

The “Prehistory” of Silicon Valley

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Time Line Events

1900	Electrical Utilities
1907	Radio
1915	Vacuum Tubes
1930	Power Vacuum Tubes
1940	Micro-wave Tubes
1954	Avionics
1956	Semiconductors
1940's, 1970's	Memory Devices
1970's ---	Computers
	Software
	Internet, Networking
	Bio-technology

Theories/Models of the silicon Valley Elephant

1) Scientific/Engineering Breakthrough	10) Venture Capital
2) Individual Genius or Hero	11) Lawyer-Startup Involvement
3) University-Industry Model	12) Community Inter-Connections
4) Military Support	13) Management-Employee Relations
5) Geography/Regional Advantage	14) Consumer Products versus Hi-Tech Specialities
6) Existing Big Corporations Versus Startups	15) Labor Issues, Immigration, Unions
7) Vertical versus Horizontal Business	16) Commercial Real Estate Developers
8) Technical Innovation	17) Investment Banks
9) Manufacturing Processes	18) Specialized Marketing Consultants

FLOW CHART

1909

1925

1932

1938

TERMAN-----

Packard, Hewlett, Woodyard, Stearns,
Ginzton, Kaar, etc

Moorhead C. Litton-----

L. Fuller-----

Fed. Tel. Co.[ELWELL] ***-----

[Mackay] H-P-----

Lee DeForest, many others

Kennedy-----

Herrold-----

Perham, Jensen(Magnovox)-----

C. Lauritsen

Hansen VARIAN

EIMAC-----

Heintz-----

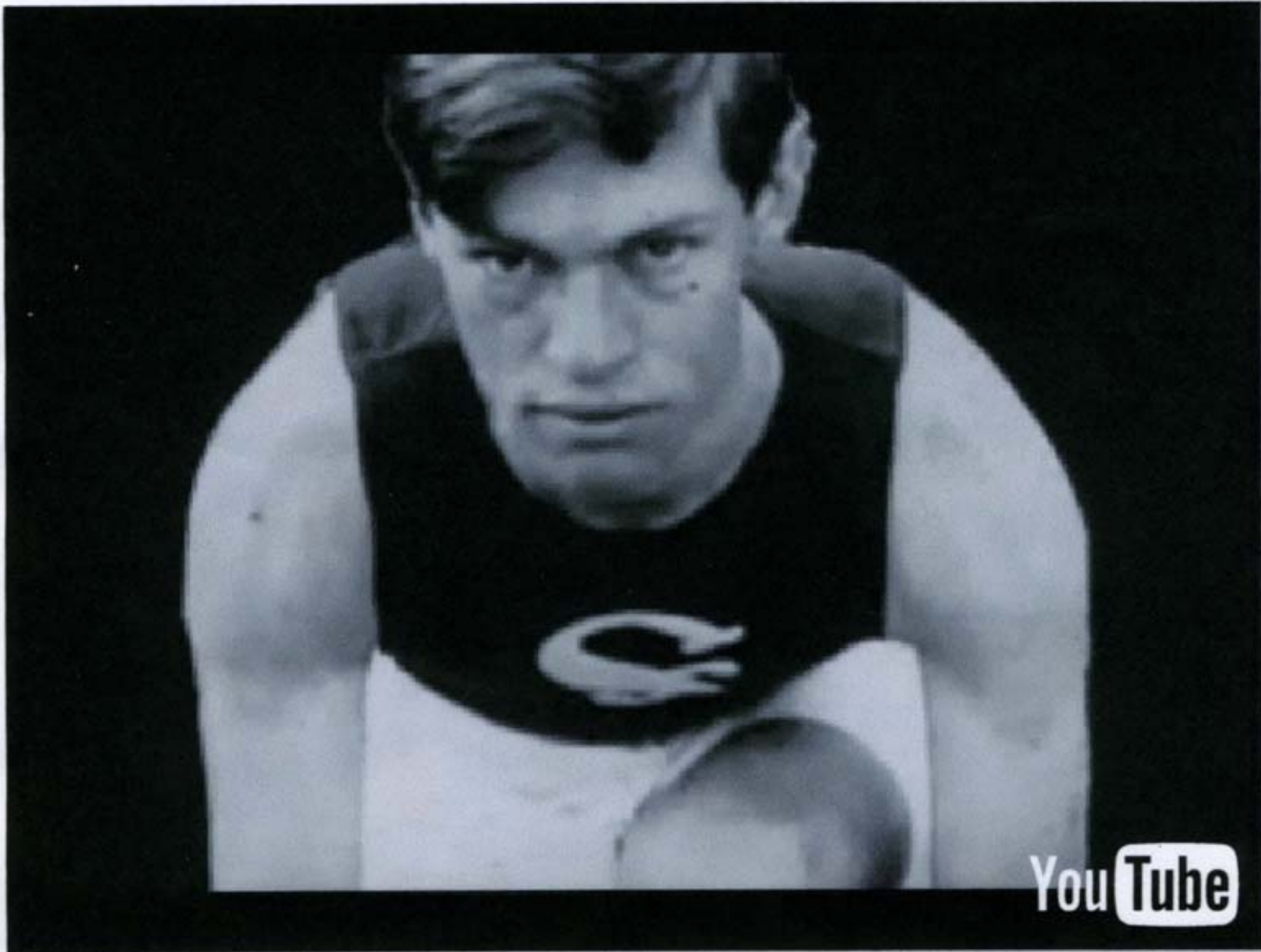
Heinz & Kaufman
[Dollar Steamship]

Gilfillan Bros. (LA)-----

[Breting,etc]

M. Stearns

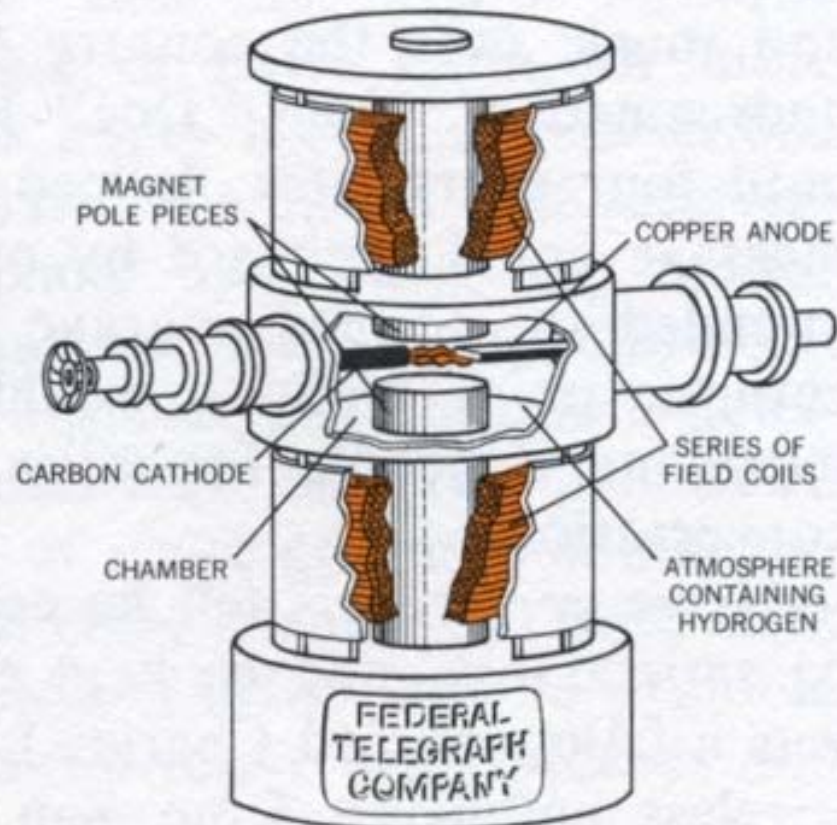
Kaar-----



2:54 / 6:01

HQ

The control bar contains several icons: a play/pause button, a progress bar with a red segment and a circular slider, a volume icon, an 'HQ' quality indicator, a share icon, and a full-screen icon.



(L to R) Douglas Perham, C. Albertus, Peter Jensen with 5 kw Federal-Poulsen arc station equipment, about 1910. Arc is mounted on box at left. Note tuning knobs and multiple-unit microphone above telegraph key on operator's table. Drawing is a later 30 kw arc, about 4½ feet tall. Jensen became co-inventor of the loudspeaker. (See Ch. VI.)



NATIONAL TELEGRAPH CO.
POULSEN RADIO SYSTEM.

