Stromberg-Carlson

A GENERAL DYNAMICS SUBSIDIARY

HISTORY OF S-C 1895 TO 1979

PRODUCED BY S-C

1979

A historical representation of the S-C company from its inception in 1895 to the then current time of 1979.

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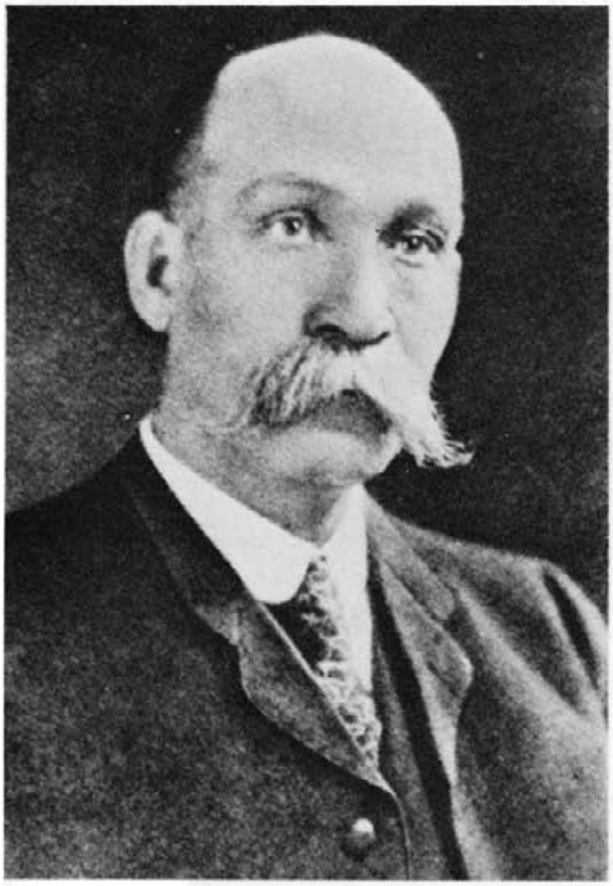
Adobe Document Produced by Mike Neale, Member of
Telephone Collectors International US
Antique Telephone Collectors Association US

For more information on these collecting organizations click on the logos:

Stromberg-Carlson

from the first telephone to the digital century



1. Androv Carlson.

2. Alfred Stromberg.

...the ability to converse

The beginning

In 600 BC, Thales of Miletus noted that briskly-rubbed amber (elektron) attracts and holds feathers or straw. Five and a half centuries later, Lucretius of Magnesia wrote that lodestone (magnes lithos) attracts and holds iron.

These ancients glimpsed the predawn light of the electrical age - an age that has already multiplied the intellectual power of a man a thousandfold more than the lever, his reach or the wheel, his stride. Until the 19th century, however, electricity was little more than a sideshow curiosity that sent mysterious tingles through the hands of the daring or made his hair stand ludicrously on end.

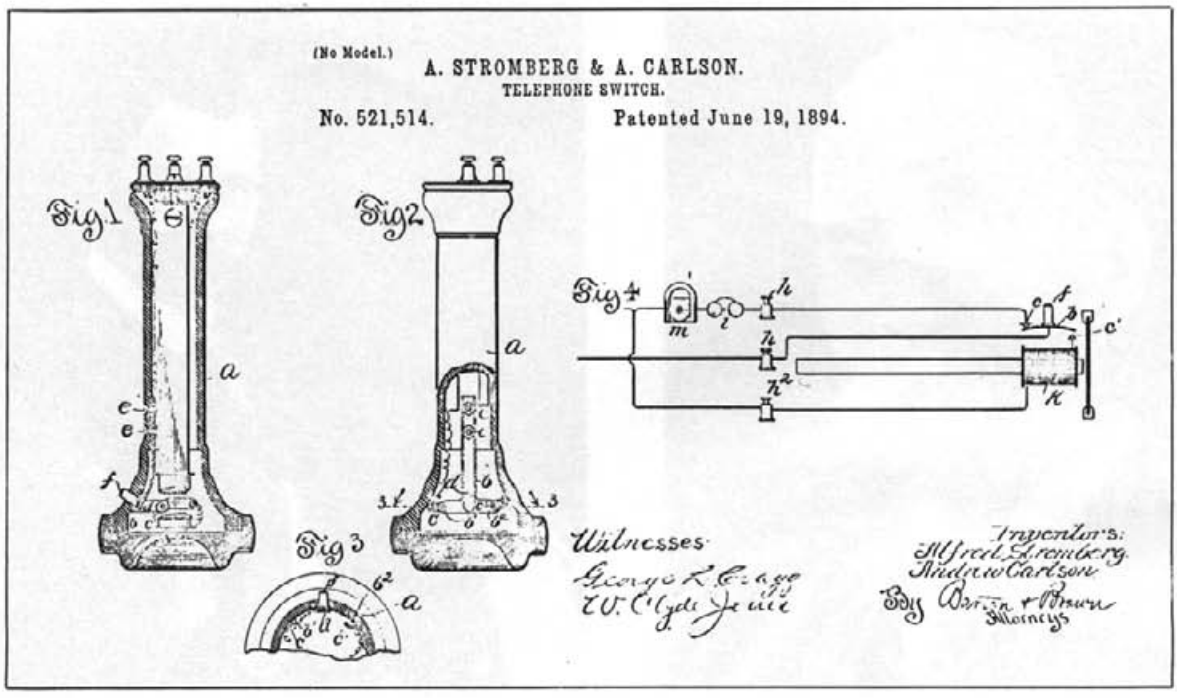
Then the bits and pieces of knowledge began falling into place. Scientists - now illustrious - probed electricity's secrets, deduced its laws and, ultimately, gave their names to its characteristics: Coulomb, Ampere, Volta, Faraday, Galvani, Gauss, Hertz . . .

Practical inventors sensed fortunes waiting in the power of electricity to traverse great distances instantaneously. The public was, however, skeptical, and often superstitiously opposed to science.

In 1843, Samuel Morse despaired while the twenty-seventh Congress almost funded mesmerism in the same bill authorizing $30,000 for his electromagnetic telegraph system between Washington and Baltimore. Yet within 10 years, more than 30,000 miles of telegraph line linked the United States. Within 25 years, WESTERN UNION was fast becoming a household word.

Alexander Graham Bell, striving to improve the telegraph, discovered the principle of the telephone in 1874. It was an awesome discovery. It gave man his first personal share in the hitherto unshared prerogative of deity - the ability to converse in many distant places at the same time.

And it founded the industry of which Stromberg-Carlson is an inseparable part.



(No Model.)

A. STROMBERG & A. CARLSON.

TELEPHONE SWITCH.

No. 521,514. Patented June 19, 1894.

Fig 1

Fig 2

Fig 3

Fig 4

Witnesses

Inventors:

Alfred Stromberg.

Androw Carlson

By Baxter & Brown

Attorneys

3. An early Stromberg-Carlson patent.

4

[JANUARY 8, 1887.

THE AMERICAN BELL TELEPHONE CO.

95 MILK ST., BOSTON, MASS.

This Company owns the Letters Patent granted to Alexander Graham Bell, March 7th, 1876, No. 174,465, and January 30th, 1877, No. 186,787.

The transmission of Speech by all known forms of Electric Speaking Telephones infringes the right secured to this Company by the above patents, and renders each individual user of telephones not furnished by it or its licensees responsible for such unlawful use, and all the consequences thereof, and liable to suit therefor.

5

4,5 By the 1890's telephony had become a big business (4). The importance of the telephone was shown by persistent attempts in early years to break the Bell monopoly (5). Independents sprang up even before patents ran out in 1890's, were serviced by independent supply companies.

Stromberg-Carlson

Electricity again, flowing over a wire and varied in intensity by the human voice, was the simple principle of the telephone. Alexander Graham Bell patented the first practical telephone in 1876 and the Bell interests did most to develop it. Yet the independent telephone industry, which sprang up after the expiration of the Bell patents in 1893 and 1894, was responsible for many basic improvements in telephony; the dial system, for example. It was the independent companies which brought the telephone to rural areas. Later, entering the cities, they offered stiff competition to the Bell system. Stromberg-Carlson grew out of the independent movement and is still serving it today.

The expiration of the Bell patents brought a veritable stampede to organize independent companies. About thirty manufacturing concerns also sprang up to service them—since Bell, fighting hard to hold its market, refused to sell equipment to its rivals. Among these equipment manufacturers was Stromberg-Carlson.

Alfred Stromberg was born in Sweden in 1861 and had been associated with L. M. Ericsson, Sweden's telephone pioneer. Stromberg came to the United States in 1884 to work with the Chicago Bell Telephone Company. Here he had met the earnest, hardworking Androv Carlson, a fellow countryman. Determined to manufacture a "better telephone," Alfred Stromberg and Androv Carlson had formed a partnership in 1894, each contributing $500 to the venture. The next year they organized their own company with a capital of $50,000. In 1896, the two ambitious young engineers moved into a machine shop in Chicago's Springer Building and went to work.

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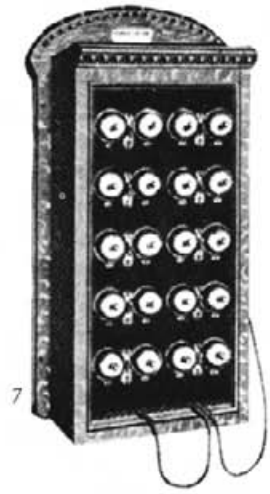

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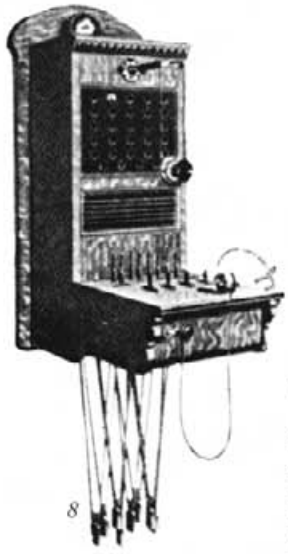


8

6-8 Stromberg-Carlson's 1901 "Country Party Line" Telephone (6) Switchboard (7) and "Village Exchange Switchboard"(8).

9 William Jennings Bryan in 1896 spoke for embattled farmers and "free silver."

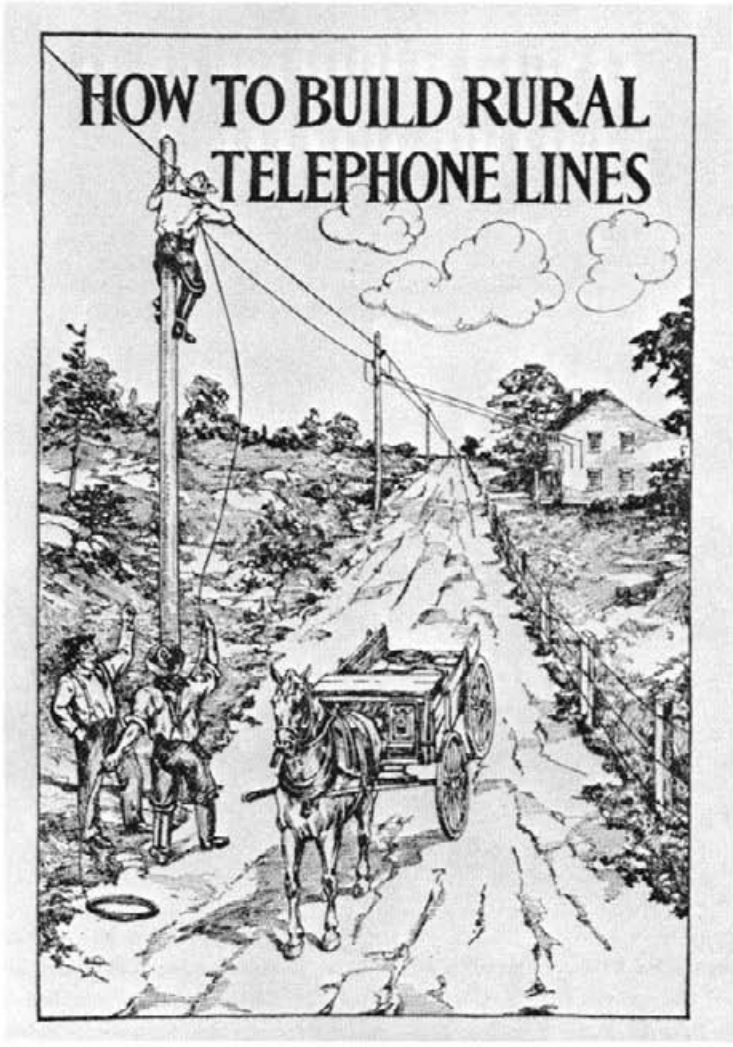
The Farmer's Telephone

The first two years of the new company were hard ones. During the McKinley-Bryan campaign of 1896, the country was sunk in depression and the agrarian Midwest was in ferment. By election time of that year, Stromberg-Carlson's employment had fallen from fourteen employees to nine. The little company might have gone under had it not been for the tireless energy of Alfred Stromberg, and the patient skill of his partner. "Carlson spent most of his time working out the apparatus in the shop," recalled one employee, "but Stromberg was usually out finding customers." The partners, above all, had produced a superior telephone, a magneto-operated transmitter and receiver designed along Swedish lines, which successfully avoided the infringement of existing patents. With its "wonderfully sensitive" transmission of sound (largely the work of Androv Carlson) the Stromberg-Carlson telephone proved ideally suited to the farmers' needs and soon became known as the "Farmer's Telephone." Listening through it, a farmer, it was said, could hear not only the conversation in his neighbor's house but even the crowing of roosters and the grunts of pigs outside the door.

