners.\textsuperscript{31}

Construction and financing of electric streetcar systems followed a similar pattern. Siemens & Halske delayed entering the business of supplying the electric streetcar industry until its engineer Walter Reichel devised a slightly arched sliding shoe to pick up power from an overhead trolley wire. Although Siemens had displayed an electric streetcar as early as the world exhibition in Paris in 1881, the firm had to wait for Reichel’s innovation before it could enter the business in 1889. After 1889 investments in public local transportation increased rapidly.\textsuperscript{32} In 1891 there were electric streetcar lines in 3 German cities; in 1896 42 streetcar lines operated on 582 kilometers of track. By 1903 electric local public transportation extended across a total of 3,692 kilometers of track in 134 cities.\textsuperscript{33}

The Siemens brothers also expended considerable effort to obtain foreign sales of their electric railways. They demonstrated electric railways in operation at the International Electrical Exhibition in Paris in 1881, as we have mentioned, and at the All-Russian Industrial Exhibition in 1882, but without any immediate return in business. In the 1880s the firm commissioned and built just three streetcar systems. In 1882 Siemens & Halske constructed a line between Mödling and Vorderbühl for the Austrian Southern Railway Association (Österreichische Südbahn-Gesellschaft), and in the same year a line between Frankfurt and Offenbach in Germany for the Weinmann Bank. In 1883 the company won a contract for a system in Portrush, Ireland.

Siemens & Halske as a rule was reluctant to serve as general contractor for the construction of electric power plants. The risks involved in such projects were high, and the firm had only a comparatively minor share of the necessary products. In addition, any such endeavors would tie up a considerable amount of the firm’s financial resources. Werner von Siemens opposed founding a company of his own for the construction
of central power stations. Primarily, he desired to be the builder of these plants and the manufacturer of the necessary machines and equipment, but not himself be engaged as an investor. His reluctance allowed other firms, more willing to accept the risks involved, to enter the business. In the hectic development that took place during the 1890s, which was characterized by a massive oversubscription of stock issues, more big corporations came into existence: Union-Elektrizität-Gesellschaft, a subsidiary of the Thomson-Houston Company; Helios AG, a public corporation, formerly the O. L. Kummer Company, and the Electricitäts-Actien-Gesellschaft W. Lahmeyer & Co. At the end of the nineteenth century a total of seven such enterprises existed in Germany.

With the relatively small capital base of a family enterprise, Werner von Siemens was in the 1880s not in a position to compete successfully on the capital market with a public corporation such as Rathenau’s DEG (later AEG). In this situation, moreover, the technical lead enjoyed by his enterprise over rival firms and his personal high reputation as an authority in electrical engineering were of no use.
Business via Representatives and Agencies

Although fundamental modifications of the entire organization of the Siemens enterprise were carried out after the turn of the century, the marketing system had to be adapted to the growth of the firm much earlier. The firm’s marketing system reflected the company’s stage of development. During the first decades of Siemens & Halske’s existence, there was no reason for the firm to establish any external sales organization, since for its main product—telegraphs—business was conducted with public authorities, which maintained direct contacts with the company. As long as the number of customers was relatively small, centralization of all domestic marketing in Berlin was perfectly feasible. Even when telegraph sales increased, the market structure of a small circle of customers did not change fundamentally. Even the largest telegraph projects were planned and executed by dealing with national authorities and administrations. (This structure has remained valid for key fields of communications technology up to the present day.) Only when electric power technology developed and expanded was the firm forced to decentralize its marketing efforts. Lacking its own organization, Siemens initially had to cooperate with qualified partners. Outside of telegraphy, the business procedures had to be adjusted to deal with the considerably more numerous private customers. Not until the second half of the 1870s did Siemens & Halske employ its first sales representatives for its products in Germany and abroad.

After the reorganization of the enterprise in 1868, Werner von Siemens had to envisage a new marketing policy. The expansion of the business and the much wider manufacturing program made it impossible to secure a sufficient volume of orders solely by means of the personal efforts and contacts of Werner and his brothers, as had been the case with the supply of telegraph lines and equipment during the first years. With the entry into the age of electric power, establishing a marketing organization became mandatory.