YouTube

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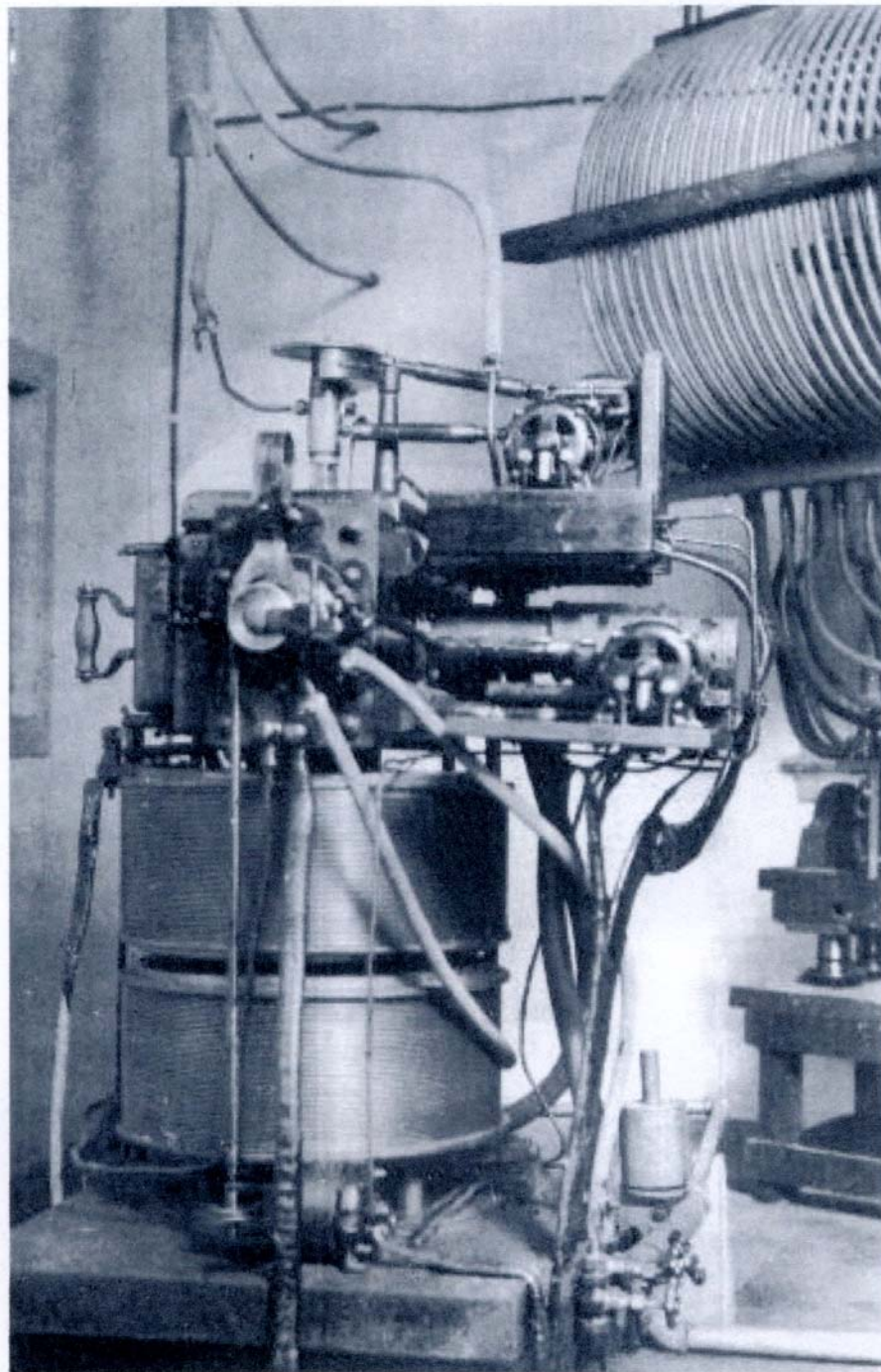
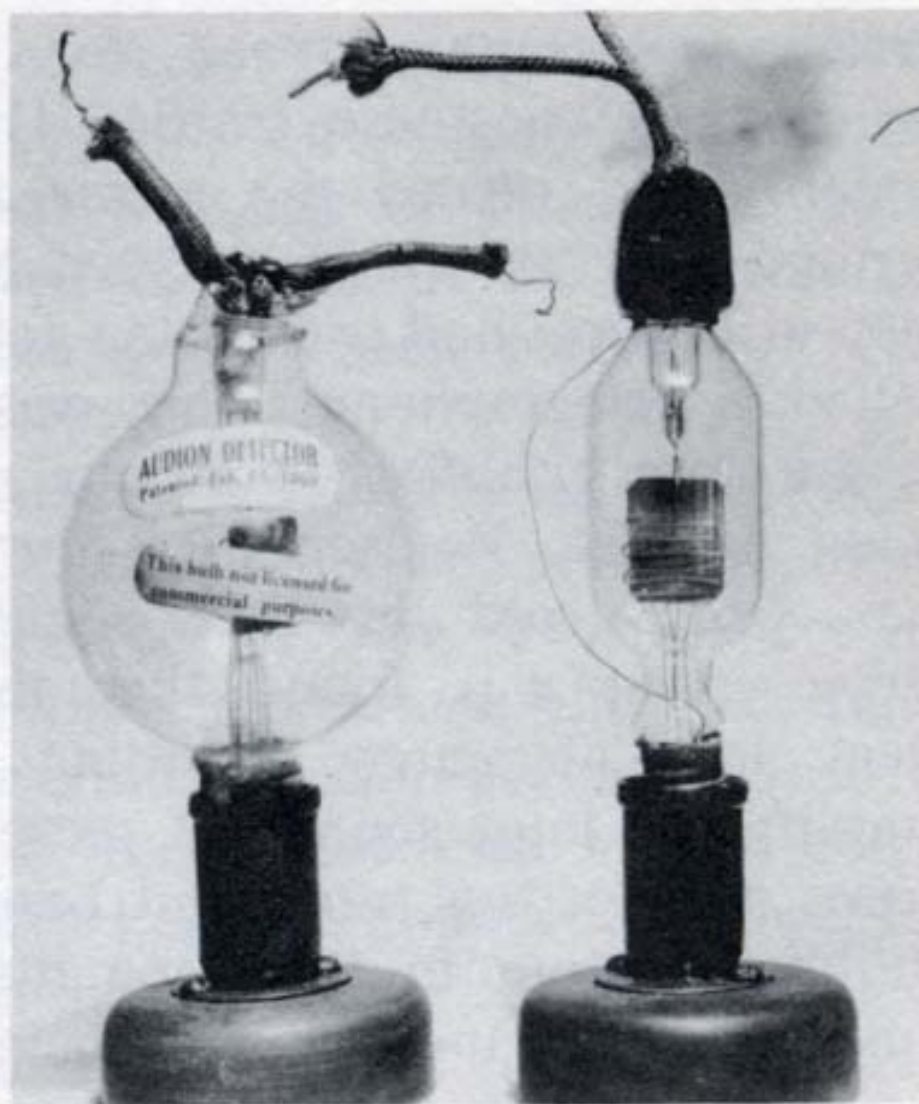
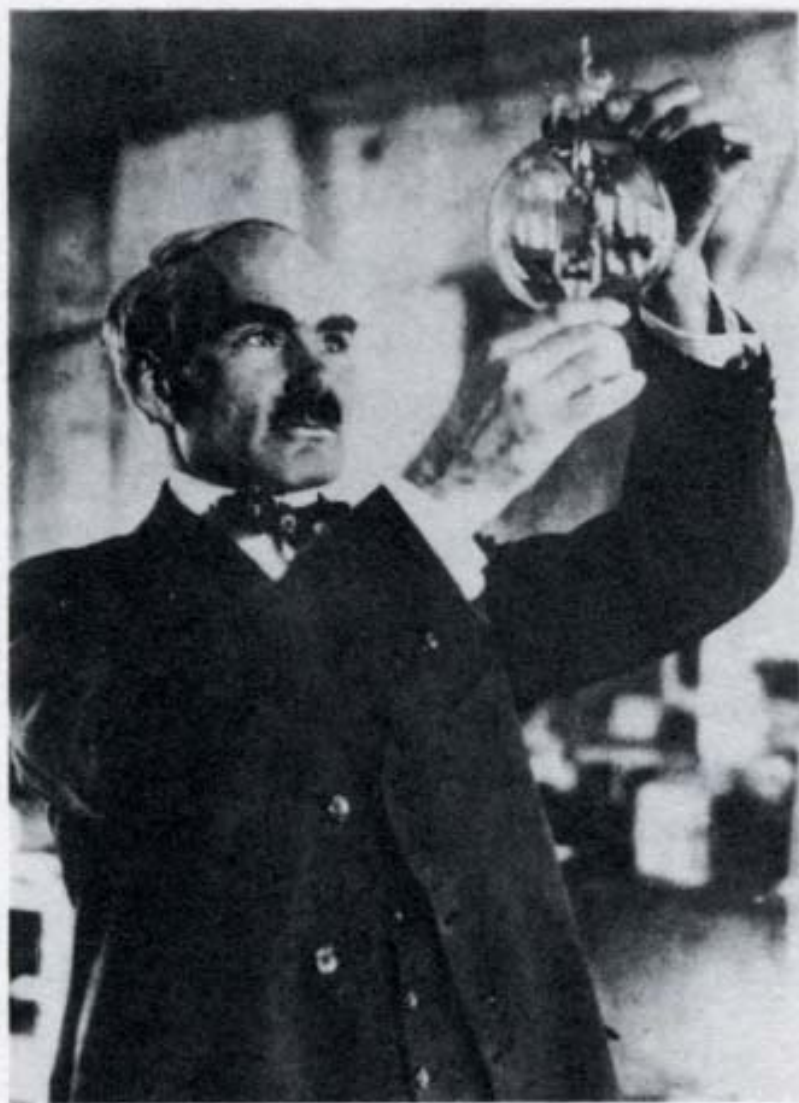


