The American Optical Company

The American Optical Company essentially began in 1833 in a small upstairs workspace of William Beecher’s jewelry and watch business. Beecher had set up shop in Southbridge in 1826 after serving a jeweler’s apprenticeship in Providence RI. His first apprentice was 14 year old Robert Cole of Worcester. Beecher had seen a pair of spectacles from England and thought he could make them better. He experimented with silver spectacle making at a time when imports were scarce and expensive. Between 1833 and 1839, Beecher employed seven men to make spectacle frames at the rate of one frame per man per day, and as a result of changes he made in manufacturing, both production and quality improved.

In 1839, Beecher sold his jewelry business to Cole and moved the spectacle making operation to his first factory, the Old Spec Shop, on lower Main Street in Southbridge. In 1843, Beecher’s mechanical ingenuity led to the first thin steel spectacle frame crafted in the US, a frame material that remained popular for six decades.

When William Beecher finally retired in 1862, the business was known as Robert Cole & Co.

George Washington Wells grew up on his family farm in nearby Woodstock, CT, the youngest of nine children. Wells had recovered from a crippling broken ankle in childhood, but it prevented him from enlisting in the Union Army during the Civil War. So in 1864, on the eve of his 18th birthday, George joined his brother Hiram making spectacles in Cole’s factory and excelled at it. The work lasted only a few months, so George used his genius for mechanical invention in other industries in both Southbridge and California. He was awarded numerous patents for mass production improvements of metal frames.

George Wells had a strong work ethic and wanted to own his own company, so he bought the controlling interest of the smaller frame manufacturing company of Henry Ammidown and Charles Edmonds. When Robert Cole tried unsuccessfully to have Wells join him as a partner, the two men instead negotiated a merger of their companies and incorporated as the American Optical Company in 1869. Capitalized at $400,000 with 400 shares and 85 employees, Cole served as president with 150 shares, and George served as clerk at the age of 23 with 40 shares.

Southbridge began its transformation from a textile town into an optical manufacturing town. Wells bought land from Central Mills and had a new factory built in 1872. Located at Main and Mechanic Street opposite the Old Spec Shop, the factory had water privileges on the Quinebaug River. Wells supervised the work at the new factory, and was elected treasurer in 1879. He traveled the country as the company’s sole salesman, successfully bringing in numerous orders from jobbers who carried the company’s goods. American Optical expanded rapidly as mass production methods were implemented. The company “was to manufacture and sell spectacles and eyeglasses of gold, silver, steel and plated metals, also rings and thimbles, and such other like articles as said company may from time to time make.”
During this time, power changed from water to steam to electricity, and the telegraph gave way to the telephone. In contrast to 1874 when there were only five styles and sizes of frames, by 1887, AO made 1.5 million pairs of spectacles and employed 400 people. Five years later, it was the largest optical company in the world, producing two million pairs of spectacles and eyeglasses, and three million pairs of lenses with a workforce of 800 people.

Wells continued patenting improvements in mass production of spectacle frames. This included a process for drawing spectacle wire out of eccentric rolls and a lens cutting machine that was used nearly unchanged for decades. Wells was a pioneer of ophthalmic manufacturing. When there wasn’t a machine to do a job, he invented one. Before long, handmade eyeglasses and spectacles that previously could only be afforded by the wealthy were now being mass produced and became affordable for everyone. George Wells had an enormous impact on the lives of millions of people.

In the early years, AO was making frames only and inserting glass lenses made by a cottage industry in Europe. The quality of these lenses were often variable, and shipping took as much as a year. In the 1800’s, vision was corrected by trying on pre-made spectacles of different spherical powers until one worked satisfactorily, and people who needed astigmatic corrections were not well served. Opticians started dividing into two groups: the refracting opticians, later to become known as optometrists, and the prescription opticians, later called dispensing opticians. As refraction advanced, the need was created for spherical and cylindrical lenses.