After the company had expanded well beyond telegraphy,
Siemens authorized representatives to handle the sale of electric generators and arc lamps. Later it authorized representatives to arrange the installation of complete generating plants. The members of the family, however, reserved for themselves any negotiations with governmental authorities, as well as the entire low-current business. The representatives chosen were usually engineers residing in the respective cities. Some of the representatives were former telegraph engineers who had shifted their professional efforts toward the new field of electric power technology and had established engineering offices. Their main task was to sell generators and electric arc lamps, and eventually also to install complete lighting systems based on incandescent lamps. Only occasionally, and then only after extended negotiations with Siemens & Halske, did the representatives handle the sale of products from other divisions of the enterprise, for example, the sale of articles and systems of low-current technology.

Initially, the network of representatives covered mainly the German Reich, but it soon included other European countries as well. The network abroad was never very dense, however. In a listing dated March 2, 1880, in addition to the firms in St. Petersburg, London, Paris, and Vienna, Siemens & Halske representatives abroad were listed only for Rome, Zurich, Brussels, and The Hague. The relationship between these representatives and the home office in Berlin was not always smooth. A main concern for Werner von Siemens was finding qualified persons, sufficiently knowledgeable in the technology involved to be able to supply dependable expert advice. Preferably, a representative abroad would also be capable of taking care of the installation and maintenance of plants. Such a representative should accordingly have an engineering office in his territory and, if at all possible, be an expert in electrical technology. The farther away the marketing territory was from Berlin, the more the representative had to meet these demands. Werner von Siemens was not afraid to reject applicants if they did not meet his expectations. Thus he wrote during the negotiations over an agency in Japan in 1884:
In general the scope of our production is too diversified and too complicated for a general agency to be successful in a country far away. Many attempts in this respect have turned out to be failures. Our products are not direct trade articles, the sale of which concludes the business. To introduce our products, technical knowledge is essential. This requirement cannot be replaced by mere instruction. In order to recommend our products convincingly, thorough understanding of their advantages is paramount, i.e., total command of the respective field. . . . Only an engineering firm—perhaps and at best in combination with a commercial one—would be able to represent us successfully. 38

Werner von Siemens realized that one of his firm's most valuable assets was its reputation. A sound reputation, he believed, was both an effective advertisement and a means to future contracts. An incompetent agent would not be able to offer the tailor-made solution, which Siemens & Halske always promised its customers. If in doubt, for the sake of the high quality of their products and of their good reputation, it was preferable to do without some agencies, even if this resulted in the loss of business. The nature of this decision was as fundamental as had been the maxim of the early years to compete successfully on the basis not of low prices but of good quality.

In exchange for its high expectations of its representatives, Siemens & Halske did not offer much. The agents had to work at their own risk. The firm neither took on warranties they had entered nor did it offer any support. Goods were manufactured and shipped on secure orders only. The buyer had to pay all expenses for freight and insurance from the factory in Berlin. The agent was granted a commission of 10% on the gross amount of the order, which was not due until payment of the amount specified in the invoice. The agents were obliged to exclusively sell products made by Siemens & Halske. This was a sound arrangement from the standpoint of the company's management, because it meant that the firm had to negotiate with only a few customers and bookkeeping requirements were minimal.
From another standpoint, however, this method of doing business was very disadvantageous, because Siemens & Halske relinquished direct control of all customer districts. Consequently, bills receivable started to pile up at the agencies, which sometimes had a narrow financial base. The risks associated with the customers were thus largely unsecured. From the technical standpoint in particular, marketing via agencies was unfavorable. As Siemens & Halske was not engaged in the installation of the products delivered, there was no way to find out how the products stood up to stress and strain when in operation, whether there were any defects or deficiencies, what types of troubles occurred, and so on.

The marketing system based upon agents soon failed to cope with the highly diversified operations of the company. As early as 1885, the management of Siemens & Halske saw the need to upgrade the agency business. Technical offices established by the firm itself were seen as offering considerable advantages. Management recognized the need to approach the customers with the intention not merely of making a quick sale but also of offering consulting and planning services. In order to implement this new strategy, it was necessary to maintain bases as close to the customer as possible. It was hoped that this marketing configuration would enable Siemens & Halske to approach the customer very early on, in order both to shape the projects according to the firm’s concepts and practices and to win the subsequent orders.  