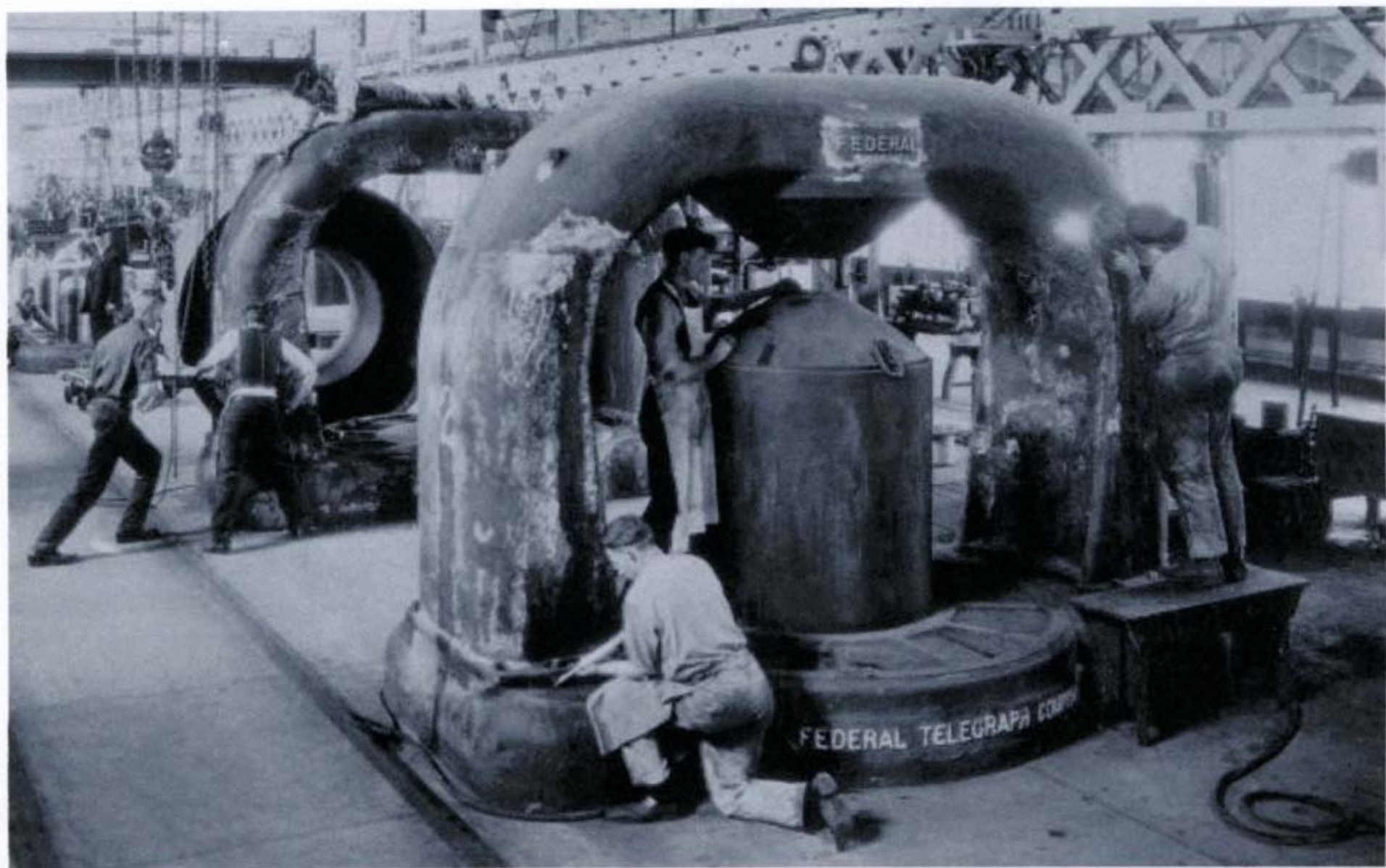
FIGURE 11-4. 30 KW Federal Telegraph arc transmitter with helix.