In 1884, George Wells recruited Charlie Wilson, an expert lens grinder who was producing his own lenses using imported glass in Mt. Kisco, NY. After a year of trial and error, AO successfully made spherical lenses from imported lens blanks. Spectacle production expanded dramatically because it was no longer necessary to wait as much as a year to glaze frames with European finished lenses. Lens quality improved, and the dioptric system of lens measurement was adopted in 1885. Flat bi-concave and biconvex lenses were replaced by AO’s first production lens, the Centex, and came with the establishment of a system of interchangeability of sizes and a standard of foci of its lenses. In addition to white glass, AO supplied blue, smoked, amber, pink, amethyst, and eupos (yellow-green) glass.

By the latter part of the 1800’s, AO had introduced a number of industry firsts: rimless spectacles in 1874, the first lens plant in 1883, trial frames in 1884, automatic lens edgers and gold-filled spectacles in 1891, eyeglass chains in 1895, eyeglass cases in 1898, and toric lenses in 1900.

In the 1890’s, George Wells was joined in business by his sons Channing, Albert, and Cheney. The sons, often referred to as the triumvirate, worked their way up the ranks from a young age and were involved with the company for fifty years. After George’s death in 1912, Channing became president and oversaw sales, Cheney was vice president and involved in research and patents, and Albert as treasurer was responsible for operations and finance. They led the company as a unified team. When they purchased Cole’s stock in 1917, the Wells brothers became sole owners of American Optical.

In order to expand the company, an international division was established in London in 1905. In later years, operations were established in Canada, Brazil and Germany. In the US, branches were developed in Chicago, New York and San Francisco. The branches served as key distribution centers which expedited orders, and tapped labor forces outside the Southbridge area which expanded production.

AO and its competitor Bausch and Lomb in Rochester, NY would dominate the optical industry well into the 20th century. John J. Bausch and Henry Lomb came over from Germany in 1848, and founded a company in upstate New York that rivaled and paralleled AO in innovations, products and organization. It is interesting to note that the Wells, Bausch and Lomb families were all very good personal friends. Wells traveled to Washington, DC with his friend and rival Henry Lomb to
fight to continue importing glass duty free so they could continue investing in lens production. Both companies needed tariffs on cheap imported optical goods that threatened their quality products.

AO successfully received a license to manufacture John Borsch’s fused Kryptok bifocal in 1910, which was soon followed with a license to make the one-piece Ultex bifocal. Kryptok, from the Greek “krypte” (hidden) and “tok” (eye) was the first successful nearly invisible bifocal. The lens was a sensation as an improved design to the ugly split and cemented bifocals that were unpopular and unattractive to wear. The Kryptok lens was featured in national consumer advertising, but because it was a difficult lens to make, spoilage was frequent, especially in drilled rimless frames. Prices were fixed at $13 retail, and anyone cutting the price was dropped from the authorized list. The one obvious disadvantage of the lens was colored rainbows seen around objects viewed through the segment, but the lens was a popular bifocal even after the patent ran out in 1925.

American Optical continued to expand in their modern facility in Southbridge on Mechanic Street, and Lensdale and an adjacent power plant were built in 1910 behind the new main plant. Lensdale was a unique structure of innovative design, with large windows and built entirely of cement to be fireproof. It was the largest concrete building of its time in the United States.

The Wells brothers were committed to working long hours at AO and took turns travelling worldwide on business. In 1916 they decided to turn their family farm, which was a short distance from the plant on Mechanic Street, into a golf course which is now known as Cohassee Country Club.

The Wellsworth trademark was used during the period from 1911 until 1927, a time of many changes in both the company and the American lifestyle. With the introduction of the automobile, driving goggles were added in 1907 to AO’s product line for protection against the elements. The Fits U eyeglasses (glasses without temples) were also popular during this time. When it was felt that Wellsworth became better known than the American Optical Company, the overlapping AO trademark was patented and introduced in 1929. A shield was added to the AO letters in 1943, with variations made in later years.

Much of AO’s dominance in the industry was a result of winning and successfully being defended against patent lawsuits. The legal and patent department was started in 1910 as there were numerous patents and lawsuits involving frame and lens innovations. At this time, sales had reached $9 million, in part due to the start of new sales and advertising departments. The 2nd AO product catalogue, printed in 1912, was 348 pages and contained a wide range of frames, lenses, cases, tools, trial lenses and equipment.