Although described as a "staunch Republican," Stromberg's earliest support came from the farmers of the Midwest whose protest had lent strength to Bryan and the Democrats in 1896. For the farmer—perennially in depression, strongly opposed to moneyed interests of the East—was beginning to appreciate the luxuries and conveniences of modern industrial society. And the telephone proved to be a major factor in breaking down the harsh isolation of rural life.

Since Bell, content with its lucrative city market, would not help them, the farmers began to create their own telephone service, using equipment supplied by independent manufacturers like Stromberg-Carlson. Forming mutual telephone-line associations, rural communities would string their own wire along public highways, connecting twenty or more telephones on a single grounded circuit and calling one another by means of a series of long and short rings. Some early systems used the barbed wire fences, uninsulated, of course, thus dispensing with wires and poles—and with service, too, when it rained. Stromberg-Carlson's chief business in its early years was supplying the equipment for these rural systems.

Farm lines developed into independent companies as subscribers felt the need to link their lines with those of other districts and talk to "town." This meant switchboards. Mutual companies were formed to purchase and operate them. Smaller exchanges would be installed, perhaps, in the general store of the nearest town where the storekeeper could "mind" the board between customers. In larger towns independent companies often set up their own facilities in rivalry with the local Bell exchange. This is how Stromberg-Carlson, specializing in rural equipment, got into the business of making larger and larger town switchboards. Here, too, was the origin of the intense competition and duplicating service between two or more companies in one city, a situation which plagued telephony in the United States for a quarter century. "We have both phones," ran the advertisements of local merchants, faced with the headache of competing exchanges.



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10, 11 The independent telephone movement grew up in the Midwest, got its start in rural areas, later expanded into towns. Independent manufacturers supplied not only rural equipment like Stromberg-Carlson's 1901 "Country Party Line" telephone and switchboard and "Village Exchange Switchboard" but also instructions on how to set up companies, build rural lines.

The Chicago period

By the turn of the century, Stromberg-Carlson had become a leader in the independent field. Not only was it supplying large central exchanges to cities like Kansas City or Savannah but it was also branching out into the manufacture of such specialized equipment as hotel, police, desk and street-railway phones. Stromberg-Carlson equipment, for instance, served the brokers at Chicago's great Board of Trade. The company moved first into a floor of Chicago's Dunn Building, and then bought the entire building and an annex next door. By 1902 Stromberg-Carlson was employing about 1200 workmen and sales were almost $3,000,000 a year. There were good reasons for the company's rapid success. In the early, chaotic days of the independent movement Stromberg-Carlson had been most careful to avoid the common practice of infringing patents. While this ethical restraint put the company at a competitive disadvantage, it kept it clear of endless expensive litigation. Moreover, Stromberg and Carlson insisted on stabilizing prices and publishing them at a time when most of the other manufacturers were engaged in ruinous price wars. These painfully honest practices gave Stromberg-Carlson, in the long run, the decided advantage of a reputation for integrity.

But Stromberg-Carlson's success could be ascribed above all to its emphasis upon quality of workmanship. A passage in the 1898 catalogue was no idle boast:

We want it distinctly understood in the beginning that we recognize no rivals to our telephone in respect of workmanship, durability, design, or efficiency... We know our business, and we know that it is not every Handy Andy who can make a telephone of this kind... We intend to control our share of [the] business by virtue of absolute merit...

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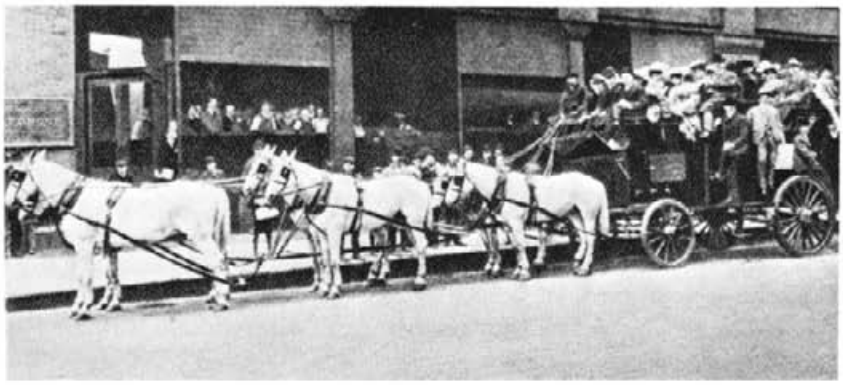

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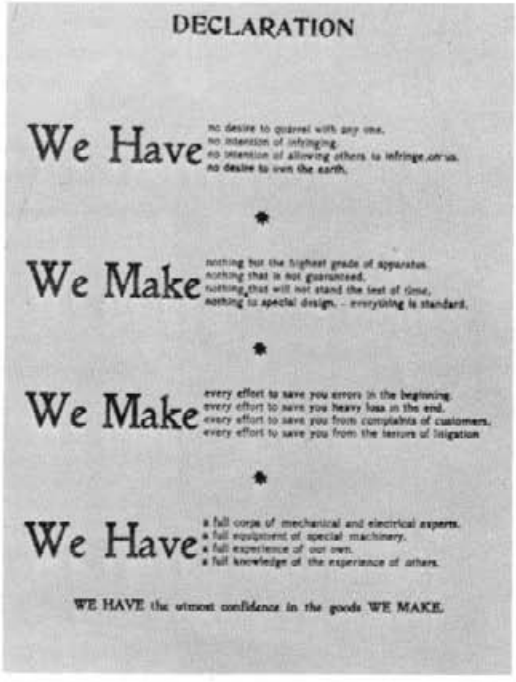
As late as 1900 every detail of Stromberg-Carlson's operation was being carried out under the supervision of the founders. According to the 1898 catalogue they "possessed that peculiar inventive genius, mechanical dexterity, and care . . . that make the Swedish name almost equal to the Yankee for ingenious contrivances, while surpassing it for workmanship and thorough construction." "Alfred Stromberg," a friend recalled, "is the most remarkable man I have ever known... His life is wrapped up in his enterprise, and . . . he has constantly developed with the growth of his business interests." The potential of the company seemed impressive. "There is no question now that independent companies are in the field to stay," the 1898 catalogue declared, "and that there is an enormous business to be done along lines that the Bell Company cannot and will not follow."

The Bell Company did not agree. It went through a complete reorganization in 1900 which placed the newly created American Telephone & Telegraph Company at the top of a nationwide organization, with Western Electric as its manufacturing arm. Thereafter, competition between Bell and the independents grew more intense. Rate-cutting and litigation continued into the 1920's, when the two antagonists finally came to terms. This conflict resulted also in considerable inconvenience and expense to subscribers. The experience of Rochester, New York, was typical where, in 1899, the city's leading businessmen set up the Home Telephone Company with equipment from Stromberg-Carlson to compete with the city's Bell company. This cumbersome "dual service" lasted until 1921.



DECLARATION

We Have
no desire to quarrel with any one,
no intention of infringing,
no intention of allowing others to infringe on us,
no desire to own the earth.

We Make
nothing but the highest grade of apparatus,
nothing that is not guaranteed,
nothing that will not stand the test of time,
nothing to special design, - everything is standard.

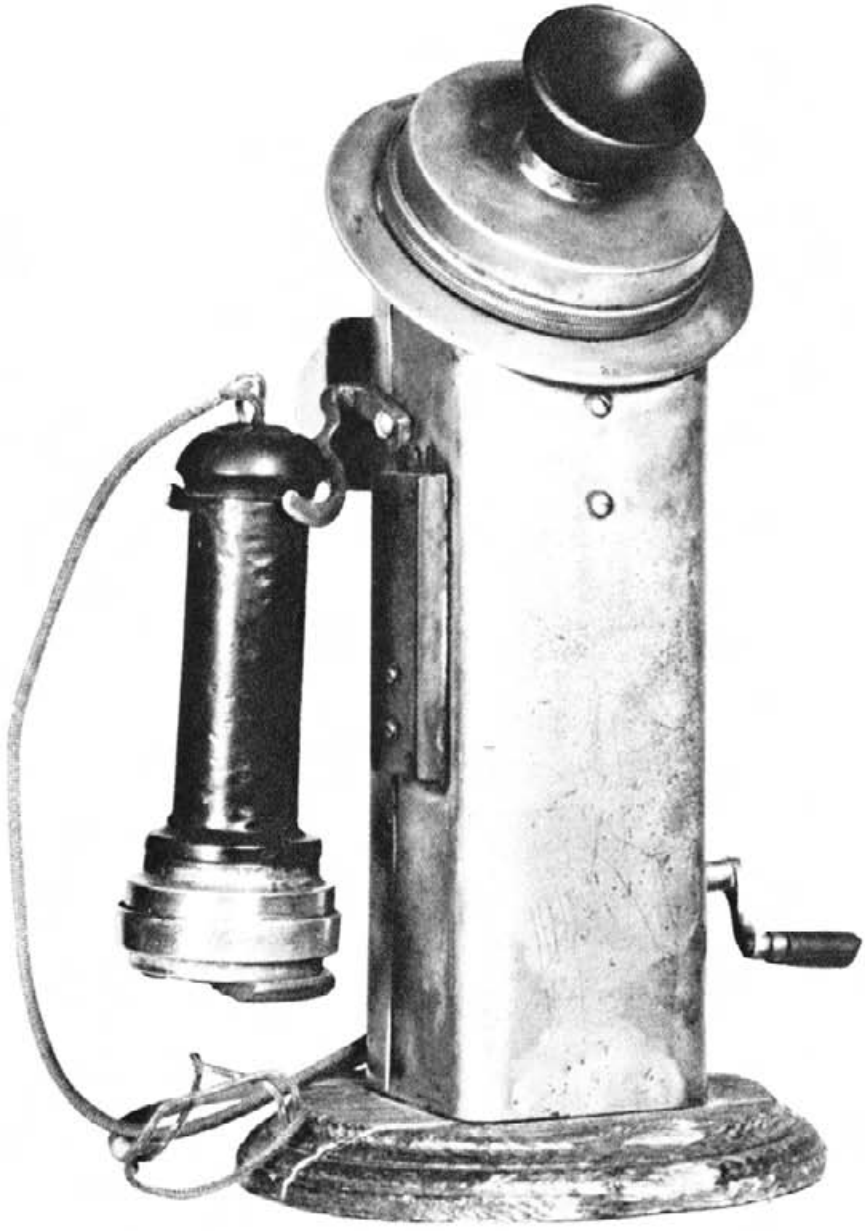
We Make
every effort to save you errors in the beginning,
every effort to save you heavy loss in the end,
every effort to save you from complaints of customers,
every effort to save you from the terrors of litigation.

We Have
a full corps of mechanical and electrical experts,
a full equipment of special machinery,
a full experience of our own,
a full knowledge of the experience of others.

WE HAVE the utmost confidence in the goods WE MAKE.

14

12-14 Extravagant-sounding claims in Stromberg-Carlson's 1898 catalogue (14) were actually close to the truth, formed basis for company's quick success, enabling it to buy entire Dunn Building on Jackson Boulevard in 1900 (12). A group of its 1000 or more employees is shown in front of the main office in a contemporary photograph (13).



15 Stromberg-Carlson's first telephone, developed in 1894, was a magneto-operated transmitter and receiver designed along Swedish lines. This telephone successfully avoided the infringement of existing patents.

16 President McKinley at Buffalo's Pan American Exposition, just before shooting.

The World.

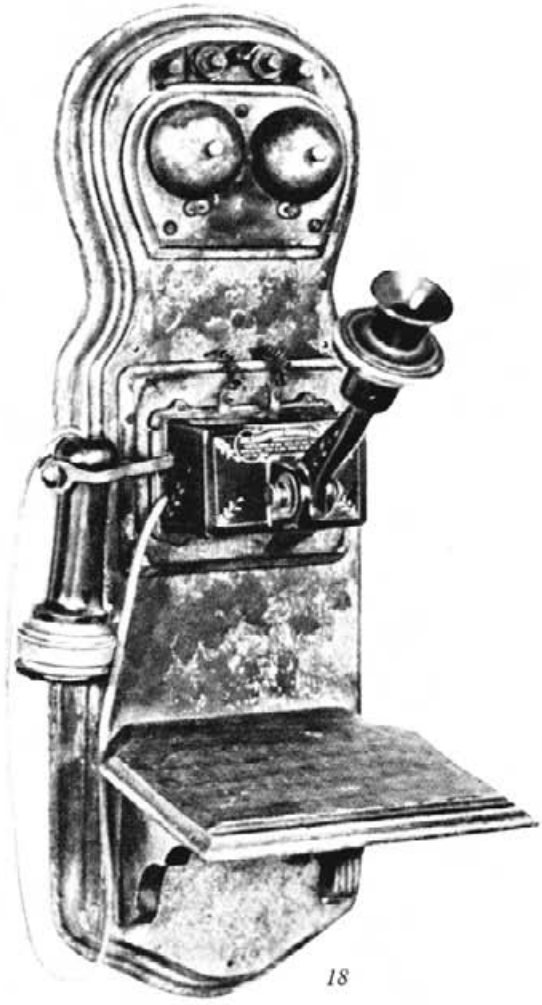
M'KINLEY SHOT; CONDITION CRITICAL; ASSAILANT CONFESSES; 7 ARRESTS.