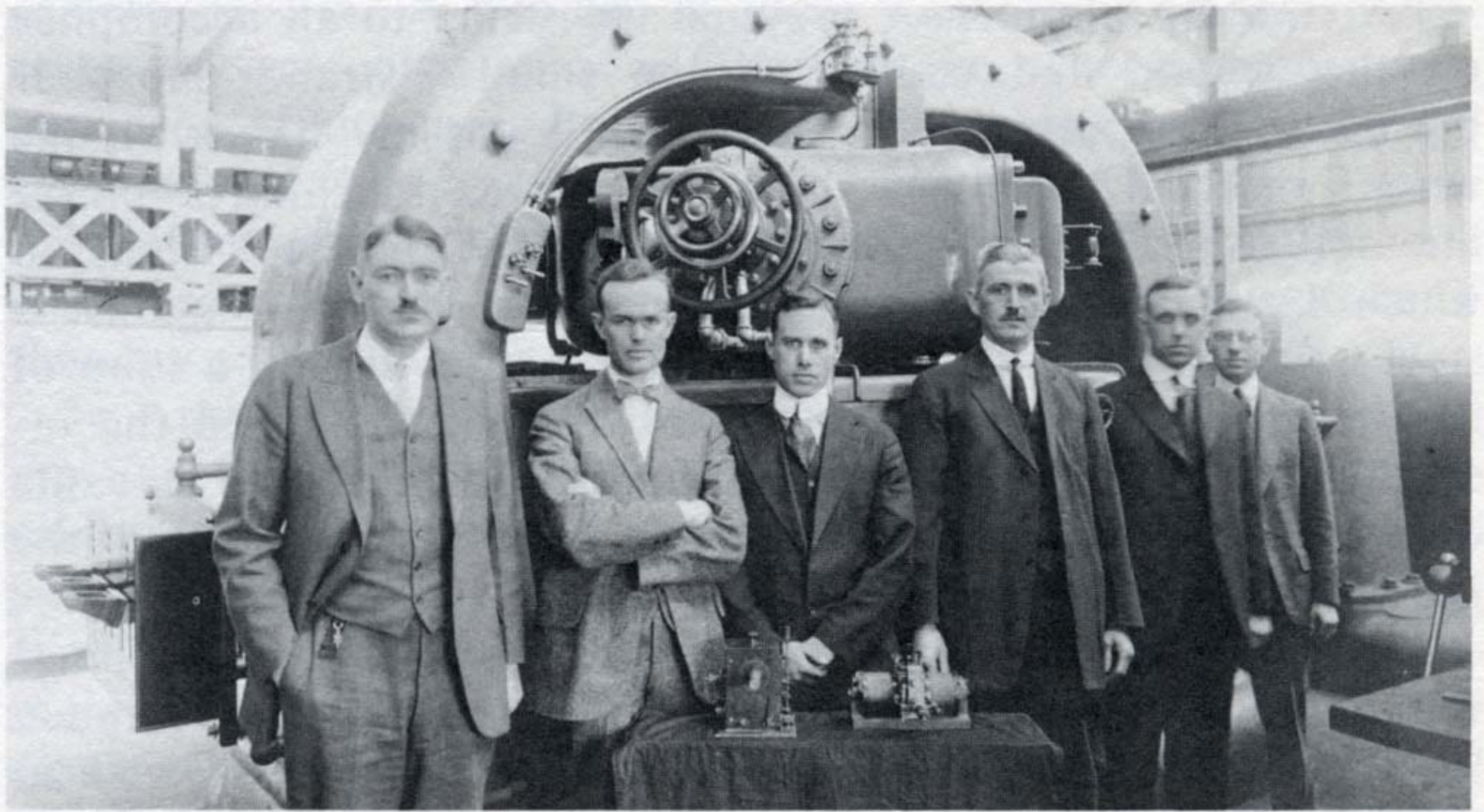


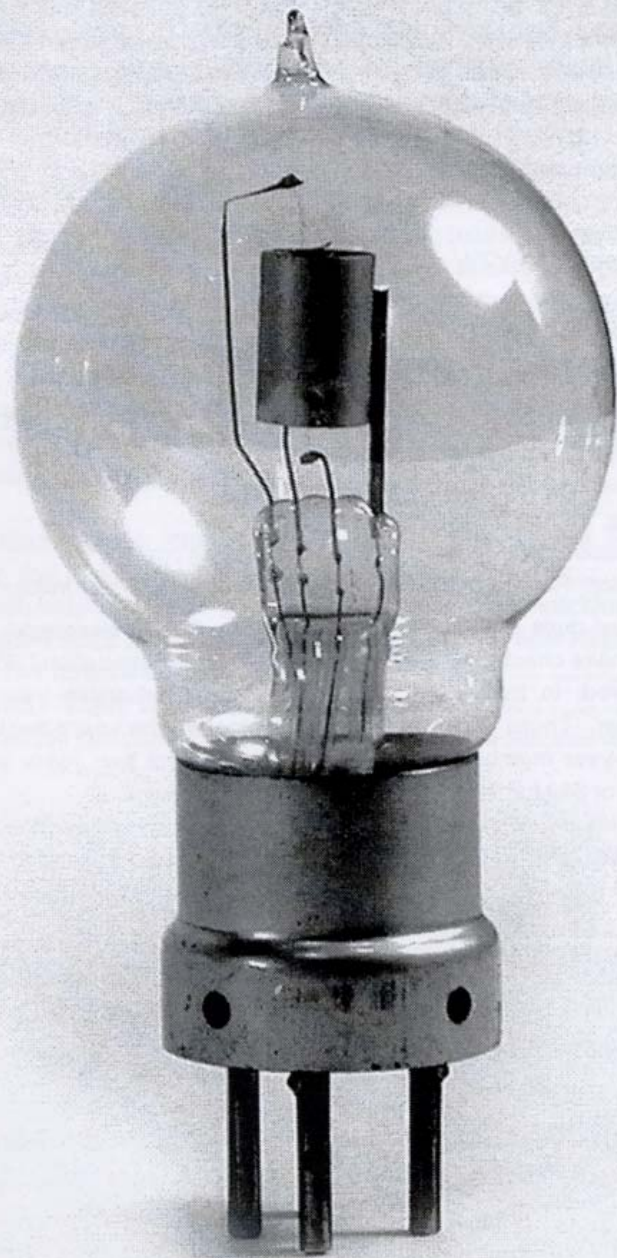
Lee de Forest, inventor of the triode, or radio tube. At right is his first tube. Important grid is the zigzag wire in front of the metal plate. Round bulb of second tube was used only because Lee's glass blower had them on hand. (About 3 inches high.)



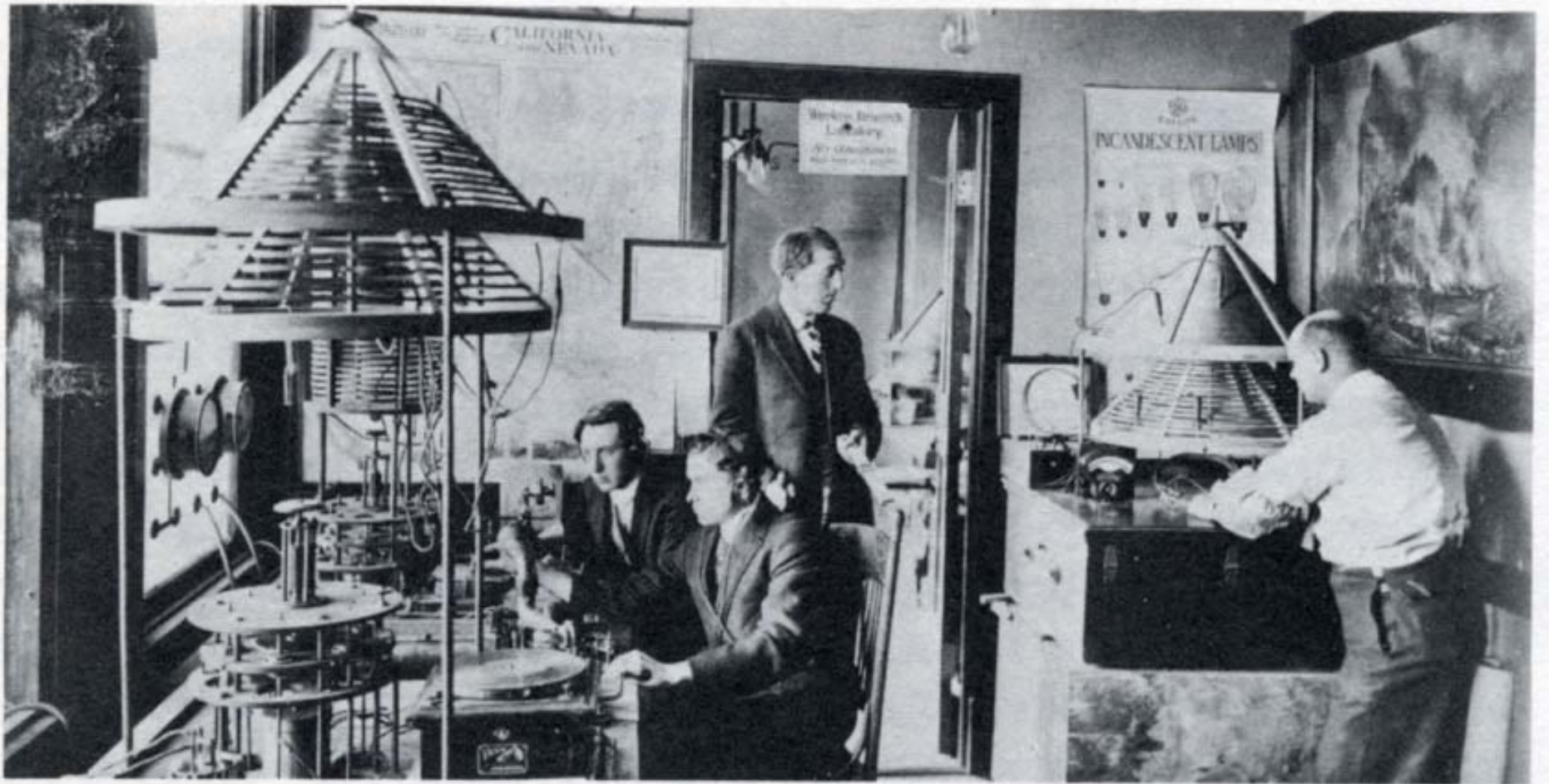
Federal Telegraph's Station Near Bordeaux