B&L worked with Carl Zeiss in Germany to introduce an optically superior, corrected curve lens known as the Punktal lens in 1915. Under the direction of John Bausch’s son, B&L was the first US company to experiment with glass formulas and to manufacture glass in 1915, just as World War I unfolded.
Improving lens design was a key reason AO hired Edgar Tillyer from the Bureau of Standards in Washington, DC in 1916 to head the new Research Laboratory. Tillyer had written a paper on the axial aberrations of lenses in 1915, and AO wanted to produce a lens to compete with B&L’s corrected curve Punktal lens. AO succeeded in 1925 with the introduction of the Tillyer corrected curve lens. Shortly after hiring Tillyer, Dr. Anne Estelle Glancy, a brilliant astronomer and mathematician was hired to assist Tillyer in lens calculations. She herself was credited with a patent for the first progressive lens design in 1924. Together they worked to solve the problem of off-axis optical aberrations in spectacle lenses.

Edgar Tillyer was credited with 165 US patents and 32 Canadian patents. One of his first patents in 1917 was for a glass formulation for the Calobar Lens which filtered infrared and UV light. This became a standard sunglass for the armed forces prior to WWII. Another key patent filed in 1920 was the AO Lensometer, an instrument which could determine the effective spherical and cylindrical power of a lens, the axis and the optical center far more easily and precisely than hand neutralization. The Tillyer Lens, introduced in 1925, was one of the most important improvements in ophthalmic optics. The lens enlarged the area of the prescription optical power of a lens. In 1928, Edgar Tillyer received an honorary doctorate degree from Rutgers University, his alma mater, after which he became known to his colleagues as Doc. Much of his early work in optics involved military applications during WWI for gun sights and periscopes, and he contributed his knowledge of glass formulations to the Manhattan project during WWII. In addition to his many patents for bifocal lens designs and manufacturing techniques, Tillyer had patents outside the optical industry for heat shields on motion picture projectors and for cutting quartz crystals for amateur radios.

During WWI, AO sacrificed commercial production to take on war work. Nearly a third of their staff were called to serve, and an additional 100 to 350 workers were on the sick list due to the Spanish Flu of 1918. AO furnished aviator goggles, machinery equipment for base hospitals and mobile units, and one third of their lens products was shipped to England. Tillyer’s previous work with optical components of submarine telescopes led to the development of improved telescope sights for tanks and airplane bombsites in 1917.

Research and development at AO produced numerous innovations in the 1920’s. In addition to the Tillyer Lens series and the Lensometer, this included Nokrome and Cruxite glass, Polaroid lenses combined with Calobar glass as a superior sunglass lens, and several frame patents. The round Windsor frame, first patented by AO in 1917, was infringed upon by many other companies. In 1923, Tillyer filed a patent for the phoropter which was awarded in 1932.

Starting in 1922, AO needed a new distribution plan in order to succeed during the severe economic recession following WWI when sales had dropped. The company purchased 14 optical companies with branches in 119 cities.

The first major acquisition was the Julius King Company and their Industrial Eye Protection Division which was relocated to Southbridge and became an important division of the company. AO bought the 12 branches of the Globe Optical Company, an optical retailer in Boston. AO recruited executives from the newly acquired companies who had been AO’s jobbers in the past. John Hardin of the Hardy Optical Company became a VP and served as a company trustee with the Wells family. At their peak just after WWII, AO established 375 branches and B&L had 300 in the US and Canada.

By acquiring the independent labs that were both wholesalers and retailers of optical products, AO was now a national chain of branch offices which insured better distribution of their products. These acquisitions now put AO in the retail business in addition to manufacturing.
AO entered the scientific precision instrument field with the 1925 acquisition of the De Zeng Instrument Company in NJ, which developed phorometers and phoropters to aid refractionists. In 1935, Spencer Lens Company of Buffalo, NY, maker of the first quality American microscope, was bought and became the AO Scientific Instrument Division. Many medical devices now diversified AO’s product offering.