"I AM AN ANARCHIST."
CZOLGOSZ'S FIRST WORDS.

PRESIDENT WILLIAM M'KINLEY.

THE LATEST BULLETIN.

17



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16-18 When President McKinley was shot (16,17) on September 6, 1901, a Stromberg-Carlson telephone (18), afterwards preserved as relic, was used to summon ambulance. McKinley died September 14.

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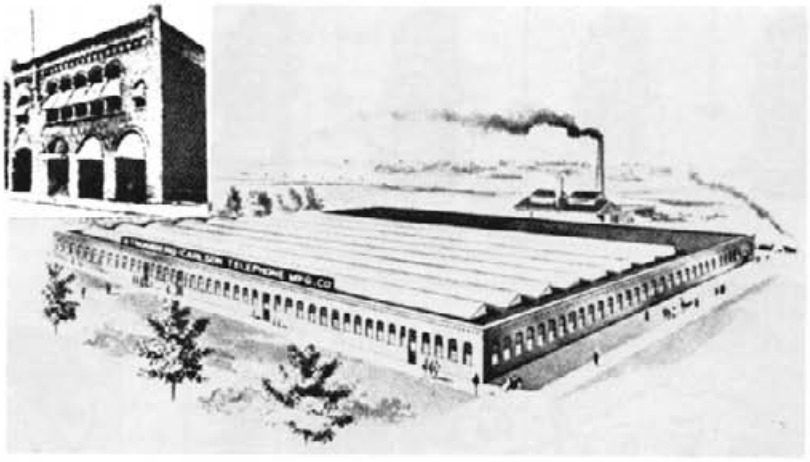

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19-22 Stromberg-Carlson built large exchanges for such cities as Rochester (19) and Louisville (20). Company moved from Chicago to new Rochester plant (21). State Street, Rochester, N.Y. in 1904 (22).

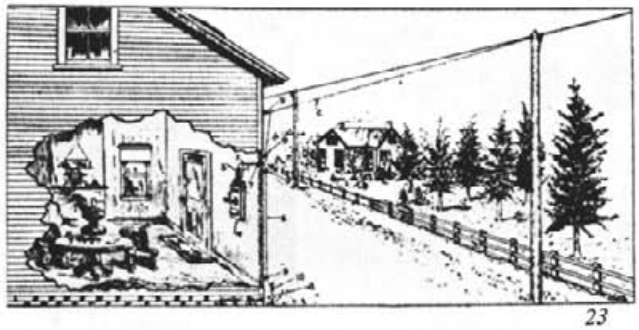
The move to Rochester

The Home Telephone Company of Rochester quickly became one of the largest of the independents. Well satisfied with its Stromberg-Carlson equipment, it heard that Western Electric had bought up one of the largest of the independent manufacturers. Fearing that Stromberg-Carlson, its main source of equipment, might go next, Home sent two of its officials to Chicago to negotiate for the purchase of Stromberg-Carlson. Their terms must have been advantageous. The two founders sold effective control of their company to Home Telephone, although they retained an interest in the new Stromberg-Carlson Telephone Manufacturing Company, which was organized in Rochester in 1902 with Alfred Stromberg as its vice-president.

In 1902 Stromberg-Carlson began to manufacture telephone cable in a new factory built on a ten-acre plot on the outskirts of Rochester. An old-time employee remembered the earliest days in Rochester:

There were many more girls than men in the plant in those days, perhaps 40 men and over 200 girls but Minne Maurhofer is the only one left of the crowd that used to raid Smith's apple orchard at noon hour and then return to share their plunder with the boys... We had a whole hour at noon then and every day there were ball games, or jumping contests and even an occasional game of duck on the rock. That winter there were shinny games . . . and even an occasional noon hour dance... But in 1904 things began to change fast.

The Chicago plant continued to produce telephones and switchboards, but in 1904 operations were terminated. Most of the personnel and forty freight cars of equipment came to the Rochester plant which now boasted five buildings. The next year the two founders returned to Chicago. Later, Alfred Stromberg manufactured carburetors and electrical time recorders.



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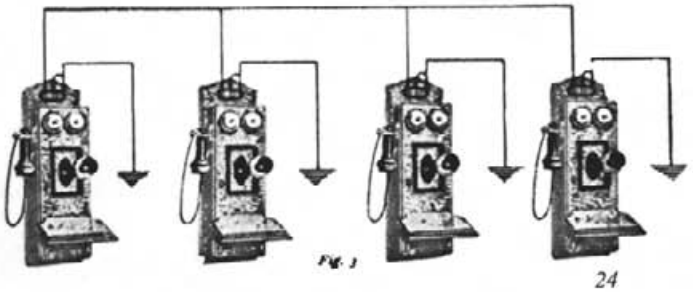

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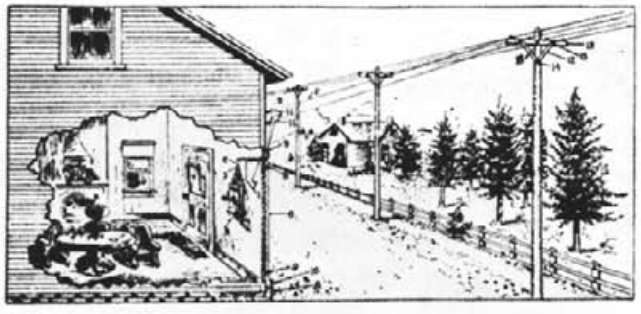

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23-29 Although Stromberg-Carlson had diversified its business, trade with rural areas continued as a most important source of income in the early 1900's. Samples of advertising literature put out by company to help rural customers include items from several booklets and an advertising card. Simple diagrams showed the customers how to string rural telephone lines, single and double.

Expansion of Stromberg-Carlson

The vigor, as well as the irresponsibility, of the industrial economy in the early 1900's was exemplified by the rapidly growing telephone industry, which in these years enjoyed an unprecedented expansion. Its prosperity, however, was constantly endangered by the sharp competition between Bell and the independents. Forced mergers frequently led to inflated holding companies, and endless patent infringement actions resulted in costly litigation. Stromberg-Carlson was very much a part of this scene. Already prosperous in Chicago, it prospered still further during the early years in Rochester, New York. Stromberg-Carlson's Kinloch Exchange, for example, installed in St. Louis in 1905, was the largest of its day. At one point employment in the Rochester plant reached 2,113, a figure not equalled until 1929.

The panic of 1907, known as the "bankers' panic," hardly even checked the onward pace of the American economy. It did, however, mark the beginning of a serious depression in the telephone industry, already overextended and dangerously competitive. Stromberg-Carlson and the independents were particularly hard hit. To make matters worse, the company had been drawn earlier into a speculative and unsuccessful venture by the Rochester businessmen who controlled both Stromberg-Carlson and the Home Telephone Company. Seizing upon a chance to gain a foothold for the independents in the profitable telephone market of the city of New York, this group bought up a franchise there in 1905 and to implement their plans, set up a holding company which owned and controlled the two Rochester firms and a New York city operating company. In a few years the whole structure collapsed.

Stromberg-Carlson might easily have survived this misfortune except for the panic of 1907. Sales declined precipitously. The company struggled along for a number of years, losing heavily despite extraordinary efforts. Wesley M. Angle, when president of Stromberg-Carlson, wrote in 1940: "Those of us who have been with the company the longest . . . and witnessed the swift growth from 1902 through 1905, can tell many a tale of the old days, of orders snatched from under the very noses of opposing salesmen . . . And we can tell, too, of orders lost, and years of declining business."

Stringent measures gradually reduced the company's indebtedness, and in 1910 it purchased the telephone business of a Chicago electric company; but the purchase apparently injured rather than helped its standing. In 1912 the directors gave up the struggle and assigned one of their number, W. Roy McCanne, to supervise liquidation of the ailing company. While carrying out his duties, McCanne began to realize that the company might still have a future. With the assistance of Angle, he set up a new firm in 1914 bearing the same name but with a more modest capitalization. Fortunately, manufacturing operations at the plant had never entirely ceased.

McCanne, who had helped to build the Kinloch Exchange in St. Louis and had taken part in the New York city venture, had joined Stromberg-Carlson in 1906. He was the "guiding spirit" of the new company, and its president after 1923. On his death in 1934 the annual report noted, "... our leader of many years, W. Roy McCanne, passed from us, but the organization he created remains to carry on."

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30-32 Stromberg-Carlson's non-rural business was brisk, included "Central Energy" (as opposed to rural, hand-cranked magneto telephones), railway and office telephones, city and branch office exchanges.

33 Signal Corps men in ten-foot-deep dugout during the final Meuse-Argonne offensive operate switchboard in touch with front. All Signal Corps telecommunication equipment, except poles, came from U.S.A.

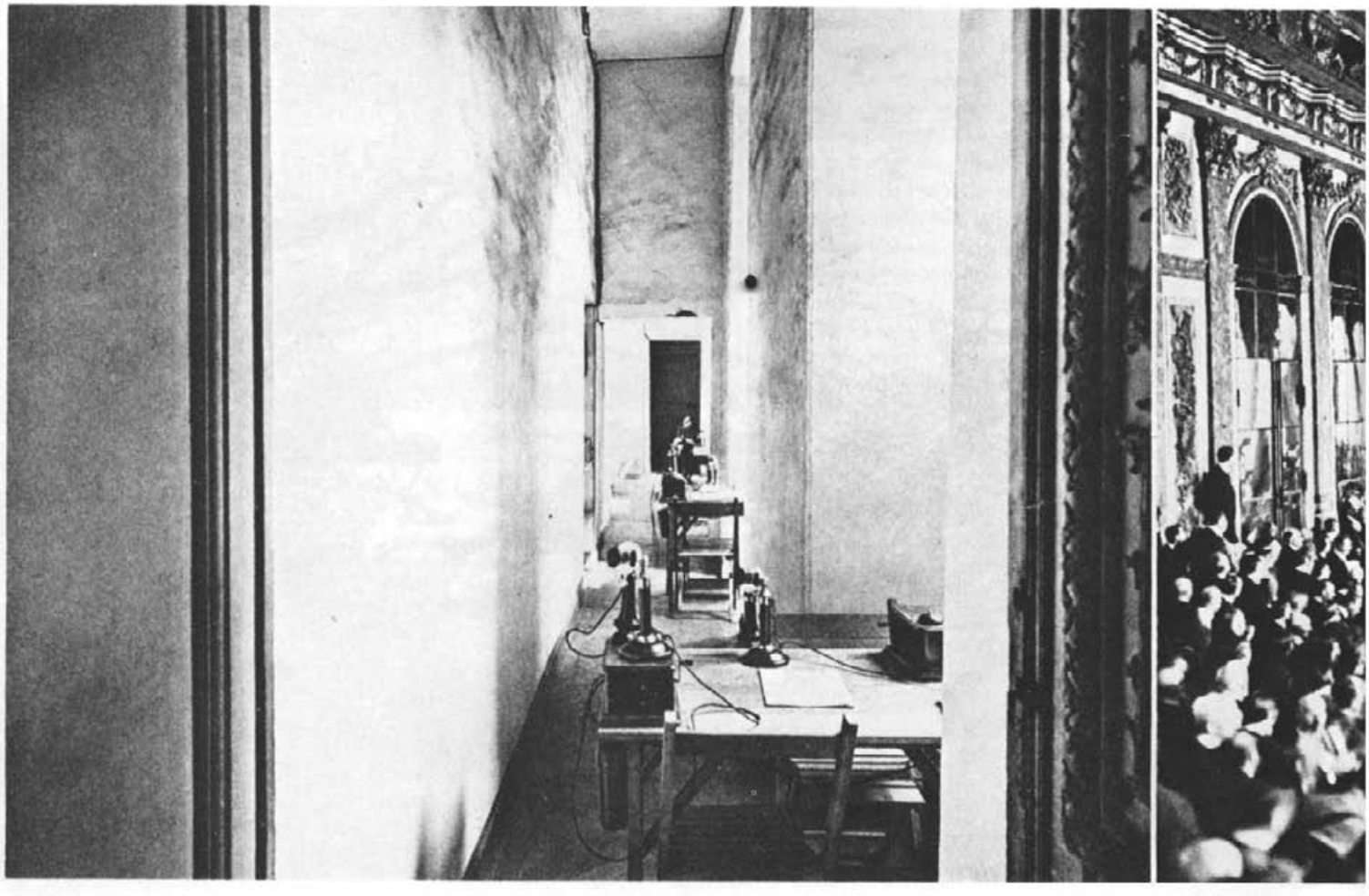
It was fortunate for Stromberg-Carlson that it stood high in the favor of the Signal Corps when the United States entered the war. Almost immediately the Federal Government took over the country's telephone and telegraph lines, and for the duration it allowed no expansion of existing facilities. At one stroke of a pen, the civilian business of the company vanished.