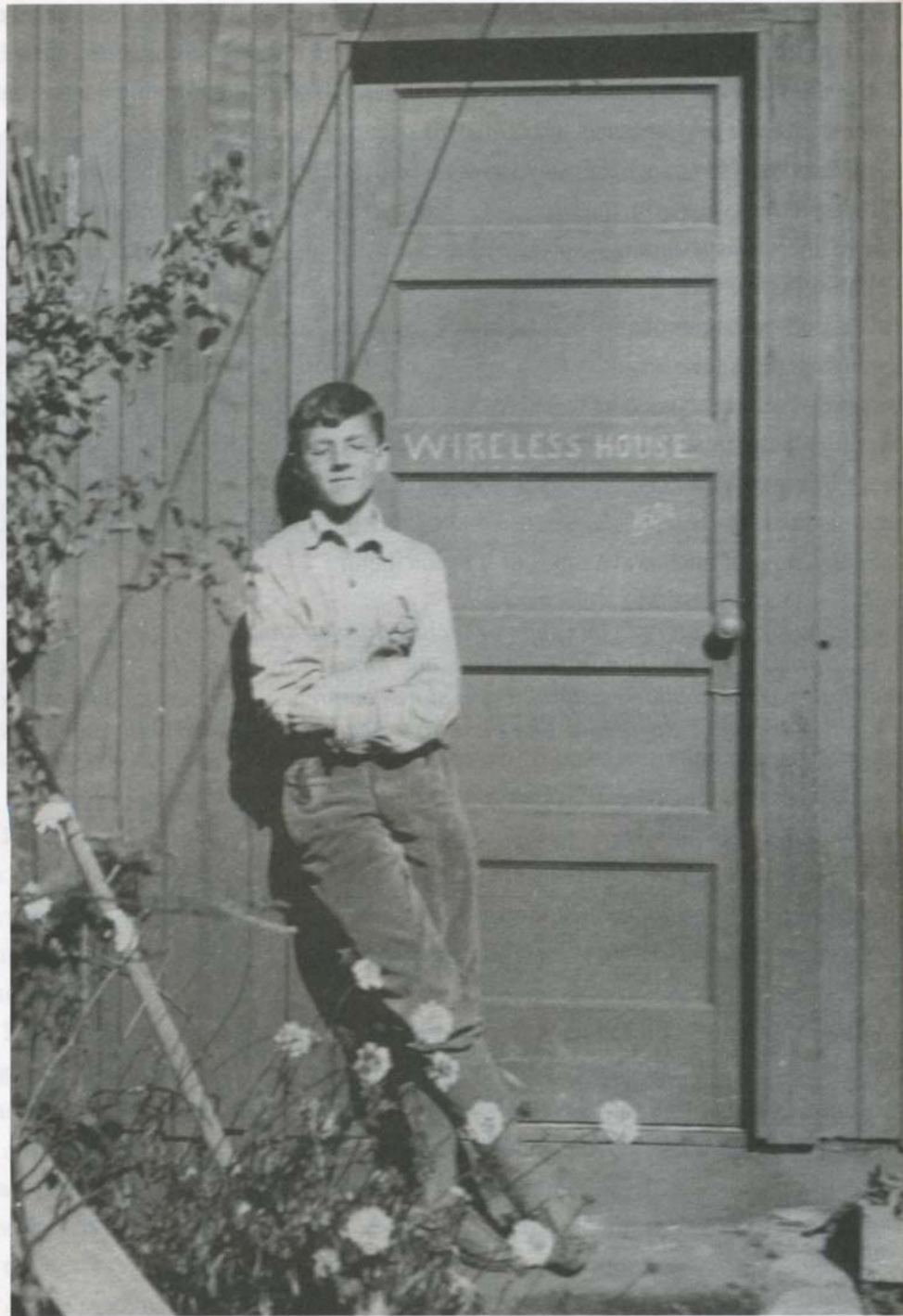


IN THIS ISSUE: THE MOORHEAD STORY



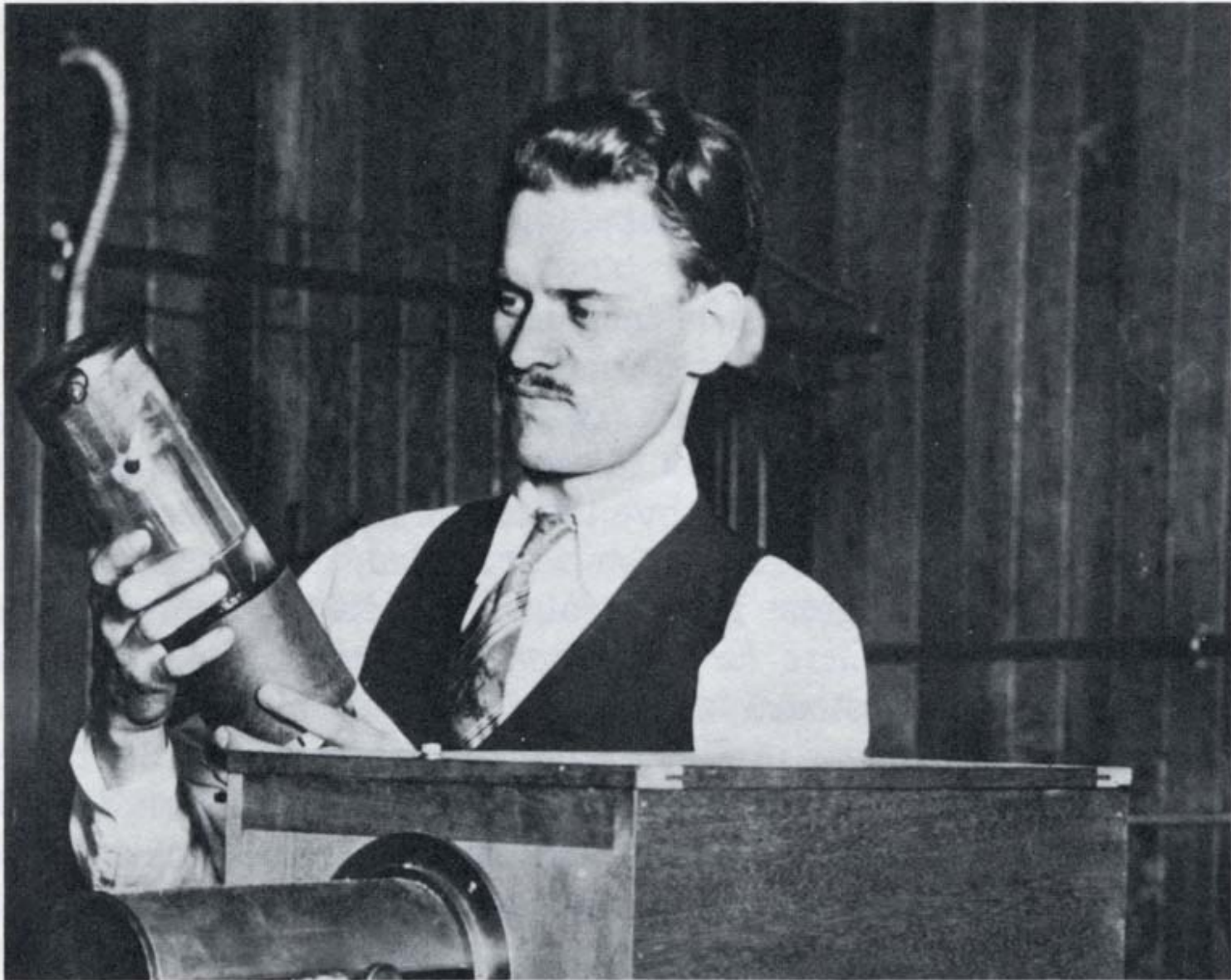
This first radio broadcasting station, built by Charles D. Herrold in San Jose, became KQW and is now KCBS. It has provided continuous service since its founding in 1909. Photo taken about 1913. (L to R) Kenneth Saunders, Emile Portal, Charles Herrold, and Frank Schmidt.





Charlie Litton and his ham shack (courtesy of Charlie Litton Jr. and Larry Litton)





Farnsworth holding the first successful electronic camera tube, the type used in the first all-electronic television transmission in San Francisco, 1927, and still used in laboratories today. Moustache was grown to offset his youthful appearance; he was 21.