Plastic frames were originally created as an inexpensive substitute for tortoise shell, as early as 1879 with the Spencer Optical’s Celluloid frame patent. At the end of the 1800’s, Dupont introduced Zylonite, made from nitrocellulose. Plastic became a popular frame material in the 1920’s, in part because Hollywood actor Harold Lloyd wore them in his films. Zyl frames also caught on as the price of metal climbed, and gradually took over more than 50 percent of the frame market after WWI. AO offered Zylonite frames in round Windsor styles in their 1926 catalogue in black, wine and demi amber colors. Nitrocellulose was easy to work with, but was highly flammable, and finally banned for eyewear around 1950. Cellulose butyrate was substituted as a zyl frame material.

During the Great Depression, the AO workforce in Southbridge was insulated from the difficult economic times, and actually increased to 7,000 by 1939. Sales increased with the introduction of the enormously popular Fulvue frame in 1930, a radically new style that positioned the endpieces closer to the top of the frame rather than at midpoint. AO was asked by Bay State Optical, which held the patent for the Rimway frame, and the Uhlemann Optical Company in Chicago which held the Numont frame patent, to collect royalties on their behalf. The control of these three popular frame patents allowed AO to dictate prices and kept AO on top in the industry. In 1933, the American Optical Company had reached the 100th anniversary of the first silver spectacle made by William Beecher. The Southbridge plant covered 17.5 acres of floor space in 36 buildings.

Channing Well’s sons John, Greg, and Turner, and Albert’s son George B. joined American Optical around 1924. The four were referred to as “the boys”, and were ambivalent about committing to AO as their fathers had. However, they were elected as trustees and served on the Operating Committee. Albert’s son George B. Wells replaced his uncle Channing in 1936 as president, keeping the company in family hands. During the 1940’s, The AMERICAN Plan was implemented to educate the public of the importance of the optical professions. AO advertisements in national consumer publications during the 1940’s promoted the value of eye care rather than the company’s merchandise.

Commercial production was again disrupted during the years of WWII. Many essential materials were scarce, and frame styles were limited. Zyl frames were still very popular during this time. AO signed up with the Vision for Victory program along with other optical companies. 18 million pairs of lenses were supplied for the war effort, and an additional 5 million pairs of sunglasses, 10 million goggle frames, safety products, and ophthalmic testing and refracting equipment used by the Army were successfully produced by the AO workforce. When skilled manpower was drafted into the war, women filled their places in the factories to keep up with the workload. Mobile Optical Units conceived in 1941 for the US Army Medical Department and were rolling out of Southbridge by 1942.

During WWII, the supply of glass prosthetic eyes, (made primarily in this country by family trained German craftsmen) was running out. The best supply of glass became exhausted, and inferior glass would not last more than a year or two before it roughened, discolored and/or imploded in the eye orbit. AO initiated the Monoplex Plastic Artificial Eye Division with 15 artists, and supplied the demand for unbreakable artificial eyes made from methyl methacrylate. The division became one of the few laboratory and training centers for oculists in the US.
In his later years, Albert Wells and his daughter-in-law Ruth were the main force behind the formation of Old Sturbridge Village. Albert had become an enthusiastic collector of primitives while on company trips in the US and Europe, and after years of acquiring, needed more room for displays. The Wells Historical Museum, incorporated in 1935, originated in his house on Main Street in Southbridge. The collection evolved into the living museum when land was purchased in Sturbridge and OSV opened in 1946. Ruth later played a role in starting the AO Museum in the main plant in Southbridge in 1983 as part of the 150th anniversary of the company.

Throughout the company’s history, employees were loyal to AO. They rallied patriotically during the war years to meet government order deadlines yet still maintained commercial production. Over the years, the many social activities and clubs were reported on in company newsletters. A new pension program started in the 1950’s. Employee pride in their company continued into the company’s final years.

There were three legal actions undertaken by the US Justice Department that shaped the optical industry in the 1940’s. Between 1920 and 1946, it had been difficult for anyone trying to compete with industry giants AO and B&L. The first suit was directed at AO’s conspiracy with others in the industry to fix prices and restrain trade in ophthalmic goods, specifically with the Ful Vue, Rimway, and Numont patents. The suit was postponed because of the greater need for war production output during WWII, but when it resumed, the case was decided against AO and other defendants, and put an end to the frame patents. AO and B&L were forbidden from acquiring more labs or exchanging information.