But Stromberg-Carlson had proved itself useful to the Army, and the Army now had need of its services. According to Wesley M. Angle, ". . . Stromberg-Carlson survived because the Signal Corps wanted apparatus we could make." The company produced quantities of portable telephones, camp switchboards, gunners' sets for use in coastal fortifications, service buzzers and a complete line of similar equipment. In addition, it did a brisk and profitable business supplying magnets for automobile magnetos, the normal foreign supply having been cut off by the war.

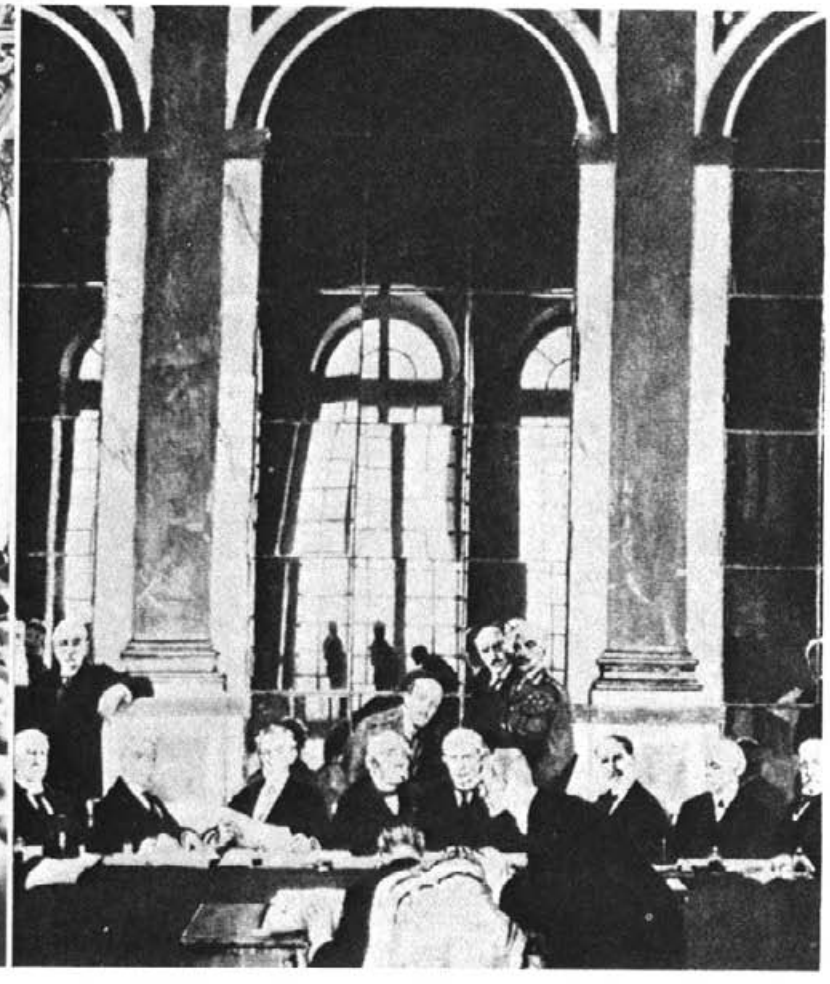
The intricate but serviceable communications equipment that Stromberg-Carlson and others produced played a major part in fighting the war in France. Soldiers operated telephone exchanges in training camps and in the teeming French bases; others strung wires that connected world capitals to the front. In combat, soldiers dragged field telephone systems forward under fire, and manned them in the trenches of Château-Thierry and Belleau Wood. The telephone carried the operational orders that led to the climactic battles of St. Mihiel salient and the forty-seven days of Meuse-Argonne, where 1,200,000 doughboys and 840 airplanes helped end World War I. "Hello, Central," ran the popular song, "Give Me No-Mans Land." It was possible.

34 Thrilled American telephone girls stand stiffly for formal portrait on their first day in France, May 15, 1918. In all, the Signal Corps sent over 323 civilians many of whom were women telephone operators. Between June 1917 and May 1919, U.S. Army Signal Corps personnel in Europe handled over 40 million local calls, around 1,350,000 long distance calls, 12 million telegraph messages. They operated 14,854 telephone stations and 396 exchanges. The Navy, under liberal Secretary Josephus Daniels, actually enlisted women as Yeomen and Marines for clerical duties.

35 Typical front-line trench with an Allied solder at telephone post. In 1914 both sides expected a short war. Then Western Front was stabilized into trench warfare. Advances were measured in yards, not miles. Machine guns, barbed wire and heavy artillery gave defenders the advantage. In 1918 failure of final German offensive and arrival of Americans broke stalemated front, led to Armistice.



36-38 Stromberg-Carlson telephones, shown in the corridor behind the Hall of Mirrors (36), were installed in the palace of Versailles for use of the delegations to the Peace Conference.



Signing of the Peace Treaty took place on June 28, 1919 (37). Painting by Sir William Orpen (38) gives a clearer view of the event, features Wilson, Clemenceau and Lloyd George.

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39-42 Wireless telegraphy, invented by Guglielmo Marconi (39) in 1895, gave impulse to development of radio. The audion tube patented by Lee De Forest (40) in 1907 was basis of all electronics. Wireless was important for marine communications (41). Ship's wireless bulletin (42), was published on board S.S. St. Paul in 1899.

42

THE TRANSATLANTIC TIMES.

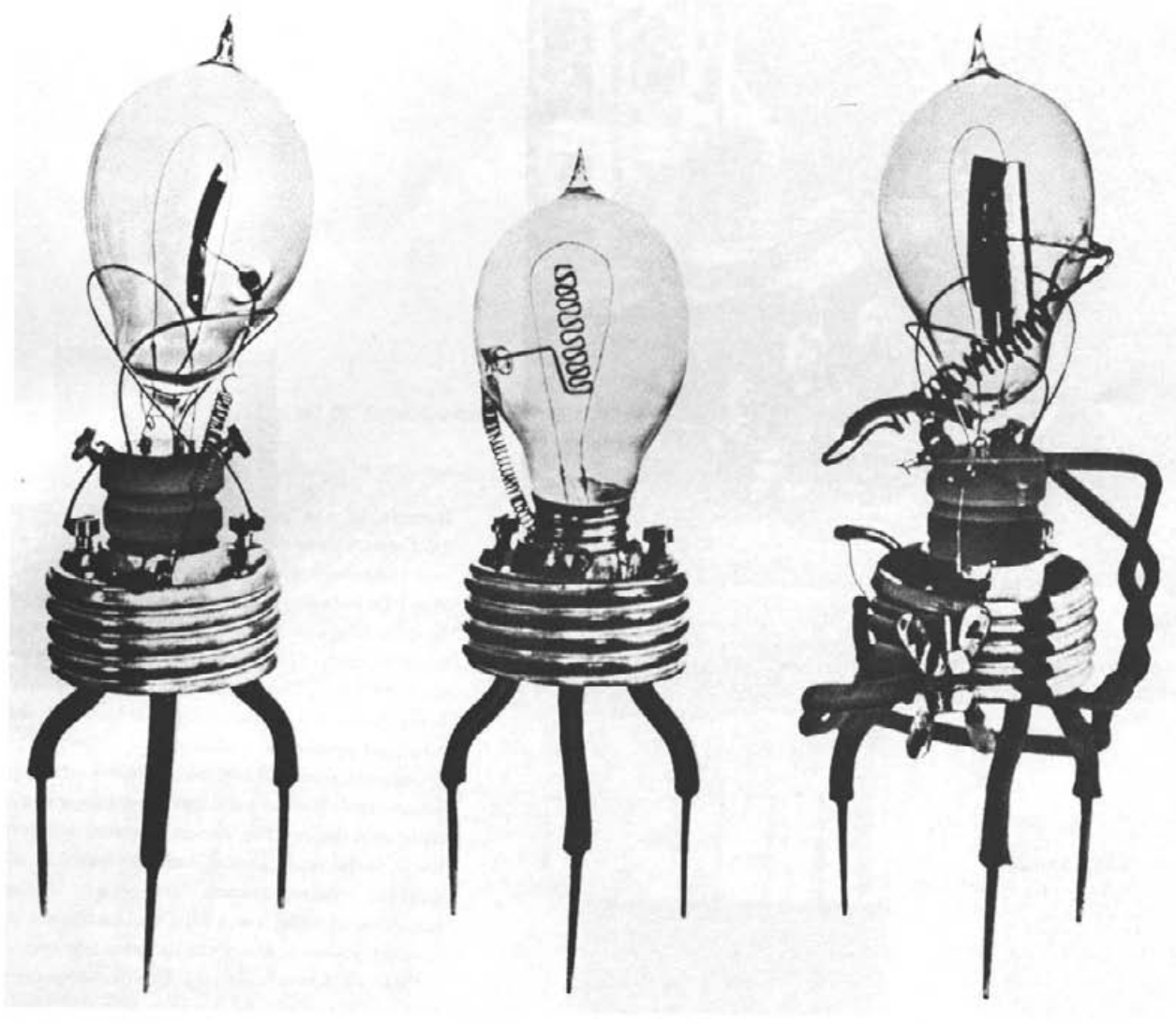
41

The birth of an Industry

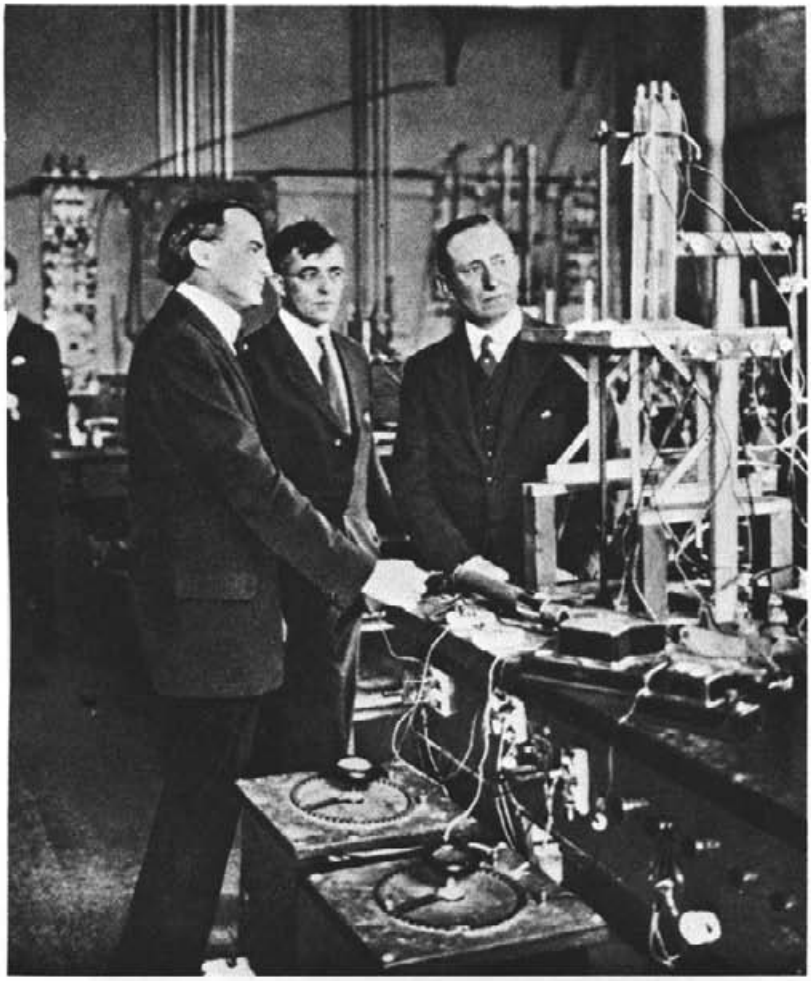
In 1873 a Scotsman, James Clerk Maxwell, published a treatise in which he set down, in rigorous mathematical form, what was then known about electricity. He discovered that his equations persistently included one term too many. To Maxwell the extra term could be decoded to mean that electromagnetic waves traveled out through space whenever an electric current was accelerated. The fact that no such waves had ever been detected, and that the whole idea seemed absurd, did not perturb him; he published his findings and turned his attention to other matters.

Some years later Heinrich Hertz, a German physicist, set up some pieces of experimental apparatus that detected Maxwell's electromagnetic waves across a room. Not long after, Guglielmo Marconi, an Italian, by an ingenious adaptation of Hertz's experiment, succeeded in transmitting dots and dashes through space. In 1906 the human voice was broadcast for the first time. A year later Lee De Forest, an American, invented and patented a three element vacuum tube, or "audion," capable of detecting and amplifying into meaningful sound a flow of electrons in a vacuum.

Thus, by 1907 four men from four different countries had laid the foundations of the entire electronics industry. Progress, in those far-off days, was somewhat slower than what we are accustomed to in these racing times. Not until the early years of the twenties did the great American public realize that music filled the air, to be domesticated by anyone who could put together a crystal, a cat whisker, a coil and headphones. In 1922 a new industry, the manufacture of radio sets, grossed $60 million. In 1929 the gross was $842,548,000.



43 Three early RCA electron tubes, developed from versatile De Forest "audion." Principle was used for amplifying long distance telephony, and in radio.



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44,45 Marconi (right), with director Willis Whitney (left) and Irving Langmuir, inspects General Electric Laboratory in 1915. Marconi made trip from England to talk with Dr. Alexanderson of GE about his invention of a radio transmitter, the high-frequency "Alternator." RCA announced in 1926 (45) first broadcasting network, NBC.