Since the agents at home and abroad were in no way integrated into the management structure of the enterprise, they almost inevitably got into conflicts of interest with the firm. They differed from the members of the Siemens family or long-term employees, who had, preceding the gradual expansion of the agency network, negotiated and executed sizable contracts, in that these agents were not bound either by family ties or by other loyalties to Werner von Siemens’s marketing concept. Since the agents worked on their own account, they would frequently buy materials for installation and other accessories not from Siemens & Halske itself but from less expensive suppliers—to the annoyance of Siemens & Halske.
As Werner von Siemens had taken great care to ensure a stable relationship between the firm on the one hand and its key executives and its workers on the other hand, his total disregard for this aspect of the business during the gradual expansion of the sales force comes as a surprise. Up to 1885 the terms of the contracts with the sales representatives were not even standardized. In 1885 uniform guidelines were defined, but deviations from these standards were frequent, particularly in the case of foreign business. Thus, a special contract was in effect for Edouard Rau, the representative for Belgium, which Rau had concluded for a period of ten years after long bickering.40

The Rau case in particular illustrates the specific difficulties arising from this type of agency business. Since 1871 Rau had worked for Siemens & Halske without any formal contract and had occasionally negotiated and concluded contracts, often with a highly fluctuating volume of sales. According to his own evaluation of his activities, Rau had been working primarily out of an interest in electrical-technical products and out of his high personal esteem for Werner von Siemens. He therefore took offense at the request to formalize the relationship by means of a contract. In a letter dated January 24, 1882, he wrote to the top management of Siemens & Halske:

Certain conditions in business life develop and modulate themselves according to the persons and circumstances involved. Among them are some that fit less easily than others into everyday commercial legal forms. This also applies to the relationship I have had the honor to maintain with you, and if my character had not suited you, and if I had not for years engaged in your business without any profits but more as a hobby, a way of life that my financial means fortunately allowed, we would not even be in a position today to hunt for the forms into which we now want to squeeze ourselves.41

The contract Rau finally agreed upon, guaranteeing him the sole franchise for Belgium, the safeguarding of the patent rights there, and a commission of 10%, but allowing no special deviations, was not able to soothe the irritations that had
grown between the parent firm and its representative. After the contract expired in 1892, the parties separated in a mood of general disagreement.

Even when dealing with long-term employees Werner von Siemens adamantly refused to make concessions. For example, in 1890 he was not willing to grant Carlo Moleschott, who together with various partners had been Siemens & Halske’s representative in Italy since 1881, a fixed monthly salary or other special terms to tide him over a temporarily tight financial situation. In a letter written in a very friendly tone, Werner von Siemens plainly stated that Moleschott could get better results only with higher sales. Paying the representatives a fixed monthly salary would not benefit Siemens & Halske.⁴²

On the one hand the reluctance to assume any share of the expenses the marketing outlets incurred, and on the other hand the inefficiency of the central management in monitoring the representatives, particularly those abroad, resulted in a generally poor business climate. Customers’ complaints about unsatisfactory installation of equipment were regular causes for quarrels between the Berlin parent firm and its representatives. If a plant completed and put into service subsequently caused trouble, frequently the result was mutual recriminations between Siemens & Halske and the representative. While the representatives blamed the malfunctions on deficiencies in the material supplied, the officers in Berlin argued that the execution of the installation at the site was faulty. Consequently, in several cases customers were only willing to sign contracts directly with the parent firm in Berlin. In such cases the representatives naturally felt cheated out of their commission. Even the “General Guidelines for Representatives” (“Allgemeine Vertretervorschriften”) set up in 1885 did not result in the basic improvement of the situation or in a change in the conduct of business.

Compared to that of the Siemens enterprise, the marketing organizations of its competitors, which rapidly gained ground, were much more elaborate and aggressive. At a very early stage, the Nuremberg firm S. Schuckert & Co., for example, started to develop a marketing organization fully integrated
with the enterprise. For a short period, DEG had made use of Siemens & Halske’s marketing facilities, but in the middle of the 1880s it started to establish its own technical offices under the management of Felix Deutsch. This development was expanded after the founding of AEG: the firm established a cost intensive yet functional distribution and maintenance network abroad. The same was true for American rival firms, which also pursued much more effective marketing strategies. Thomson-Houston and Westinghouse spent large sums on marketing structures with strong regional dispersion.43