The second suit in 1946 involved a payment system that was in place to eye doctors who accepted rebates on glasses purchased from AO. When the case was settled in 1951, it enjoined AO from dispensing or owning a dispensing business for 10 years, and could not set consumer prices for ophthalmic goods or services or even suggest retail prices.

The final suit against AO and B&L began as a complaint made by an independent lab owner in Wisconsin to his US Senator when he could not get a listing with either AO or B&L. “The Milwaukee Case” was filed in 1961, and was settled by a consent decree in 1966. AO and B&L were enjoined for 20 years from opening more than five new wholesale labs a year, and could not engage in the retail business for five years.

These three consent decrees changed the US optical industry. When AO and B&L labs no longer had financial advantages, they could no longer compete effectively against independent labs. The independent labs were free to take advantage of optical laboratory innovations at a time when AO labs became burdened with increasingly antiquated AO machinery.

Charles Cozzens took over the presidency of American Optical in 1946 and became the first person outside of the Wells family to run the company. There were numerous challenges that had to be addressed as war production ceased. Although Channing, Albert and Cheney Wells had officially retired in the 1930’s, they all had offices in Southbridge and had difficulty letting go of their company. Their interference had made it difficult for George to lead the company in a new era of business. When Cozzens died unexpectedly in 1947, George Wells resumed as president on an interim basis until 1949 when he resigned and was replaced by Walter Stewart, a protégé of Cozzens.

Tax laws changed after the New Deal, so by 1951, the Wells family disposed of its interests, and AO became a publically traded on the New York Stock Exchange. At that time there were a dozen US plants outside of the main factories in Southbridge where metal frames, lenses, cases and furniture were manufactured. These included Brattleboro, VT (special lenses for safety equipment), Keene, NH (precision instruments and devices), Chelsea, MA (sunglasses), Frederick, MD (plastic frames) and Putnam, CT (safety products). By 1958, there were 4,000 AO employees in Southbridge, with an additional 6,000 in these other locations.

The diversity of AO products was enormous. The J.W. Fecker Division in Pittsburgh, PA developed sophisticated optical systems and astronomical instruments, satellites and missile tracking devices. The scientific instrument plant was in Buffalo, NY and manufactured ophthalmic instruments, microscopes, microtomes and medical devices. AO-Todd was a film projection project in the 1950’s that put films like “Oklahoma” on the wide screen. Research in 1954 at the Southbridge facility began with a three-person research project to draw optical fiber, and developed into the Fiber Optics Division in 1966. Development of fiber optics at AO was started with the help of the CIA who were looking for a means to code and decode messages.
The consent decrees forced AO to alter its direction, and management now had to abide by the courts and compete in a rapidly changing economic environment. Weldon Schumacher assumed the helm from Walter Stewart and carried on the tradition of offering the best product at the best cost. AO was able to do well in all divisions during this time, and expanded the international division which was comprised of Canada, England, Switzerland and Southeast Asia.

Following WWII, as the economy expanded, AO introduced many new frame styles. New zyl and combination frames for men and more ornate frames for women were popular in the 1950’s and 1960’s.

In 1957, American Optical management changed to become more sales oriented and hired executives from outside the optical industry. Conditions in the industry proved tough and eventually the company was sold in 1967 to Warner Lambert, a large pharmaceutical company that saw great promise if AO could be managed and marketed more effectively. Many of the better AO executives were reaching retirement age and left, and others became disenchanted and found opportunities elsewhere.

Research succeeded in many new developments regarding plastic lenses in the late 50’s and the 60’s. Columbia Resin #39, developed by PPG Industries in PA, began a long climb to become a lightweight, less breakable lens alternative to glass. AO developed their first plastic lens, the AOLITE Aspheric Cataract Lens which offered major improvements in ophthalmic optics. Design features of the new glass Masterpiece lens were incorporated into the new AOLITE line, producing a superior, flatter lens. During this time, AO introduced its first plastic photochromatic lens.

In 1962, AO’s Instrument Division formed a partnership with Reichert Scientific Instruments, which was bought by Cambridge Instruments in 1986. A merger of several companies with Cambridge lead to Leica, Plc. in 1990.