45

46 Stromberg-Carlson headset, 1916.

Because it was possible not only to improve Lee De Forest's three element tube but to vary it, a whole new technology was opened up. By the end of World War I De Forest's audion was a powerful device both for broadcasting and receiving signals. Other uses called for other kinds of tubes, and the circuitry that would put them to work; these too were quickly brought into being. Radio was now basically an engineering, development and production problem.

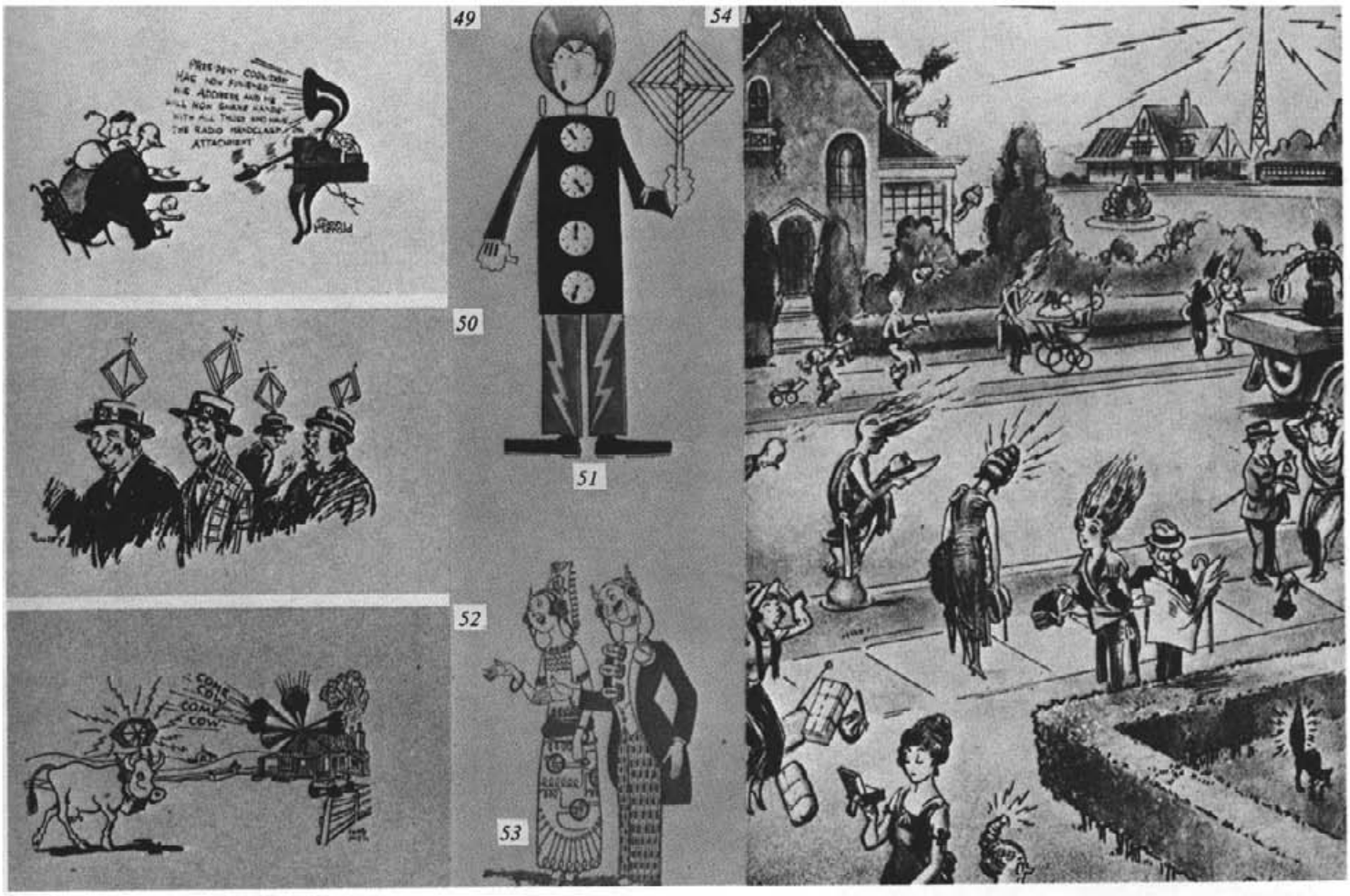
Once the principle had been worked out, it was all so inevitable and so easy that invention was almost a daily occurrence. The same invention, however, was likely to be made almost simultaneously in a dozen different research centers. The penalty for such a luxurious advance was a tangle of conflicting patents that threatened to throw the industry into turmoil.

Owen D. Young of General Electric acted decisively. Buying control of the American Marconi Company in 1919 he organized the Radio Corporation of America. The new corporation quickly made cross-licensing agreements with Westinghouse and American Telephone and Telegraph Company, then carried its activities abroad and entered into agreements with foreign countries. Soon, RCA controlled more than 2,000 major radio patents, and almost nothing worth having in the radio field lay outside its control.

All this was done to establish in wireless telegraphy and telephony the kind of control that American Telephone and Telegraph enjoyed over the conventional telephone business. But Young had built far better than he knew. In a matter of months, the new radio industry showed signs of becoming a giant.

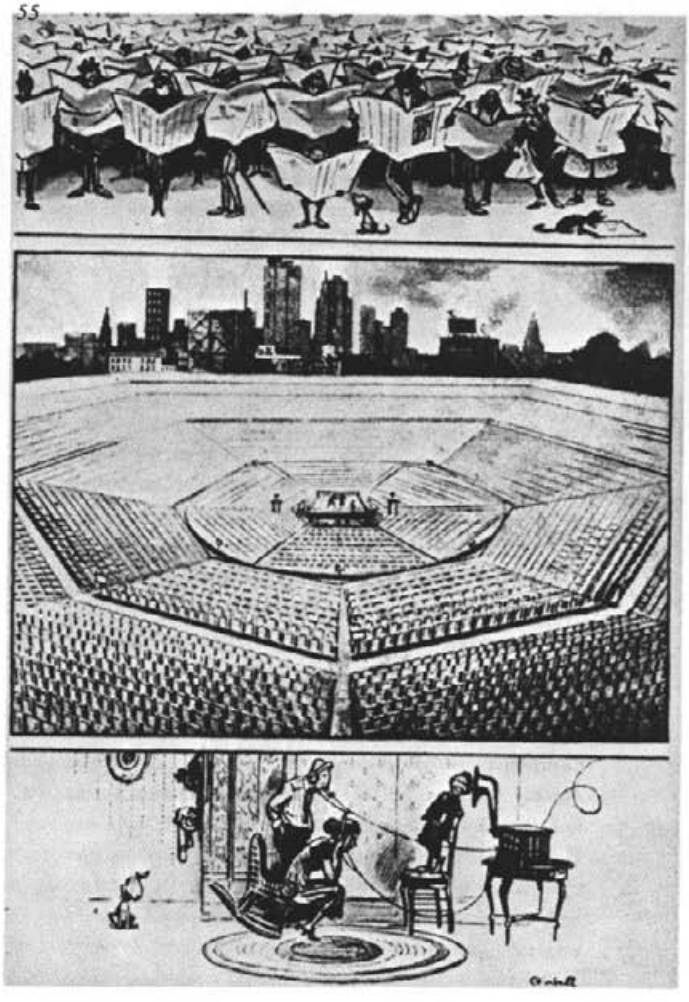
47 Dr. Frank Conrad holds one of KDKA's first microphones.

48 RCA's first broadcasting station, WDY, at Roselle Park, New Jersey, in 1921. Telephone transmitters and tent-like drapes to muffle resonance were standard equipment of early stations.



49-54 Radio craze was gold mine for the cartoonists who poked fun at radio's mysterious influence on the public. Life cartoonist of 1924 thought that permanent waves (54) might act as aerials.

55



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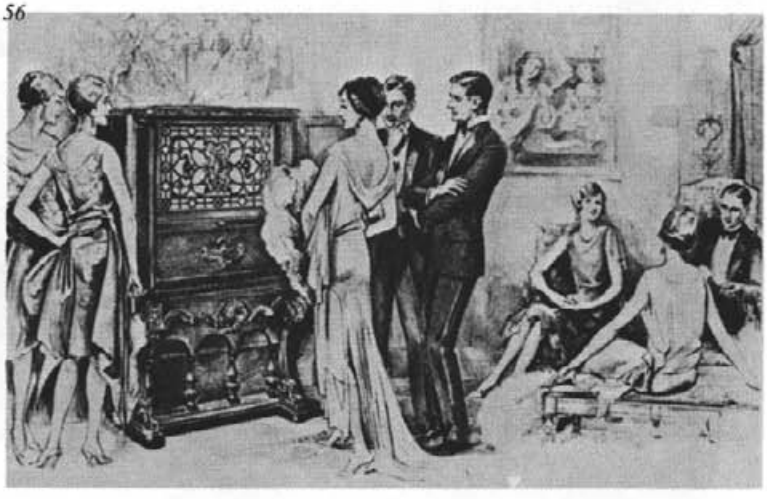

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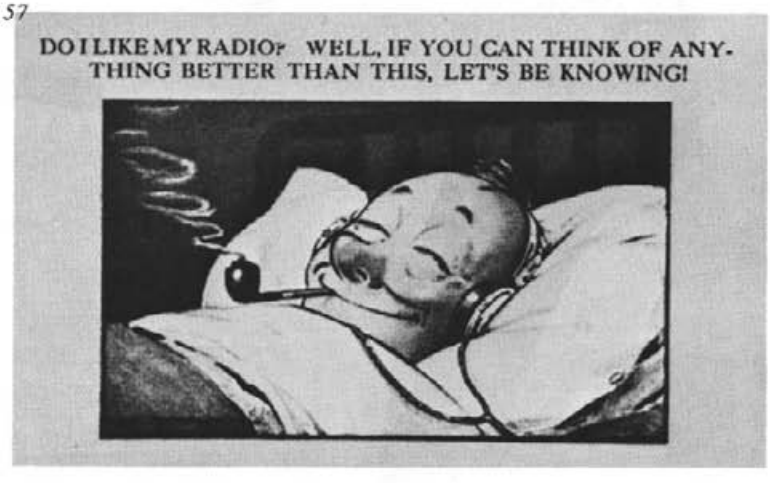


55-57 Cartoon, "The next big fight" was more prophetic of television broadcasting than of radio (55). Conversation piece (56) or earphones (57)...the twenties and radio were made for each other.

Stromberg-Carlson takes the plunge

Westinghouse opened its powerful KDKA station with Dr. Conrad just in time to broadcast the election returns of 1920. In no time at all the public, discovering the superiority of the vacuum tube radio, discarded its crystal sets and rushed to buy the new type. In 1922 almost a million receivers were in use, and by 1924 more than 500 broadcasting stations were on the air. In 1926, pressed hard by the growing competition, RCA set up an affiliate, the National Broadcasting Company, the first national chain of stations. This was quickly followed by the organization of its rival, the Columbia Broadcasting System. Secretary of Commerce Herbert Hoover, wrestling with this precocious new industry, called a series of conferences. By 1928 he had created some semblance of order in broadcasting under government supervision.

Stromberg-Carlson watched the exploding radio market with close attention. The company had been in the radio parts business for years. In 1922 it began to make radio jacks, cords and plugs and stepped up production of headsets in response to the tremendous new demand. Its telephone engineers, moreover, with their specialized experience in the transmission of a broad range of speech and music, were better equipped than most to handle the new medium. Some companies which jumped into the manufacture of radio sets had made automobiles, or pianos, or batteries; the engineer-designers they hired were mainly experienced in electric power transmission. Hence, most early sets were designed to handle only a very narrow band of audio frequencies and sounded so shrill and unnatural that sopranos were often ruled out of the broadcasting studios.

Led by Dr. Ray H. Manson, Stromberg-Carlson's engineers knew they could do better; yet the company hesitated. Sales of its improved telephone and switchboard apparatus had increased. The Company was now mass producing switchboards which had formerly been put together by hand craftsmen. It was manufacturing every kind of telephone from hand-generator wall sets to the latest type of cradle phones. Through its Canadian manufacturing subsidiary, established in Toronto in 1923, and elsewhere throughout the world, foreign sales were on the rise. The modernizing of obsolete exchanges and equipment provided additional revenue. Since RCA had tied up most available radio patents, Stromberg would have to find some new system if it was to take the plunge. And this system would have to be one which would give a better tonal quality than the "regeneration sets" then on the market. Although hundreds of new radio companies were infringing on some patent, Stromberg-Carlson, as in the earlier days of the telephone, refused to jeopardize its future by pirating patents. Nor would it attempt to avoid patent infringement, as others had, by putting out an inferior product.

Eventually, Stromberg-Carlson found what it wanted in the "neutrodyne" radio circuit of Dr. L. A. Hazeltine. Taking out a license for the development of the system in 1923, Stromberg-Carlson joined a group of small radio manufacturers, also licensed by Hazeltine, called the "Independent Radio Manufacturers, Inc." Thereafter, Stromberg-Carlson worked very closely with the energetic and ingenious Hazeltine in perfecting its own version of the neutrodyne system.

