



Figure 17.12 First intercontinental radiotelephone connection, 1927. (After *Bell System Technical Journal*, Vol. VII, 1928, p. 169.)

cuits connected the United States with 140 countries. A radiotelephone long-distance record was made in 1930 with a radio communication over 23,000 km between stations on Java, Indonesia, and in Argentina via Berlin. A first around-the-world radiotelephone conversation starting and terminating in New York took place on April 25, 1935.

One of the largest shortwave stations for intercontinental telephony was installed in France at Saint-Assise, southeast of Paris, in 1929. The 39-m-tall antenna was composed of two layers supported by two masts 75 m apart. It operated on 15, 55, and 24.5 m and communicated with the United States, Africa, and Southeast Asia within an 11,000-km range.

17.5 RCA AND C&W CREATED TO BEAT MARCONI

Marconi was the catalyst, and the big loser, in the establishment of two major telecommunications companies: the *Radio Corporation of America* (RCA) in 1919 and *Cable & Wireless* (C&W) in 1928.

17.5.1 Radio Corporation of America

Marconi, in 1919, once more endeavoring to establish his delayed “Wireless Girdle Round the World,” approached General Electric with the intention of buying 24

frequency-alternator radio stations. Franklin D. Roosevelt, then acting secretary of the U.S. Navy, feared that this would result in a worldwide British monopoly on radio transmission, in addition to the existing British monopoly on submarine communication. He informed U.S. President Wilson, then at the peace conference in Paris,¹⁶ who instructed the Navy to prevent the sale to Marconi and to establish an American-owned radio company. General Electric, eager not to lose the business, bought the Marconi Wireless and Telegraph Company of America and established the *Radio Corporation of America* (RCA) as the successor of that company on November 21, 1919. To give RCA access to all U.S. radio patents, a complex set of agreements was made between the U.S. Navy, General Electric, AT&T, Westinghouse, the United Fruit Company, and RCA. AT&T held patents on the vacuum-tube technology of de Forest; Westinghouse had the patents on Edwin Armstrong's feedback oscillator and heterodyne technology; the U.S. Navy controlled the arc technology of Poulsen and Elwell; and the United Fruit Company operated a large radiotelegraphy network for communication between its plantations, ships, and offices. In the same year, RCA negotiated a Four Power Pact with Marconi, the French *Compagnie Générale de Télégraphie*, and the German company Telefunken. The four companies settled the first international radio cartel, in which the world was divided into six territories:

1. *RCA territory*: the United States and the Philippines
2. *Marconi territory*: the U.K. and the Commonwealth
3. *RCA for internal and Marconi for external communications*: Canada, the Caribbean, and Guyana
4. *RCA for internal and the others for external communications*: Latin America apart from Argentina, the Caribbean, and Guyana
5. *Limited competition*: China
6. *Open competition*: the rest of the world

Under this agreement, each company was to have exclusive rights to use of the other companies' patents within its respective territories. The agreement was to run until January 1, 1945. RCA took over from Marconi the radiotelegraph services from the United States with the U.K., Hawaii, and Japan, and established new services to France, Germany, and Norway. It started national radiotelegraph service on March 1, 1920. The first South American service started on January 1924, to Buenos Aires, Argentina, with shortwave equipment. By that time, radio broadcasting had begun, and RCA, unlike Marconi without a global empire to serve, turned its interest to this new field.

17.5.2 Cable & Wireless

At the end of the 1920s, Great Britain still dominated world communications by submarine cable, with 450,000 km of cable compared with 270,000 km owned by U.S. companies, 37,000 km owned by French companies, and 30,000 km by all

¹⁶Marconi participated as a plenipotentiary delegate to the peace conference in Paris, in which capacity he signed the peace treaties with Austria and Bulgaria.

others. However, the British submarine cable companies experienced a significant loss of revenue due to the success of Marconi shortwave radio operated by the GPO inside the British Empire (the "Imperial Chain") and by Marconi Wireless outside the Empire. Moreover, they had reason to be concerned about the rapidly growing role of U.S. telecommunications companies, especially of IT&T, which in 1927 bought All America Cables, which had 50,000 km of submarine cable to the West Indies and to Central and South America. Discussions on the British challenge in telecommunications were widely covered by the *New York Times* and other newspapers. To examine the situation and find means of counterattacking, the *Imperial Wireless & Cable Conference* was held in London in 1928, with the participation of the major British radio, telephone, and cable companies, which were united in a loose alliance known as the Electra House Group. A decision was taken that both cable and radio operations should be merged into a common system. *Cable & Wireless* was formed as the holding company for a new communications company called *Imperial and International Communications Ltd. (I&IC)*. I&IC was the merger of the leading cable company, the Eastern Telegraph Company (Section 8.7.3), and Marconi Wireless. In 1934 the name of I&IC was changed to *Cable & Wireless Ltd.* and the holding company was renamed *Cable & Wireless (Holdings) Ltd.* Cable & Wireless became a public company on January 1, 1947. In 1950, C&W employed a staff of 800 in the U.K. and 8200 overseas. By 1954 it operated 240,000 km of submarine cable and 320,000 km of radio circuits. Currently, C&W has evolved from a worldwide telecommunications operator to a global carrier focused on the business market. It has four main operating units: global markets, network operations and carrier services, Cable & Wireless United States, and Cable & Wireless IDC, which is responsible for the C&W activities in Japan and East Asia.

For Marconi, this merger was the end of his international radio activities.¹⁷ He returned to Italy, where he got involved in politics and supported Mussolini, who appointed him president of the National Council of Research in 1928 and president of the Royal Academy of Italy in 1930. He was made a marchese and nominated to the Italian Senate in 1929. As his last involvement in radio, he presented to Pope Pius XI a radiotelephone connection between Vatican City and the summer residence of the Pope at Castel Gondolfo, a distance of about 20 km, in 1932. This was a novelty, as it presented the first practical application of a radio frequency at 600 MHz.

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¹⁷The Marconi operation companies became part of C&W, while the Marconi production facilities became part of General Electric of Coventry (GEC). It was not until 1999 that Marconi Communications was again created as a transmission manufacturing company in the U.K.

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PHOTOTELEGRAPHY

18.1 KOPIERTELEGRAPH OF GUSTAV GRZANNA

The German engineer Gustav Grzanna was the first person to use a method of scanning the X/Y axes, combined with the use of photographic paper in the receiver, in 1901. The position of the stylet on the X/Y axes in the transmitter was coded such that each position corresponded to a certain strength of the line current. Instead of a stylet, a little mirror attached to a magnet needle was used in the receiver. Two electromagnets, one for the X and the other for the Y axis, controlled the movement of the magnetic needle and thus of the mirror in such a way that a light ray directed toward the mirror and reflected on the photographic paper wrote the received message on the photographic paper. Grzanna called his device a *Kopiertelegraph* (German for “copying telegraph”). He founded the company Kopiertelegraph in Dresden in 1901 but stopped production in 1905 when a compatriot, Arthur Korn, introduced a more efficient product.

18.2 TELAUTOGRAPH OF ARTHUR KORN

As photography became popular at the beginning of the twentieth century, the German physicist Arthur Korn (1870–1945) developed a facsimile machine suitable for transmission of photographs. He was the first to introduce a facsimile machine with optical scanning in the transmitter and photographic reproduction in the receiver, in 1902. Korn used a selenium cell inside a cylinder made of glass at the transmitting end. The light, which scanned a transparent film on the outside of the cylinder, was