Overall profits continued to disappoint, and Warner Lambert sold AO in 1982 to a private group of investors headed by Morris Cunniffe and Rudy Wood in a leveraged sale of $35 million with $5 million down. The new owners, who had no experience in the optical industry, reorganized the company and reduced the workforce by one-third. The domestic labs were sold for low prices or closed, and though settlements cleared the way for AO to continue manufacturing soft contact lenses, that division was sold in 1985. AO was set to sell the contact lens division for $85 million to Allegan, primarily for their lens solution, but when the government did not approve of the sale, the division was sold to Ciba-Geigy for $90 million, with a loss of 260 jobs. Frame production was shut down. The AO Fiber Optics division was sold to Schott Fiber Optics Corporation in 1986. Gene Lewis remained president after the 1982 sale.

The AO glass plant in Southbridge closed in 1979. Lens production was gradually dismantled starting in 1987, and fused glass bifocal production was shifted to a company AO acquired in Brazil which eventually pulled out of the lens market. Single vision glass lenses were produced for a very short period in Thailand and Hong Kong before being completely halted. Plastic lens production was shifted to Tijuana, Mexico in 1992, and the last lens produced in Southbridge was the glass executive bifocal lens in 2005. In 1989, AO sold their safety division, AO Aearo (A-ear-O which supplies eye and ear protection) to Cabot Industries and is still headquartered in Southbridge. AO Sunwear was sold in 2006 and also remained in Southbridge.

In 1993, town officials in Southbridge entered a US Department of Defense contest to site a financial training center that promised to bring 4,000 jobs. They hoped to renovate the AO main plant which had been mostly vacant for 20 years. Southbridge won the contest, but when plans changed and the project was nearly scrapped, a letter writing campaign, along with a late night phone call from Sen. Edward Kennedy to then President Bill Clinton ensured the project staying on track. The DOD signed a 20 year contract to lease space at the new Southbridge Hotel and Conference Center, an $84 million world-class conference facility with 201 hotel rooms which opened in late 2001. It was projected the hotel would employ up to 200 people and the government would employ 150 more. When the DOD is not using the facility, the hotel public facilities are available for rent. In 2009, Quinsigamond Community College leased classroom space in the AO complex behind the hotel.
In 1996, SOLA International purchased the AO Ophthalmic Lens Division, renamed it AO Lens Co. and moved the company headquarters to San Diego, CA. In 1998, the AO Compact progressive lens was introduced, and was named the Best in Lens Design by the Optical Laboratories Association in 1999. AO, SOLA and Carl Zeiss Ophthalmic merged in 2005 to form Carl Zeiss Vision, and a small office remains in Southbridge. It was the last year of lens production (of the Executive bifocal) in Southbridge.

Over the course of 182 years, the American Optical Company rose from the humble beginnings of William Beecher’s small upstairs workshop in Southbridge, MA to become the largest optical company in the world. Contributions made to society were not limited to ophthalmic optics, but included safety products, medical devices, scientific instruments, military contributions, communications and more. The company which had set itself in 1869 to “manufacture and sell spectacles and eyeglasses of gold, silver, steel and plate metals, also rings and thimbles and such other like articles as said company may from time to time desire to make” accomplished so much more. As George W. Wells had stated, his company “spared no pain until every person who needs them shall have glasses of true scientific merit.”

Preserving the American Optical story is now the work of Dick Whitney, a long time AO employee in ophthalmic lens design and standards who now works for Carl Zeiss Vision in an office on Main Street in Southbridge. Following the footsteps of his father Donald who started in lens design at AO in 1947, Dick started a website www.dickwhitney.net in his father’s memory.

When the artifacts in the AO Museum were in danger of being discarded, Dick saved as much as he could and put it into storage. The collection has grown with donations that still come in. Following John Young, the first curator who helped set up the AO Museum in 1983, Dick and assistant Donna Silverberg are hoping to find a permanent home in historic Southbridge for the artifacts of a company that advanced the optical art during its long reign. Dick is active in his community, and records Southbridge events in photographs and recollections by others on his website. He maintains another website, www.opticalheritagemuseum.org devoted exclusively to the history of the American Optical Company. Both sites are continually updated and serve as a valuable resource of ophthalmic history for generations to come.

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Bibliography


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