Hazeltine's circuit design was one of three which had emerged during the early years of radio. The most common was the "feedback" or "regenerative" system; another was the "superheterodyne" circuit, both invented by Edwin Armstrong and eventually sold by him to Westinghouse. In the fall of 1923, Stromberg-Carlson introduced its first loudspeaker and early in 1924 brought out its first complete set. It was a perilous time to enter the market. Several hundred firms were making complete sets, but so intense was the rough-and-tumble competition that in two years the field would be narrowed down to about forty manufacturers.

The neutrodyne set soon became very popular, and the members of the Hazeltine group—numbering fourteen small concerns—did a booming business. In 1926 RCA challenged the Hazeltine patent in the courts and in 1927 won the case. Thereafter Hazeltine's licensees, including Stromberg-Carlson, were obliged to take out RCA licenses, too. This was but one example of many court battles fought by RCA over various radio patents which by 1928 gave it a commanding position in the field. For firms such as Stromberg-Carlson, however, the inauguration of RCA's licensing system did provide access to the major patents in the field. Before this, Stromberg-Carlson's skillful development of the neutrodyne circuit system and its emphasis on quality and tone had already put it ahead of most of its competitors. Its slogan, "There is nothing finer than a Stromberg-Carlson," was a fact. In 1927 it entered broadcasting, in 1928 began to construct its new and far larger plant, and by 1930 its radio business was larger than its telephone business.

59 Dr. Hazeltine, inventor of neutrodyne.

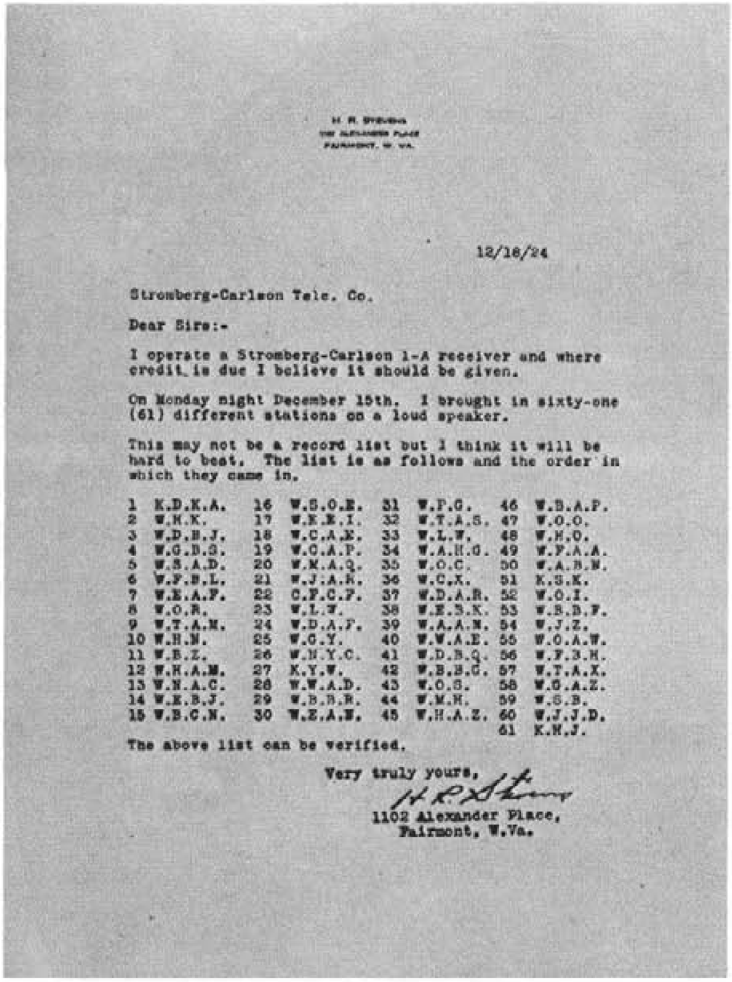
60

61

62

58-61 Stromberg-Carlson's first neutrodyne receiver of 1924, in table version (60) and in console (61). Company still made earphones (62) but put main promotion into advertising (58) quality and tone of its new radio receiver.

63



12/16/24

Stromberg-Carlson Tele. Co.

Dear Sirs:-

I operate a Stromberg-Carlson 1-A receiver and where credit is due I believe it should be given.

On Monday night December 15th. I brought in sixty-one (61) different stations on a loud speaker.

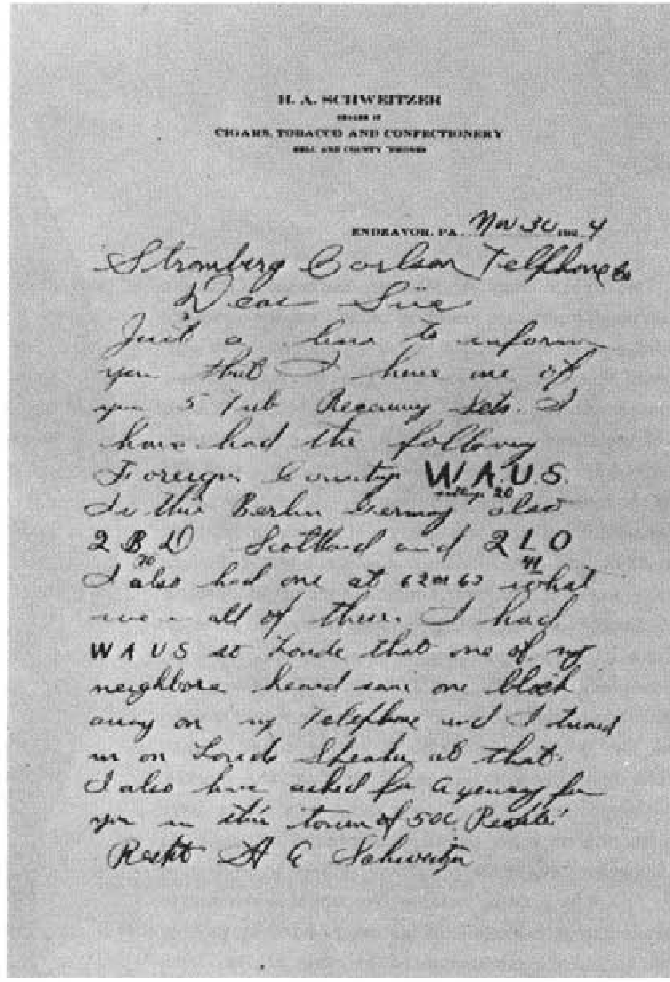
This may not be a record list but I think it will be hard to beat. The list is as follows and the order in which they came in.

1	K.D.K.A.	16	W.S.O.E.	31	W.P.G.	46	W.B.A.P.
2	W.M.K.	17	W.K.E.I.	32	W.T.A.S.	47	W.O.O.
3	W.D.B.J.	18	W.C.A.E.	33	W.L.W.	48	W.H.O.
4	W.G.B.S.	19	W.C.A.P.	34	W.A.H.G.	49	W.F.A.A.
5	W.S.A.D.	20	W.M.A.Q.	35	W.O.C.	50	W.A.B.N.
6	W.F.B.L.	21	W.J.A.R.	36	W.C.X.	51	K.S.K.
7	W.E.A.F.	22	C.F.C.F.	37	W.D.A.R.	52	W.O.I.
8	W.O.R.	23	W.L.W.	38	W.E.B.K.	53	W.B.B.F.
9	W.T.A.M.	24	W.D.A.F.	39	W.A.A.M.	54	W.J.Z.
10	W.H.N.	25	W.G.Y.	40	W.W.A.E.	55	W.O.A.W.
11	W.B.Z.	26	W.N.Y.C.	41	W.D.B.Q.	56	W.F.B.H.
12	W.H.A.M.	27	K.Y.W.	42	W.B.B.G.	57	W.T.A.X.
13	W.N.A.C.	28	W.W.A.D.	43	W.O.S.	58	W.G.A.Z.
14	W.E.B.J.	29	W.B.R.R.	44	W.M.H.	59	W.S.B.
15	W.B.C.N.	30	W.Z.A.N.	45	W.H.A.Z.	60	W.J.J.D.
						61	K.N.J.

The above list can be verified.

Very truly yours,
H R Strong
1102 Alexander Place,
Fairmont, W.Va.

64



H. A. SCHWEITZER
CIGARS, TOBACCO AND CONFECTIONERY

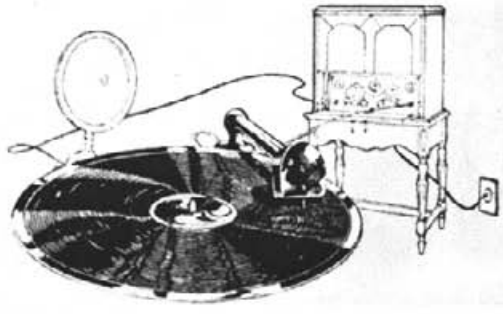
ENDEAVOR, PA. Nov 30 1924

Stromberg Carlson Telephone Co
Dear Sir
Just a line to inform you that I have one of your 5 Tub Receiving Sets. I have had the following Foreign Country W.A.U.S. In the Berlin Germany also 2 B D Scotland and 2 L O. I also had one at 62 or 63 what are all of them. I had W A U S so loud that one of my neighbors heard same one block away on my telephone and I turned in on Loud Speaker at that. I also have asked for agency for you in this town of 500 People.
Respt H A Schweitzer

63,64 Stromberg-Carlson's gamble on the neutrodyne receiver proved almost immediately successful. Testimonials poured in only a few months after the new receiver had been introduced.

65 Performers await WHAM auditions in 1929. WHAM carried on Rochester's tradition as music center, provided Stromberg-Carlson with vehicle for testing new apparatus, stimulated sales.

66



67

68

66-69 An early hi-fi was the magnetic pickup (66) of 1927. Stromberg-Carlson emphasized research, pioneered in high fidelity (67) and in radio-phonographs while mass-producing radio receivers like the grand console (68) in its new Rochester plant (69).

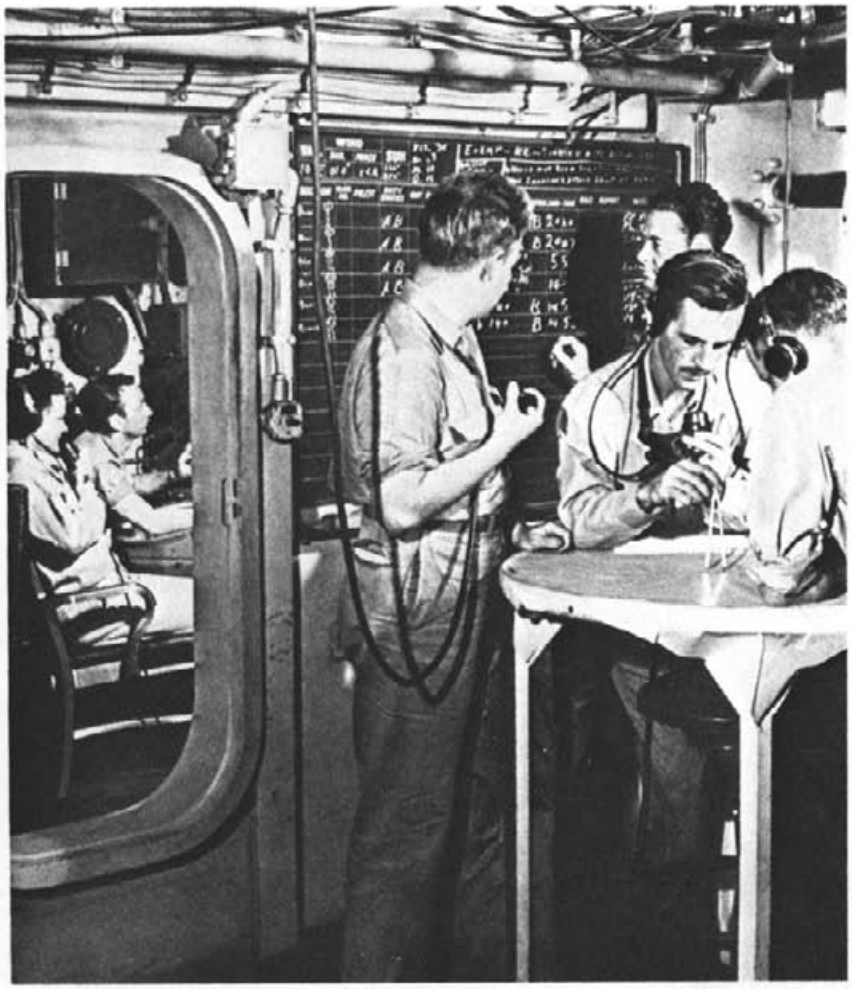
69

Radio and broadcasting

Though Stromberg-Carlson had applied mass production techniques to its line of radio receivers, it did not neglect the product research and sales development so important in gaining and maintaining a market. The company pioneered such new features as "chassis" mounting of the operating unit, total shielding, automatic volume control, and an early form of "push button" tuning. In the 1930's it pioneered, too, in high fidelity sound with its improved amplifiers and speakers, its "Acoustical Labyrinth" speaker housing and its "tweeter-woofer" speaker system for home radios.

The company led the way in the mating of radio with the record player. As early as 1926 it was the first to provide a phonograph jack in the radio chassis, with radio-type volume and tone control. A year later it put out a magnetic phonograph pickup unit which could be mounted in an old phonograph or a new, motor-driven one. Its 1930 radio combination included a fully automatic record changer.