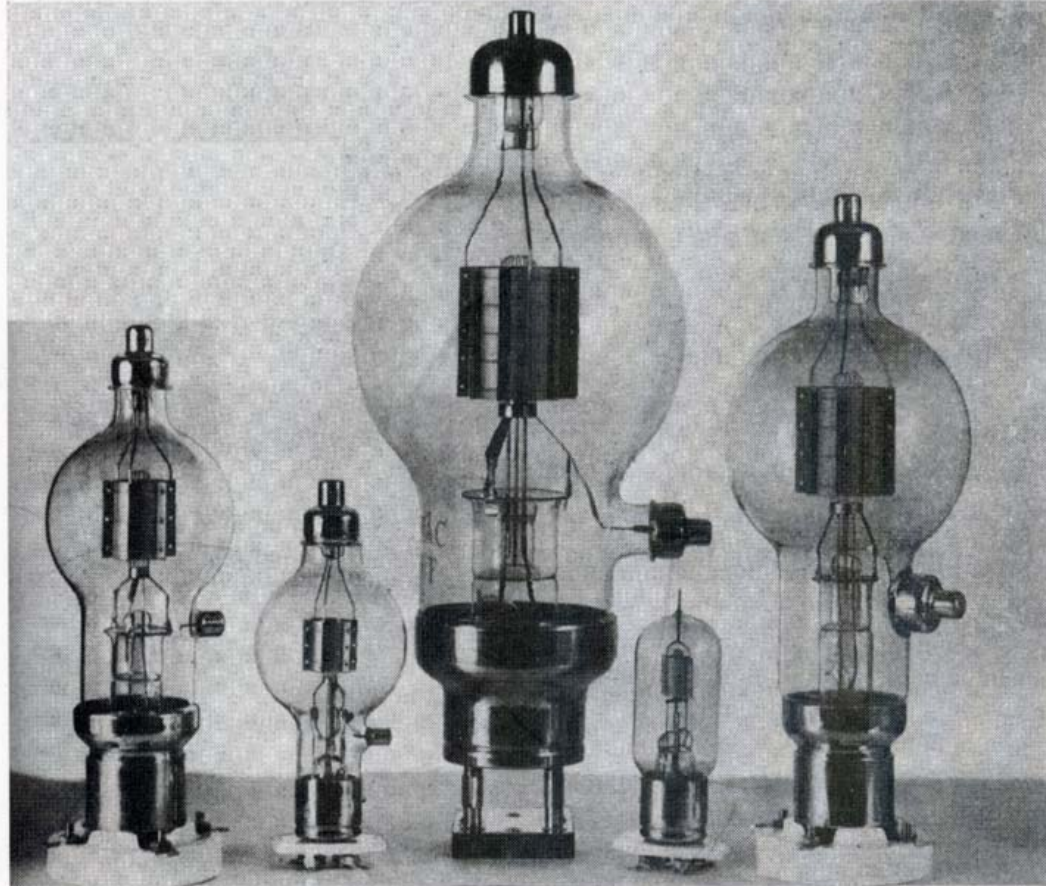




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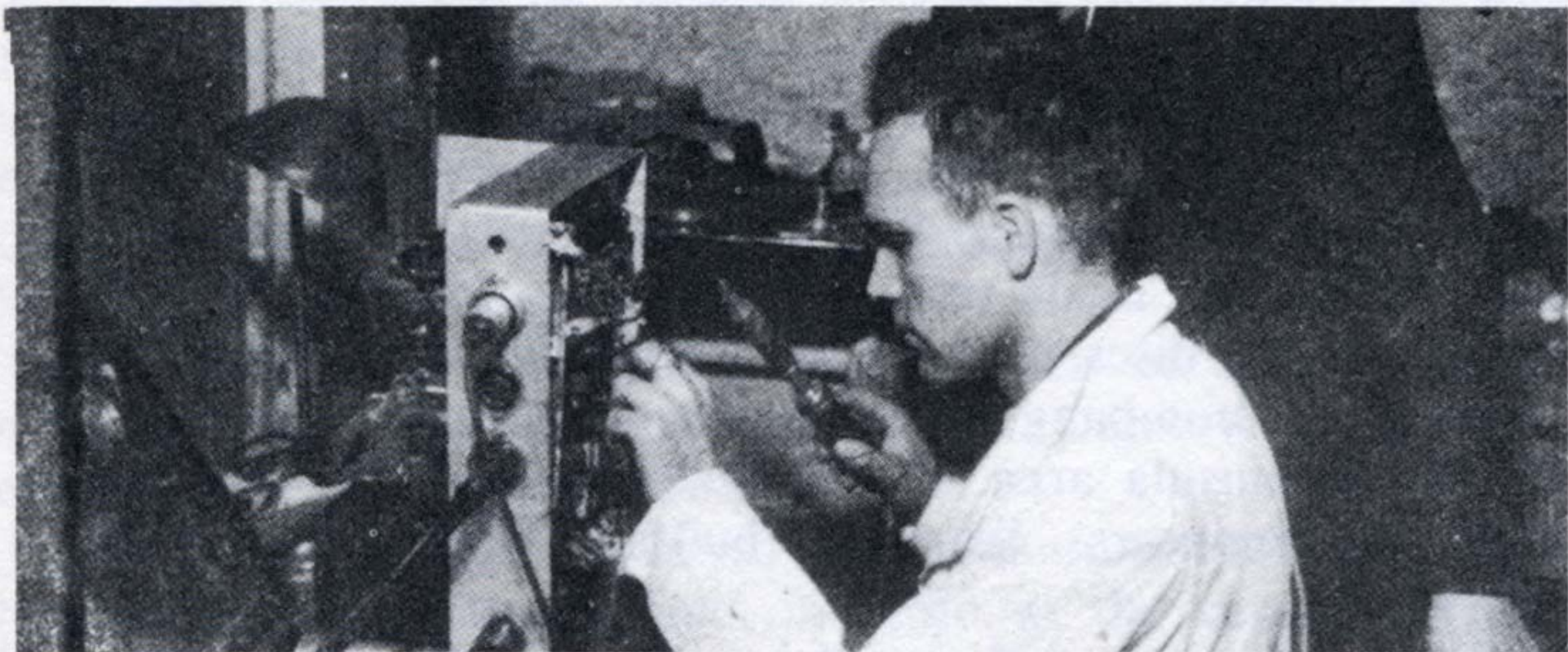
EITEL-McCULLOUGH, INC.

SAN BRUNO, CALIFORNIA
U. S. A.

CABLE "EIMAC"



Jack A. McCullough (left) and William W. Eitel with a power transmitting tube that was a forerunner of those which they produced for World War II radar. Eimac Inc. became a world leader in power tubes.

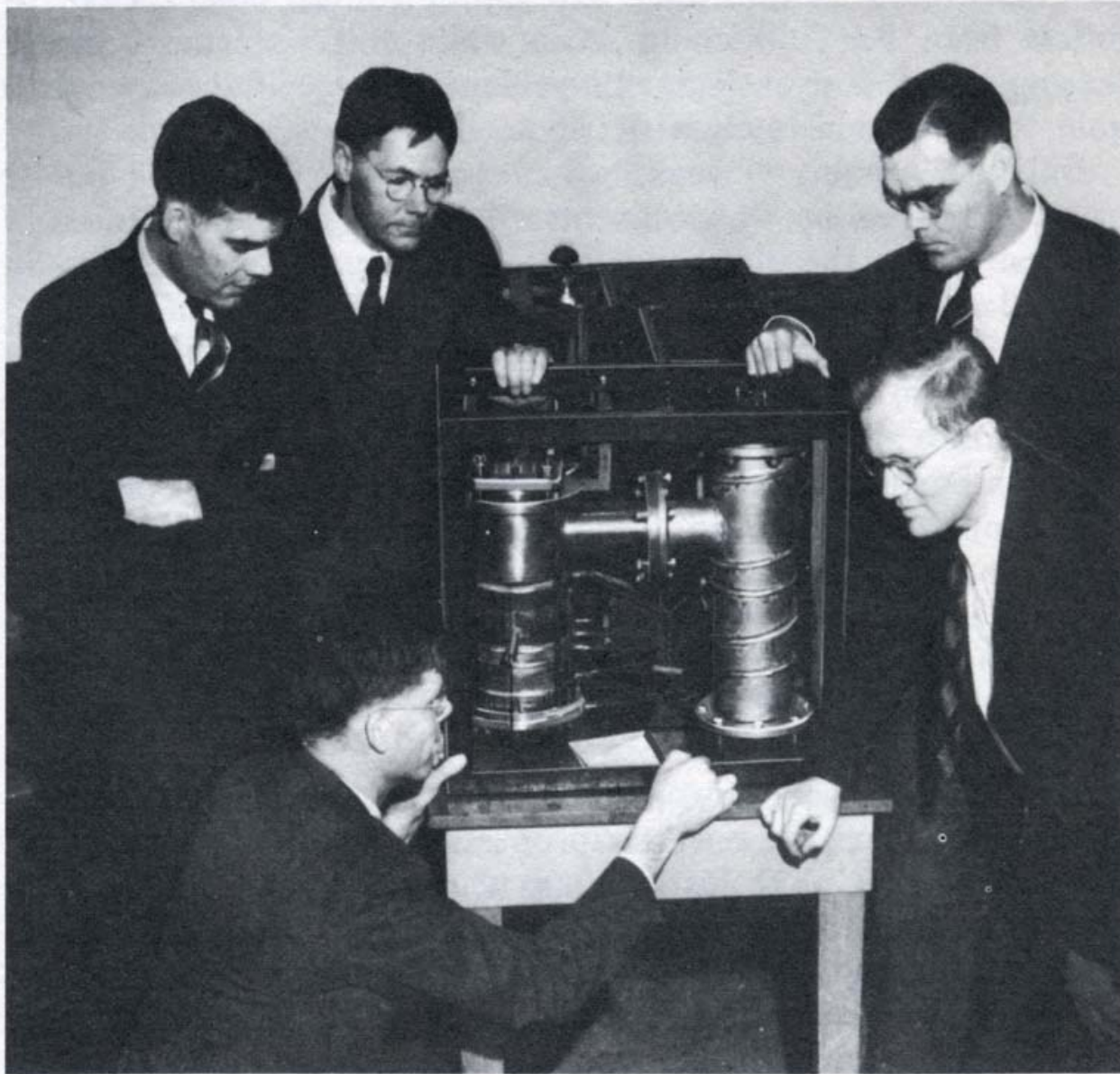


John M. Kaar with the amplifier of one of his first products, a machine to make phonograph records, built for Menlo School, Menlo Park, 1936.