Not until the 1890s, after Werner von Siemens’s withdrawal from the top management, did Siemens & Halske make substantial efforts to create a marketing network fully integrated with the enterprise. The second stage in the expansion of marketing was characterized by the gradual discontinuing of business with independent agencies, by the direct hiring of reliable people, and by developing the firm’s own sales centers, called Technical Offices (Technische Büros). These external marketing offices, which were staffed with engineers, were to watch for sales opportunities and to clarify the prerequisites for solving problems, to such an extent that subsequent processing and managing of projects could be handled by the parent firm at home. Over time, the simpler offers were prepared directly by the Technical Offices themselves.44 The earlier agencies, which had only negotiated contracts, were thus replaced by competent technical advisers. This feature was also emphasized by the term technical office.

The spread of Siemens & Halske’s Technical Offices proceeded slowly. Back in the autumn of 1879 the company had established the Vienna Technical Office of Siemens & Halske Berlin, but the only thing this branch had in common with the later Technical Offices was its name; it represented the nucleus of what eventually became the factory of Siemens & Halske in Vienna. (A few years later, at the beginning of the 1880s, the term technical office was dropped from the name of the Vienna establishment.) The first real branch office in Vienna, in the true sense of the term technical office, was established in 1890 by the local factory works. The structure of this branch
was similar to that of the municipal office of the Schuckert firm in Nuremberg; it was intended to relieve the factory from the small business of installations and the sale of parts. On January 20, 1890, the first Technical Office Siemens & Halske was established in Munich. A short time later a second Technical Office was established in Mulhouse, Alsace, followed by offices in Cologne, Hagen, Frankfurt, and Dresden. Starting in 1894, the transportation department was placed in charge of the entire marketing system of the electric power business. Before the turn of the century, the Vienna factory also established the first Technical Offices in other parts of Austria, eventually totaling twenty-one branch offices in 1914. However, owing to its slow start in establishing the Technical Offices, Siemens & Halske lost its leading market position in the Austro-Hungarian Empire.

Production Abroad

Generally speaking, business firms that emphasized research and technical progress founded production firms in other nations as part of the last stage of their development of an international orientation and strategy. Siemens & Halske was an exception to this general pattern of business development. As we have seen, Siemens & Halske became an international firm, albeit one with kinship ties closely intermixed with business activities, before it developed its own marketing organization. London was its outpost for production abroad, where, after the acquisition of the factory in Woolwich, Siemens & Halske began to operate its own production facilities in 1863. After the expansion of the cable factory in Woolwich in 1873 and the acquisition of a gutta-percha processing factory, production in England increased continuously. Nevertheless, the British branch of the firm still acquired many devices and parts from Berlin, a practice that continued even after Werner and his brothers in effect dropped the concept of the comprehensive enterprise and founded Siemens Brothers & Co. Ltd. on January 1, 1881. Time and again Berlin and London argued
Siemens factory, Hainburgstraße, Vienna, 1890
over the special terms to be granted. In its main field of activity, however—the production and laying of submarine cables—the London firm grew independently.

The situation changed in Vienna when the company began local production there in 1883. Before that time the Vienna branch had operated only as a workshop for repair jobs and the installation of equipment. But when the Vienna branch was awarded large orders in the field of railway safety, orders substantially exceeding the manufacturing capacity of the facilities in Berlin, execution of these orders was shifted to Vienna. Shortly afterward, the scope of production in Vienna was expanded to include electric generators and arc lamps. The construction of three central electric power stations, which Siemens & Halske subsequently operated on its own account while also providing the administration, increased the business of electric lighting to such an extent that the facilities were enlarged in 1887. Following Werner von Siemens’s retirement in 1889–90, a second factory had to be established to accommodate the production of lead-shielded cables. The production facilities and the administrative offices were grouped into two separate units, with Vienna I taking care of production while Vienna II handled project management and the administration of the electric power plants. The Vienna office was also important for the sale of electric streetcars.