Stromberg-Carlson entered broadcasting with the purchase of Rochester's five-year-old radio station WHAM in 1927. Increasing the station's power from 100 to 5,000 watts and later to 50,000 watts, the company built a new transmitter at Victor, near Rochester, and affiliated the station with NBC. WHAM gained a reputation for the broadcasting of fine music by Rochester's great orchestras. The company now enjoyed a dual manufacturing operation, which contributed in no small measure to its stability. In 1929, for the first time in its history, Stromberg-Carlson made a net profit of over $1 million. During the spring of that year it moved into a new, larger plant in Rochester.



70

70,71 Combat information center (70) of escort carrier USS Nassau plots radar information on enemy aircraft. Men on right are relaying information with telephone handsets. During the war Stromberg-Carlson supplied Navy with a type of sound-powered telephone; manufactured radar and sound equipment; provided over 40,000 switchboards, 66,000 telephones. Stromberg-Carlson modulator (71) for airborne radar was important anti-submarine warfare device.

71

Military communications

The submarine and the airplane telescoped a generation of development into four frenzied wartime production years. As a result the products in 1945 were recognizably the offspring of the 1941 models. The communications industry, by contrast, went through a technological revolution. Radar, for example, was little more than a subject for research when the war began; before the war ended it was almost requisite for survival.

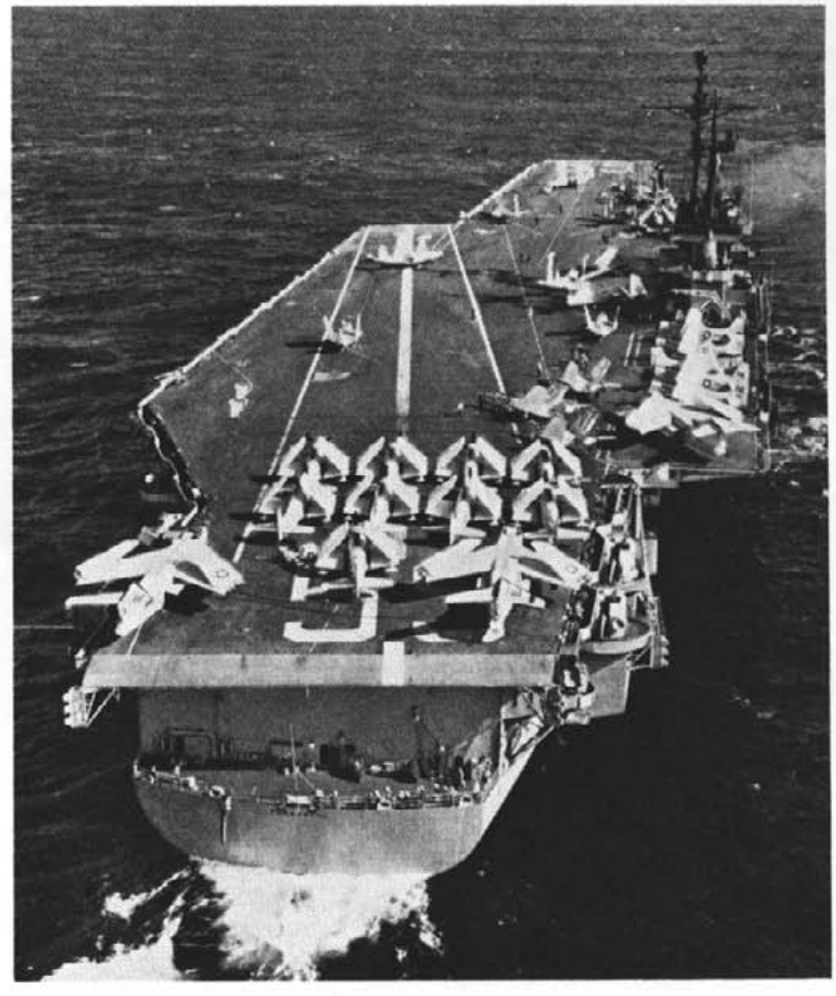
Stromberg-Carlson began limited production for the armed services in 1939, and by 1944 ninety-four per cent of its output was war production, most of it for the Navy. A great deal of this was in areas where Stromberg-Carlson had been a leader for many years: switchboards, telephone instruments, field radio sets, and sound systems. But a substantial part, and perhaps the most significant for the future, came from the company's research laboratories. Among these products were the Mark II airborne radar modulator, a tank intercommunication system, a radio telescript, sound-powered telephones and great Navy "bullhorns."

The problems that were met and mastered in building such equipment called for complex applied research programs. But the equipment could not be laboratory toys: each item had to be rugged, simple to operate, easy to maintain, and designed with the elaborate control systems that the military found necessary. Stromberg-Carlson's war effort was perhaps not as spectacular as that of Convair or Electric Boat, but it was no less essential. Most impressive was the speed with which the company converted from consumer goods to military production. It was this kind of flexibility that won the production war on the home front.

Stromberg-Carlson

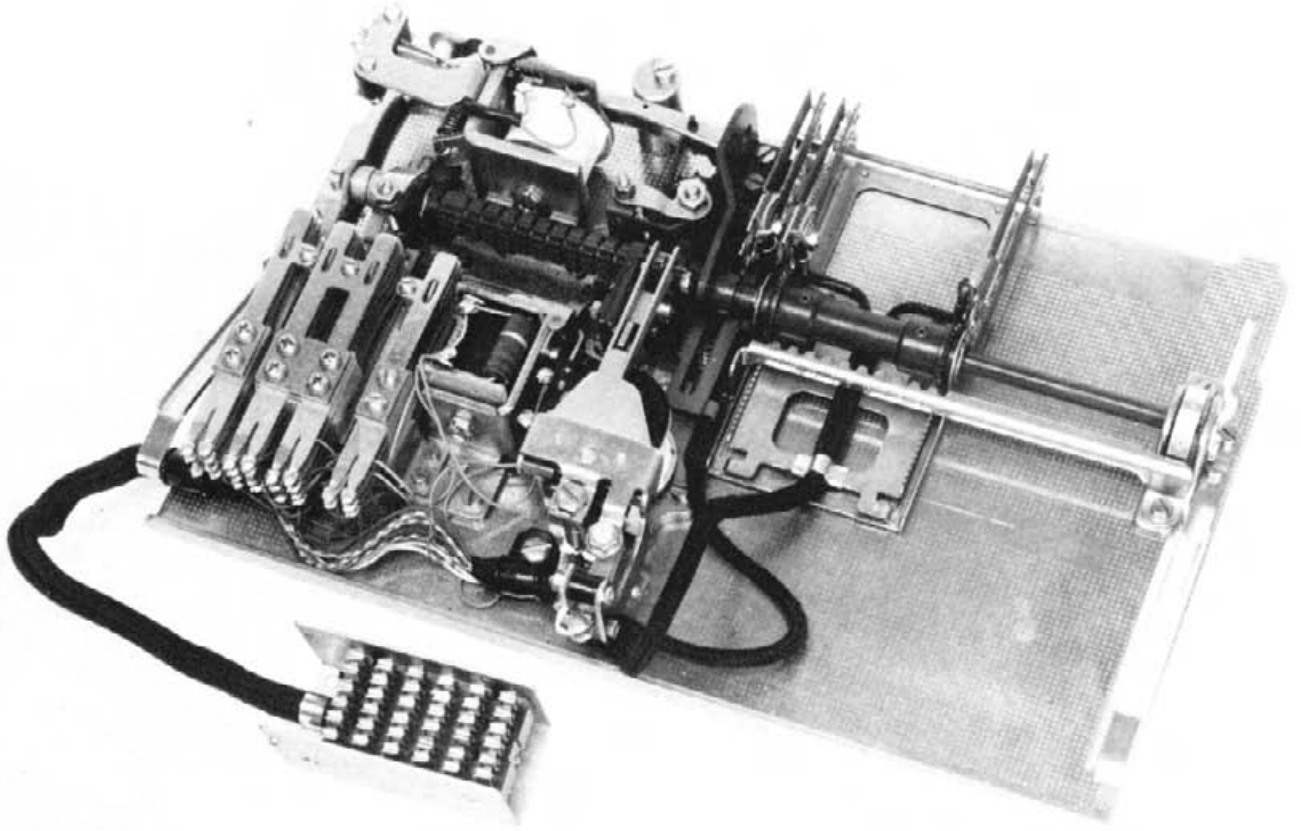
The scientific and technical breakthroughs of the early fifties had a significant impact on the Corporation's planning. Nuclear power, jet and rocket propulsion were making possible under the sea, in the air, and in space outside the earth's atmosphere speeds and ranges beyond human capacities of endurance and control. For example, the Air Force B-58 bomber, flying at Mach 2, or twice the speed of sound, is so fast that it is, of necessity, virtually an automatic plane with the pilot "along for the ride." And missiles, whether guided or ballistic, are largely electronic instruments. Electronic computers and communications devices are indispensable for the control of these weapons and for analyses during their complex development programs.

Obviously, to such an important defense supplier as General Dynamics, an electronics component seemed essential to the Corporation's growth. To Hopkins, Pace, and Earl Johnson, then senior vice president-operations, Stromberg-Carlson not only had potential in the electronics field but also a substantial commercial stake in the growing communications industry. Stromberg-Carlson had recently improved its operating policies, and had begun to emphasize electronics and high-fidelity sound equipment. Merger with General Dynamics provided the new Division with the financial resources it needed for expansion in electronics and with a vitalizing interflow of information with top technicians and scientists in such fields as aerodynamics and atomic energy. Stromberg-Carlson, with rapidly growing scientific and technical competence, began to realize its potential in the electronics field.

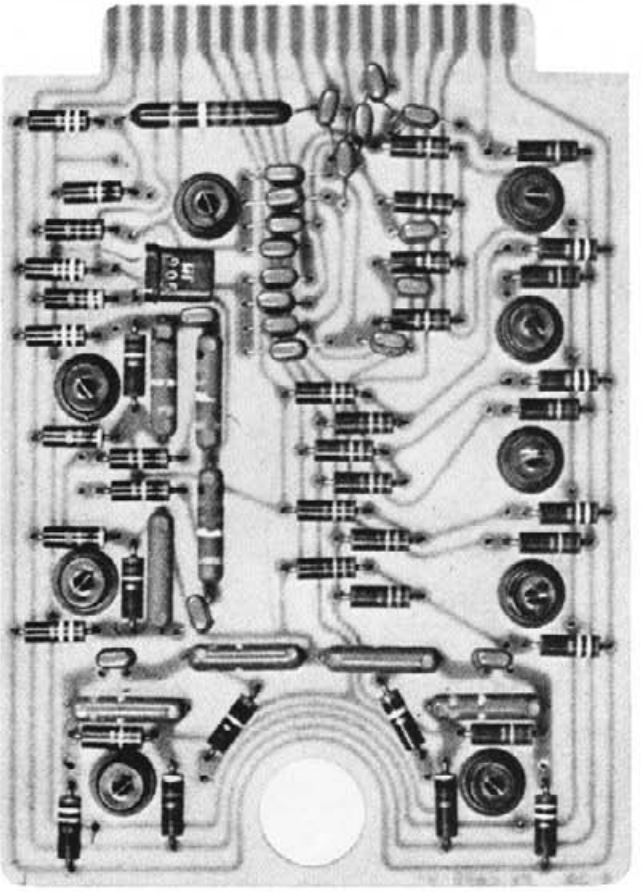


72 Supercarrier USS Forrestal. Planes on deck are equipped with Stromberg-Carlson TACAN, electronic air navigation system which automatically and continuously "fixes" carrier for planes returning from missions.

73 Seven-inch Charactron shaped beam tube.



74 The XY® switch, based on a Swedish design, was perfected by Stromberg-Carlson to provide economical dial telephone capability to the independent telephone industry. First XY switchboard was installed at Worthington, Pennsylvania, August 7, 1947. Within 20 years, approximately half of the independent exchanges in the United States used XY switchboards.

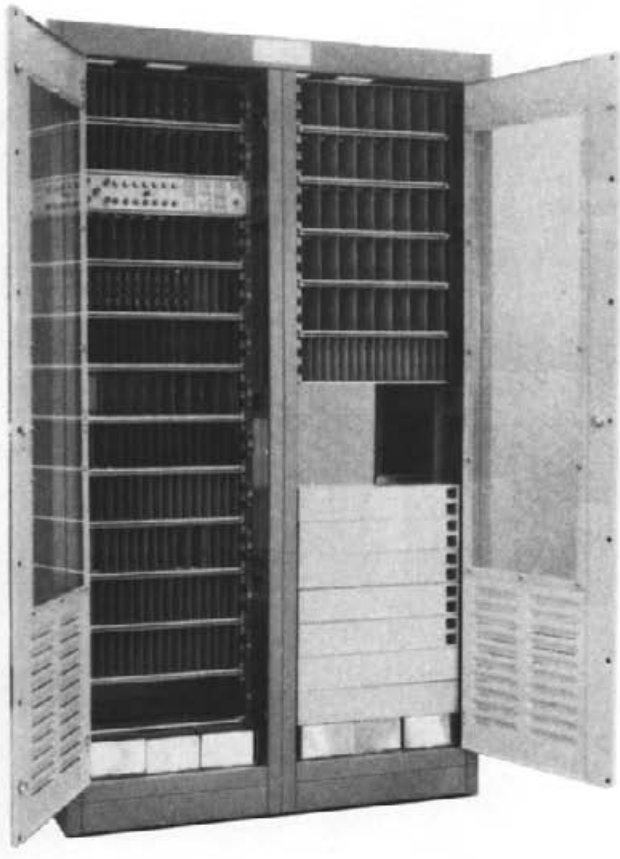


75 Actual size printed circuit "allotter card for 100-line, 15-link transistorized switchboard.

A new decade

The decade of the '60s was a paradox: It had a turned-off generation when almost everyone and everything was plugged-in. Electronic products proliferated. Microelectronics surged from the laboratory onto production lines. As equipment shrank in size, it expanded in capability. Electronics was the wave of the future!