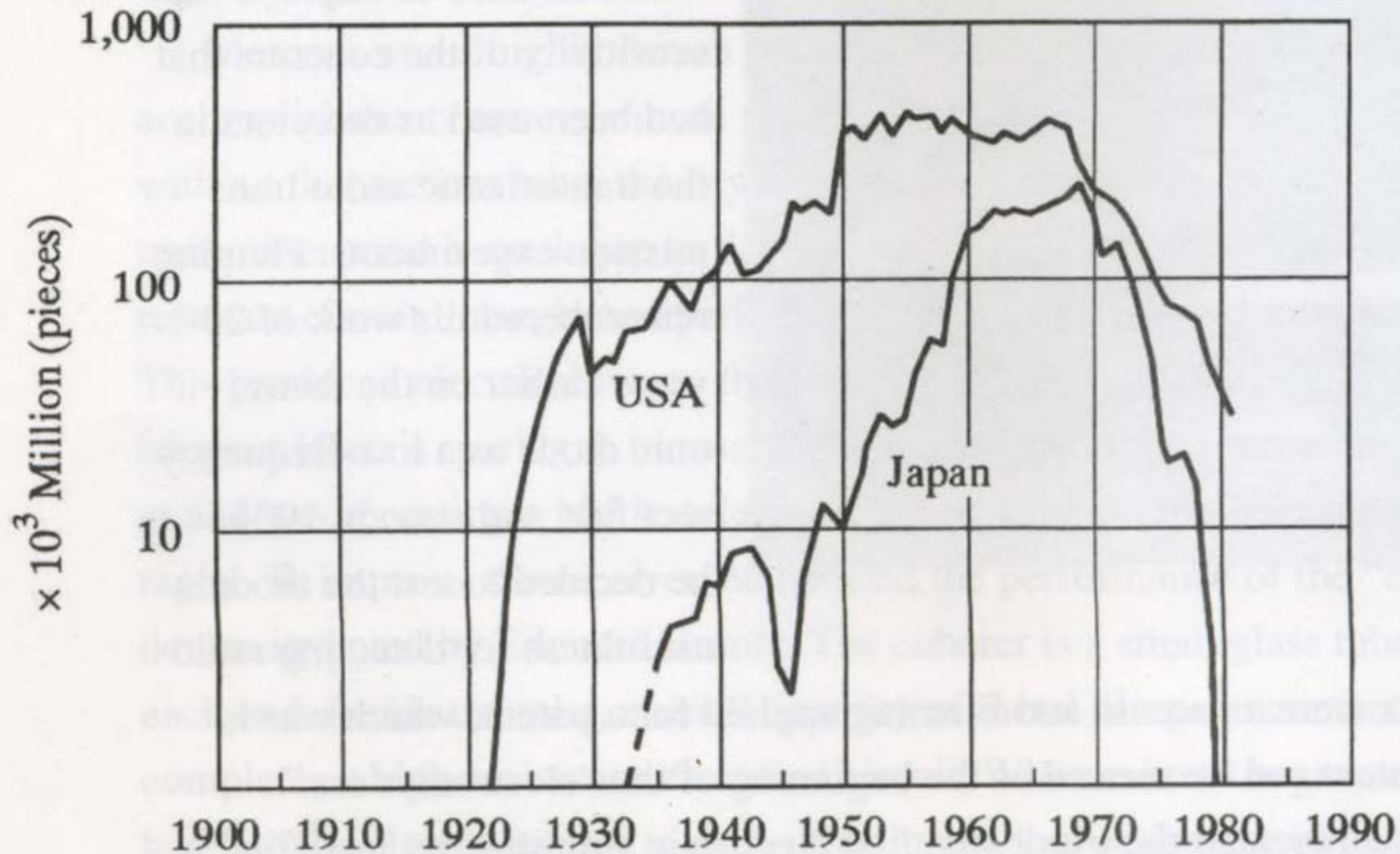
C



(Clockwise) Russell Varian (kneeling), Sigurd Varian, David Webster, William Hansen, John Woodyard, with early model of the klystron, revolutionary high frequency vacuum tube invented by the Varians and Hansen. Webster, head of Stanford physics department, and Woodyard, a graduate student, assisted in the development of early models.



Alexander M. Poniatoff, Russian-born engineer, founded Ampex Corp. and developed magnetic tape recording into a major industry in the United States. Recorder is special type used to tape impulses from instruments such as those measuring heartbeats of an astronaut.



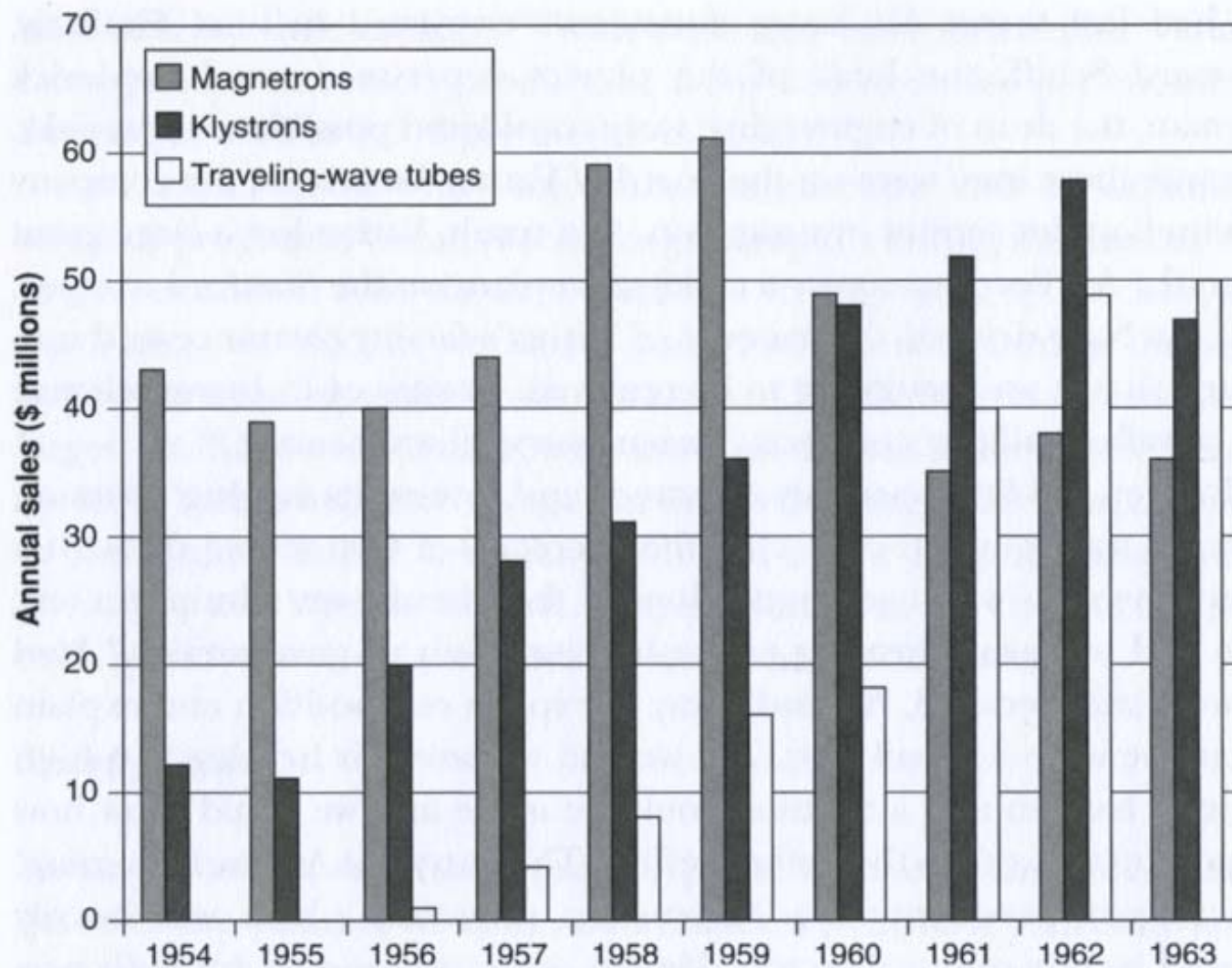


Figure 3.5

The market for microwave tubes, 1954–1963. Source: Edward Ginzton, speech at shareholders' meeting, February 20, 1964, folder: speeches 1960–1965, box 14-A, Edward Ginzton Papers, SC 330, Archives and Special Collections, Stanford University.