Business with Russia reached a new peak after Carl Siemens returned to St. Petersburg in 1880. In spite of poor business there during the 1870s, Siemens & Halske had remained the market leader, yet in the new field of electric illumination it had to face the competitors Yablochkov and AEG. After the All-Russian Industrial Exhibition in 1882, Siemens & Halske constructed a cable factory in Russia. As in the case of the establishment of cable production in Berlin, this was done in order to qualify for a large order that was supposed to be granted to a firm with domestic production in Russia. This Russian facility also allowed the firm to avoid the high import tariffs that had been levied in 1877. The cable factory formed the nucleus of the later United Cable Factories St. Petersburg, which was run jointly by Siemens, AEG, and Felten &
Guillaume. The successful completion of such highly prestigious illumination projects as the floodlighting of the wide, luxurious boulevard Nevsky Prospekt in 1884 and of the Winter Palace made the demand for central electric power stations in Russia rise by leaps and bounds. Initially, Siemens & Halske was unwilling to assume responsibility for the generation of electricity but only prepared to supply the necessary machines. In February 1887, however, Carl Siemens, acting for the Siemens’s St. Petersburg business, which had been independent from the parent firm in Berlin since 1880, became a partner in the new Company for Electrical Lighting (Gesellschaft für Elektrische Beleuchtung), which had a capital of 1 million rubles and, according to the regulations spelled out in the license, was authorized to lay power cables and construct central electric power stations in all parts of Russia. This partnership paid off well in the years to come: from 1904 until 1911 Siemens made huge profits from the shipments of three-phase turbogenerators to Russia. For the time being, however, there was another downturn in business, even causing Carl in 1890 to try—unsuccessfully—to sell the St. Petersburg business at an acceptable price.
The last project Werner von Siemens started before his death was the establishment of a branch of his enterprise in the United States. In 1886 Werner had authorized the German American Henry Villard to market his patents, especially his patent on lead-shielded cables, for Siemens & Halske in the United States. He envisioned either an outright sale of the patent or a partnership in a company already operating. As the president of the Edison Electric Light Company, Henry Villard, together with Georg Siemens, the director of the Deutsche Bank in Germany, prepared to proceed toward a substantial financial interest of the German electrotechnical industry in the Edison General Electric Company, which had resulted from the merger of the various Edison companies in 1889. Along with AEG and the Deutsche Bank, Siemens & Halske bought shares of 1 million marks, mainly with the intention of starting the production of lead-shielded cables in the United States. Werner explained this in a letter dated January 21, 1890, to Henry Villard: “We subscribed to the tune of one million marks not out of hope for profits from a rise of the price of the stock, but only in order to secure and accelerate the implementation of the planned contract and the construction of the cable factory according to our system.”48

The development of the American venture proceeded slowly, however. Negotiations on the contract to use Siemens technology in a new factory for lead-shielded cables were protracted. Apart from the production of lead-shielded cables, Werner von Siemens was also interested in entering the American market with his electric railways and streetcars, but patent litigation involving several American railway construction companies prevented a quick entry into this market as well. All plans had to be scrapped when, in 1892, the Edison General Electric Company merged with the Thomson-Houston Group to become the General Electric Company. The president of Thomson-Houston unequivocally took charge in this merger, and the banks forced Henry Villard to withdraw from the new General Electric Company. As a consequence, the German investors rapidly backtracked.

Nonetheless, Siemens & Halske executives remained inter-
ested in penetrating the American electric streetcar market, and they decided to pursue the matter on their own initiative. In January 1892 Werner’s oldest son, Arnold, traveled to the United States, initially intending to sell his father’s patents. After making inquiries, however, Arnold Siemens changed course and investigated establishing a company of his own that would include production facilities. Consequently, on March 4, 1892, Siemens & Halske, together with two American partners, O. W. Meysenburg and A. W. Wright, founded the Siemens & Halske Electric Company of America, located in Chicago, Illinois. They specified the purpose of the enterprise as the production and sale of electric generators, railway motors, and associated equipment. At first the new firm was successful, receiving numerous orders, but a devastating fire completely destroyed the factory, abruptly snuffing out the company’s transatlantic hopes. Damage amounted to $600,000; production was never restarted.⁴⁹

The “Private Business” in the Caucasus

Werner von Siemens ran a “private business,” the copper mine at Kedabeg in the Caucasus Mountains, in addition to his enterprises in the electrical industry. Werner had bought the mine, together with his brothers Carl and Walter, in 1864. The purchase upset Halske, who thought the risks involved were not worth the additional work. Even after Halske’s withdrawal from Siemens & Halske, the Siemens brothers exempted Kedabeg from the legal contracts between them. The Kedabeg copper mine also remained a constant source of annoyance for those associated with Siemens who did not participate in the venture.