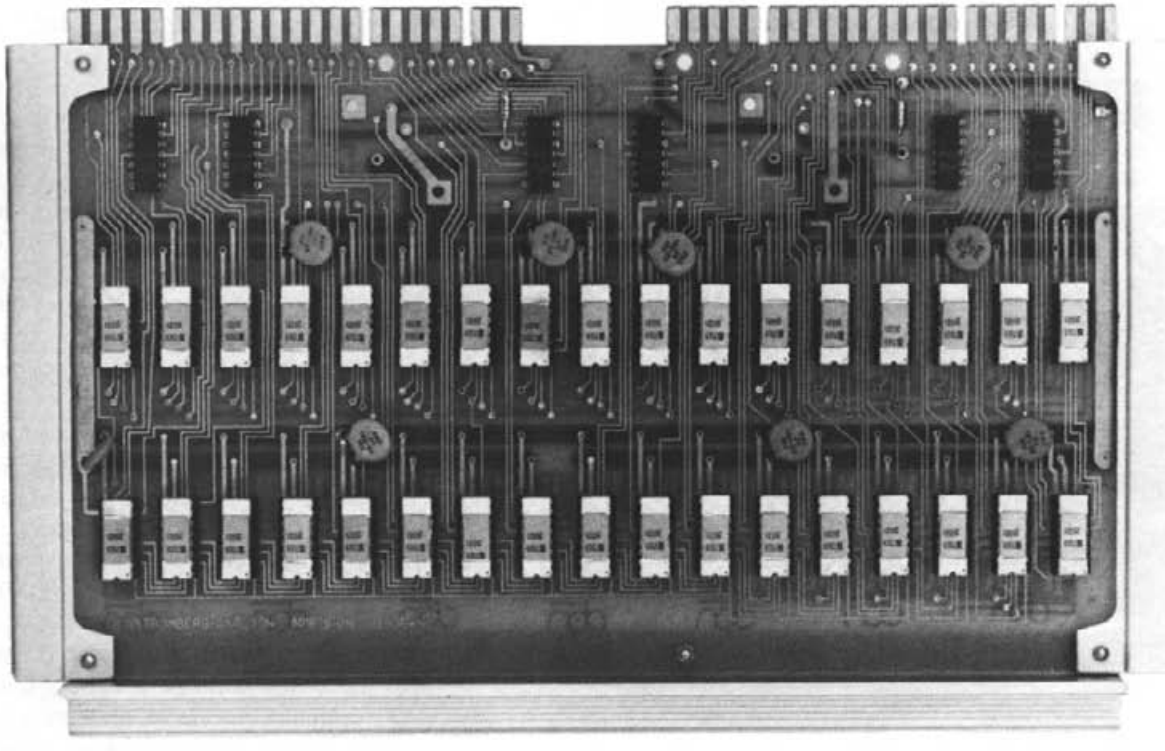
Stromberg-Carlson's future was not, however, a simple choice. For the marketplace, like a kaleidoscope, was changing constantly, ranging from the juvenile with a transistor radio plugged into his ear to the Lunar Excursion Module landing men on the moon. One market, the United States Independent Telephone Industry, offered powerful reasons for concentrating there.



76 The DYNALOGIC® EPABX a TDM Switch of the early 60's.

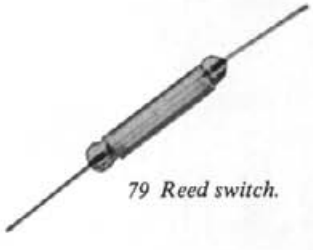
For one thing, the industry was Stromberg-Carlson's traditional market. Literally hundreds of telephone companies were founded on Stromberg-Carlson products. And by 1961, the company's XY® switching systems served thousands of exchanges. Independent telephony was growing at a rate greater than that of the Gross National Product and also of the Bell System. The bumper crop of war babies was reaching maturity; housing tracts were mushrooming into cities overnight. In one decade, society seemed bent on making up the lives and time and wealth lost in the two prior decades. The ensuing demand for telephone service made the Independent Telephone Industry the most lucrative of all possible markets. So sixty-seven years after its founding as a manufacturer of telephones for an infant industry, Stromberg-Carlson again turned its attention exclusively to telephony.

The tempo of the '60s was breathtaking. In 1961, Stromberg-Carlson installed the first electronic PABX in the United States. It was the first generation of telephone switches to use time-division-multiplexing (TDM) - a startling concept where electrical transmission signals are interrupted at micro-second rates. Each transmission interval (a "time-slot") carries a discrete message. This technology is very complex but the advantage is easily grasped: A single path can carry hundreds of messages simultaneously; previously, it carried only one.



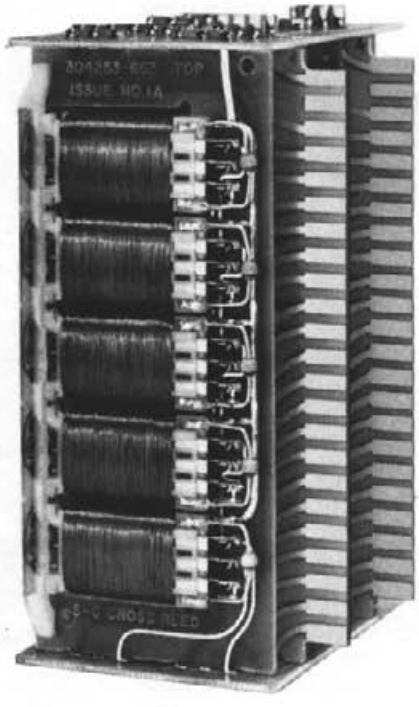
77 Typical printed circuit card used in electronic systems of the '60s.

78 *CROSSREED® ESC-1 installation at Seneca-Gorham Telephone Corporation. Holcomb, N.Y.*



79 *Reed switch.*

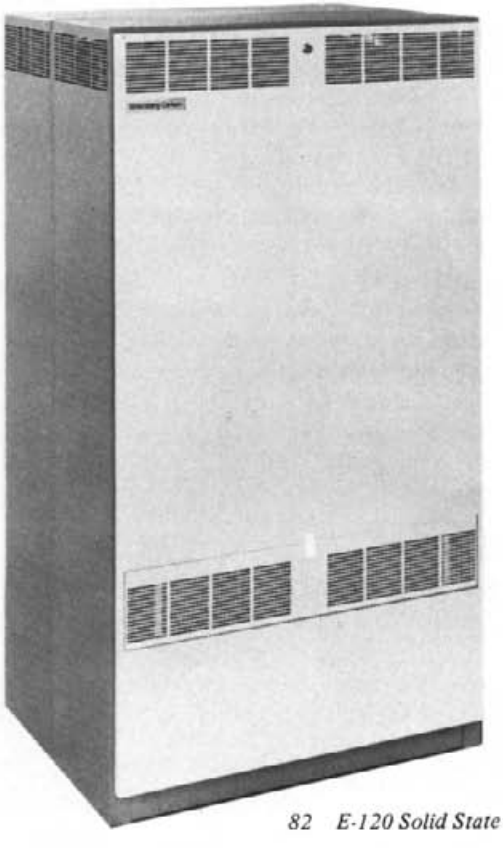
80 *Relay coil for four reed switches.*



81 *CROSSREED® Switching matrix module.*

An Atlas-Centaur boosted Friendship 7 and John Glenn into earth orbit in 1962, the year Stromberg-Carlson installed the world's first electronic community telephone exchange and the first commercial pushbutton telephones in the United States. When Astronauts Armstrong and Aldrin landed on the moon in 1969, Stromberg-Carlson telephone systems on three Apollo Instrumentation Ships were major links in the mission control system. The same year, Stromberg-Carlson completed a monolithic facility to manufacture medium- and large-scale integrated circuits.

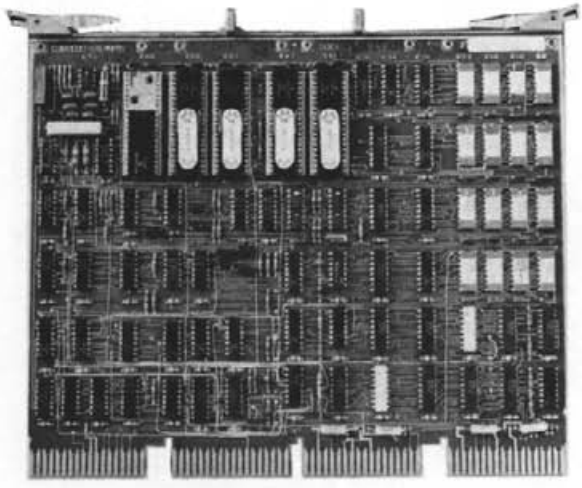
Midway in the decade, Stromberg-Carlson acquired the United States Instrument Corporation of Charlottesville, Virginia - also a maker of telephones and telephone switching systems - and became a subsidiary rather than a division of General Dynamics, responsible briefly for all commercial electronic business including data processing and sound systems. To market that year came the Stromberg-Carlson Datagraphics 4400 computer document recorder which translated computer digital code into human language and printed it on microfilm at the rate of 50,000 pages in 8 hours.



82 *E-120 Solid State PABX.*

The decade that opened with the first generation of time (TDM) switching closed with a new family of CROSSREED® switching systems. But the accelerating rate of technological change exerted relentless pressure. Even before telephony celebrated its centennial, the industry met the prerequisite conditions for a technological revolution.

83 *E-120 PABX Attendants turret.*



84 SYSTEM CENTURY® CPU.

85 Computer Programs are Stored on "floppy" disc.

The industry had accepted electronic digital computers for business transactions, accounting, toll recording, billing, directory service . . . It had accepted electronic digital computers as switching system controls although they were far too expensive for use in small central offices . . . It had accepted signal transmission in digital format using time-division-multiplexing. Semiconductor technology advanced rapidly, enabling mass production of large-scale integrated circuits of high reliability. And the computer industry then perfected small but very powerful micro- and minicomputers at low cost.

It was the same technology that placed electronic digital calculators on department store counters at a price that school children could afford.

Collectively, these conditions confirmed an evolution: The telephone network - already a kind of giant, analog computer - was destined to become a computerized digital network for both signal transmission and switching. The signs were clear; the direction, irreversible.

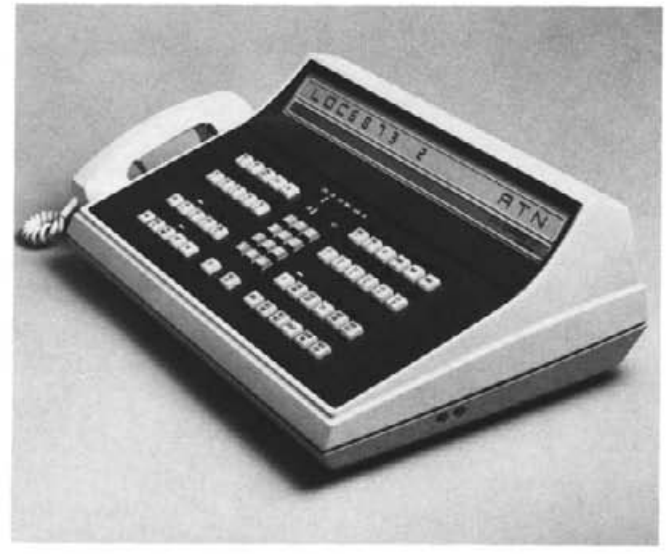
Stromberg-Carlson synthesized these facts and created a family of digital switches called SYSTEM CENTURY® - a name that anticipates dramatic progress in the second century of telephony and Stromberg-Carlson's unique role of leadership in the independent industry.

The SYSTEM CENTURY family brings to the smallest telephone company both stored program computer control and digital switching at an affordable price. The smallest village can now have the communicating sophistication of the largest city.

And the family of digital products - DCO (central office), DTM (tandem), DBX (branch exchange, DRS (Toll Recording System), DSU (Satellite Unit), DTI (Trunk Interface) DMO (mobile office) - has a unique capability for continued enhancement as the digital century unfolds. They are compatible with each other; with an analog-, analog/digital-, or all digital network; and with present and future technology - more powerful computers, move versatile programs, optical transmission and switching - whatever the digital century holds.

The digital century called for the new name - SYSTEM CENTURY - to symbolize Stromberg-Carlson's exciting concept in telephone switching - a unique concept that will have as great an impact on tomorrow as the Farmer's Telephone Line and the XY Switch had on yesterday.

SYSTEM CENTURY®



86 SYSTEM CENTURY DBX Attendant's Console

87 SYSTEM CENTURY DCO.

Stromberg-Carlson

A GENERAL DYNAMICS SUBSIDIARY

T-2148/Issue 2/February 1979