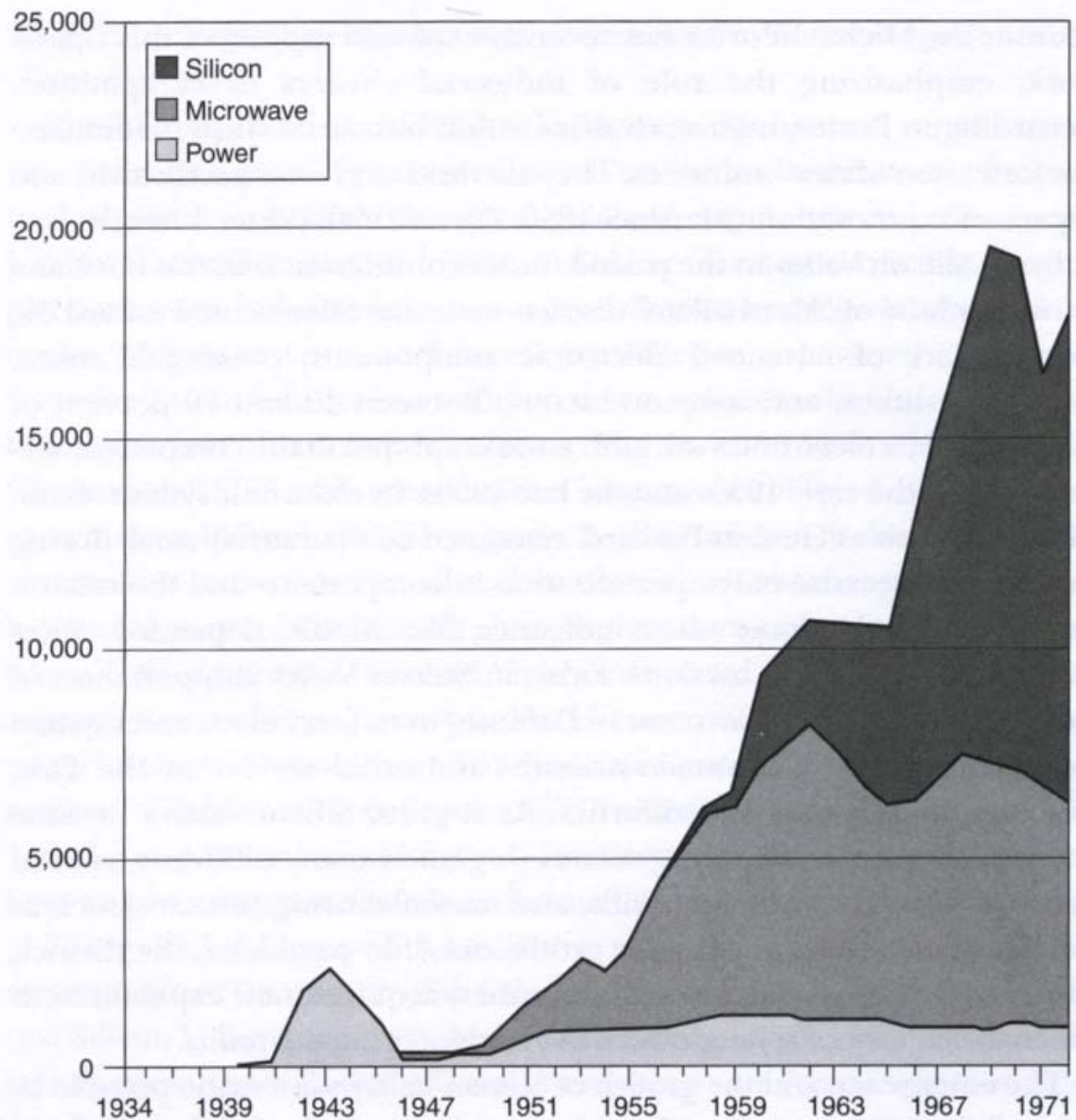
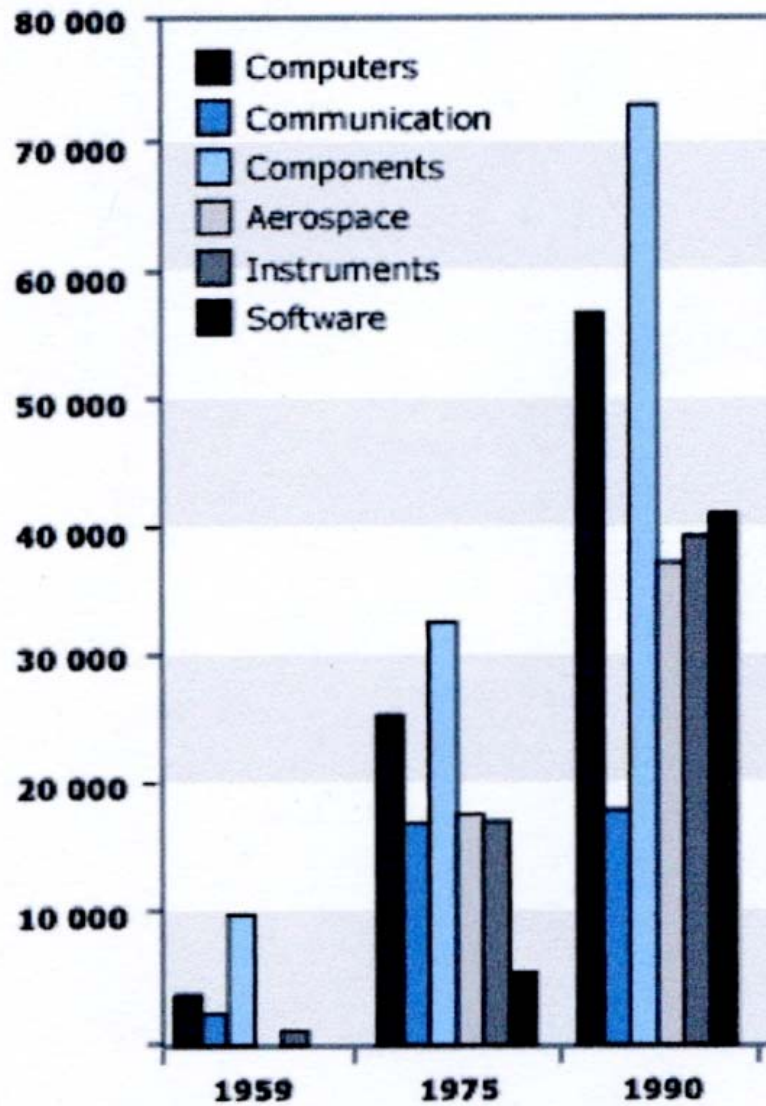


Figure I.1

Employment in manufacturing of electronic components (power-grid tubes, microwave tubes, and silicon components) in San Mateo and Santa Clara counties, 1934–1972. Source: Census of Manufactures.

High technology employment in Silicon Valley



Graph on employment in the Valley in 1959, 1975, and 1990.

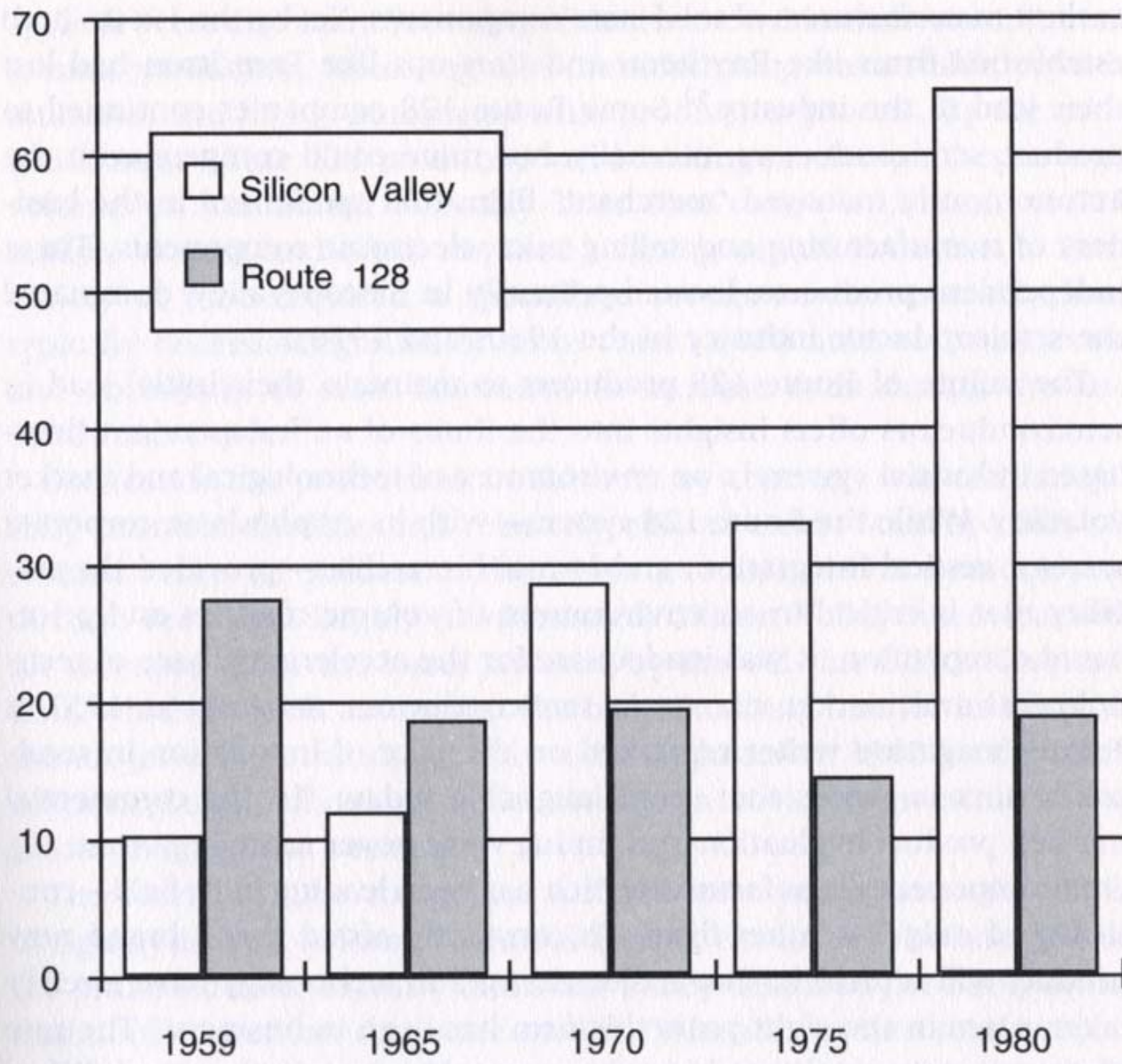


Figure 2. Employment in electronic components and semiconductor firms, Silicon Valley and Route 128, 1959–1980. Data from *County Business Patterns*.

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C. Stewart Gillmor
APS Meeting, 16 March 2009

Partial Bibliography

- Condon, Bill, “The Moorhead Story”, Tube Collector, vol. 5, no. 2, April 2003
 - Gillmor, C. Stewart, Fred Terman at Stanford, Stanford U. Press, 2004.
 - Kenny, Martin, ed., Understanding Silicon Valley, Stanford U. Press, 2000.
- Lee, Chung-Moon, William F. Miller, Marguerite Gong Hancock, and Henry S. Rowen, eds., The Silicon Valley Edge, Stanford U. Press, 2000.
 - Lécuyer, Christophe, Making Silicon Valley, MIT Press, 2006.
- Morgan, Jane, Electronics in the West, National Press Books, Palo Alto, CA, 1967.
- Pellow, David Naguib, and Lisa Sun-Hee Park, The Silicon Valley of Dreams, NYU Press 2002
 - Pond, Norman H., The Tube Guys, Russ Cochran Publishers, 2008.
 - Saxenian, AnnaLee, Regional Advantage, Harvard U Press, 1994.
- Sibley, Ludwell, “Eimac’s Magic Books”, Tube Collectors Special Publications No. 14, August, 2008.
- Veras, Joe, 50 Years of Amateur Radio Innovation, Pediment Publishing, 2008.