Werner bought the mine because he thought it would be a good project for Walter to supervise. The mine, which had rich deposits, was in bad condition, yet Werner thought Walter could turn it into a profitable venture. Walter knew the Caucasus. Stationed in St. Petersburg, he had supervised the
construction and the maintenance of telegraph lines in the Caucasus for his brother Carl. In the course of those activities, Carl had discovered the mine with its rich deposits of copper. Carl and Werner also developed a growing interest in the project.

After the death of his first wife, Mathilde, Werner von Siemens made his first trip to the Caucasus. Two more visits were to follow. On his first journey he inspected the mine and detected two main drawbacks: its remoteness and the logistical problems this caused, and the low professional skill of the employees. Above all, the poor infrastructure of Transcaucasia turned out to be a crucial problem. Between Kedabeg, situated near Elisavetpol, and the Black Sea—a distance of about 600 kilometers—there was no railway or hard-surface road. All materials and equipment for the operation of a modern mine had to be imported from Europe and transported to the mine site. The second problem concerned the workforce. The nomadic population of the area was willing to work in the mine
only until they had accumulated enough money to meet the necessities of daily life for awhile. Consequently, there was no long-term stable workforce. For this reason, Werner von Siemens suggested trying to settle the workmen permanently in the vicinity of the site by building solid masonry homes for them and their families, which might motivate them to accept long-term employment and to work on a regular schedule. The key positions at the Kedabeg mine were filled by German officials and by Russians from the Baltic provinces.\(^5^0\)

When Walter Siemens suffered a fatal accident in the summer of 1868, Werner von Siemens traveled to the Caucasus for the second time. Walter’s death left a vacancy in the management of the mine (and also at the German consulate in Tbilisi, where he had served) that turned out to be particularly difficult to fill. Nevertheless, the mine continued to operate quite profitably, and the Russian government offered more mine projects to the brothers.

Carl had initiated improvements in metallurgical technology at the mine. He would have welcomed an opportunity to continue to manage the mine, but his active management proved impractical. At first Werner had thought the brothers would integrate the mining activities in the Caucasus into their comprehensive enterprise, but this did not happen. The profits from Kedabeg were never more than about 20% of the profits made in Berlin or London, although the mine’s returns were rising. Nevertheless, Wilhelm Siemens, as the administrator of Walter’s estate, urged his brothers to concentrate on more-important activities.\(^5^1\) Eventually, however, it was not Wilhelm’s admonition but his wife’s ill health and eventual death that influenced Carl’s decision to dedicate himself primarily to the electrical side of the family business and to move to London.

Werner believed it essential that a member of the family represent the Siemens firm in Tbilisi to ensure that an outbreak of “business anarchy” (geschäftliche Anarchie) did not occur.\(^5^2\) Werner urged his youngest brother, Otto, to obtain the appointment as German consul in Tbilisi and to look after the mine’s affairs. Otto, who suffered from tuberculosis, had already spent some time with his brothers in Tbilisi and was well
acquainted with the business situation there. Otto’s experience and physical strength, however, were not sufficient for the management of the mine. So Carl, while living in London, continued to manage Kedabeg.

Carl had little luck with the directors employed at Kedabeg. In 1871 the situation improved slightly when Otto, by marrying Annette von Krehmer, widow of Prince Swiatobolk-Mirski, gained considerably more influence in Tbilisi. The improvement in the mine’s operation proved short-lived, however, because Otto fell victim to his illness in the autumn of 1871. Without the direct supervision of one of the Siemens brothers, the director of the mine in the 1870s, Carl Schnabel, ran it down. In his final report on Kedabeg in 1876, Carl Siemens wrote that Schnabel had been ill for half a year but had done the least damage to the firm during that period of time.  

Schnabel’s successor, Gustav Kölle, turned out to be more suitable; he stayed in Kedabeg until 1905. Under his direction the copper production of the mine soon increased greatly, and after 1877 the mine was profitable. Werner von Siemens remained interested in this enterprise, even though it differed substantially from his other activities. When in 1890 he wrote about his trips to the Caucasus in his memoirs, he was still contemplating plans for the modernization and reorganization of the mine, which he wanted to see developed and expanded into a European model plant.