Date: June 3, 1981

To: N. David

From: D. B. Whitney

Subject: AO Safety Firsts

Please excuse my delayed reply to your memo of May 12 on the above subject. I set out to research the subject a bit, jotted down a few notes on your original memo and then AR'd it for December 18. I believe, Neal, that there are quite a few firsts of which AO can take pride:

1. The first safety goggle (see Exhibit A).

2. The first heat tempered lenses (see Exhibit B).

3. Invented Calobar glass (see Exhibit C).

4. Invented Cruxite glass (see Exhibit D).

5. Introduced FUL-VUE frame (see Exhibit E) – the forerunner of the FV7 shape, this was the first frame to have the temples attached to the top temple corner rather than the center of the eyewire.

6. The first one-piece Franklin-type bifocal – the EXECUTIVE. It is interesting that this has become the first Rx safety polycarbonate bifocal.

In addition, we can lay claim the invention of instrumentation essential to safety eyewear, such as:

1. The Lensometer.

2. The additive refractor (the Phoroptor).

3. The additive trial set.

In addition to the above, I suspect we might have important firsts in areas such as welding plates, gold coated heat reflecting plates, and didymium lenses for absorbing sodium flare. I have been unable to document these, however.

I hope the above is of some help to you.

DBW/sn

Enc.

THIS IS THE STORY OF AO SAFETY PRODUCTS

EXHIBIT A

When American Optical was founded in Southbridge in 1833, some fifty-two years after the guns of the Revolution were silenced, few [remnants] of the conflict were still visible on the New England countryside.

In a land stirring with growth, the optical frame shop established by founder William Beecher enjoyed a modest success that gave no hint of the tremendous expansion to come. But the years that followed found American Optical in the forefront of the optical business as the major manufacturer of optical frames and lenses, ophthalmic instruments, and a variety of optical products for specialized use in the fields of science, medicine and industry.

At the turn of the century, approximately sixty years before Congress passed the Occupational Safety and Health Act, AO became involved in protecting people at work. The company introduced the first safety goggle – a product that proved so effective in reducing accidents that one Chicago plant credited AO goggles with saving twenty eyes within a month.

Later, applying its expertise as a maker of optical lenses and frames, the company combined optical precision with the protective qualities of safety lenses to produce safety glasses. Similar in appearance to regular eyeglasses, AO safety glasses – with lenses and frames specially designed and constructed to withstand the demanding requirements of industrial use – became available either with plano (uncorrected) safety lenses, or with precision-ground prescription safety lenses to fill the visual corrective needs of wearers.

With a successful record in the development and manufacturing of effective safety eyewear, AO logically progressed to the complete protection of the working person. Always keeping abreast of new technologies and utilizing new developments in materials, AO Safety Products now offers many different types of equipment to afford personal protection, convenience, and working comfort.

The AO line of personal protective equipment includes a [combined] range of products to assure worker safety. In addition to safety [eye] wear, the company makes hearing protectors and ear inserts to [provide] workers against harmful noise. Respirators for protection against [literally] thousands of potentially hazardous vapors, gases, fumes, and mists. Faceshield, Safety caps, Welding helmet, Gloves and Clothing to protect workers against weather, heat and other [hazards]. And a line of protective specialties from first aid kits to [?] skin conditioners.

Still pioneering in safety, AO continues to keep pace with [changing] technologies, constantly seeking new ways to improve it products.

Chemically Tempered Ophthalmic Lenses

In 1930 Laminated glass was introduced as a result of an accident in a lab where a flask had been filled with a mixture of celluloid, acetone and alcohol and had been forgotten for many years. The contents during this time had evaporated to a thin dried residue adherent to the inner surface. A later mishap resulting from glass splinters caused Edouard Benedictus to return to this curious flask. Thus was formed the first sheet of "Triplex" laminated safety sheet glass.

From these beginnings evolved our present thermally tempered glass, laminated "Motex" and followed by thermosetting plastic circa 1950. The writer played an interesting role in the perfection of the latter.

The subject matter at present of utmost consequence which affect IRL at the doctor's level concerns the quality of the lens surface obtained after it has been processed by the conventional heat-tempered methodology then tendered acceptance by the profession and thereafter dispensed to the patient.

The writer must digress at this point to emphasize the obtuse chauvinistic ineptness of bureaucracy. In this instance the FDA, with respect to what occurs to a lens of crown glass when it is subjected to heat treatment by the prevailing and accepted process. Precisely, all the advantages of precision surface grinding and polishing are dissipated; let alone, the incident of breakage, warpage, internal stress, mild discoloration, and an increase in the minimum thickness requirement obviated by the conventional treatment. Notwithstanding these basic single vision dilemmas, the fused type bifocal (Kryptok, flat-top, curved-top, Nokrome, etc.) presents additional problems brought about by the interference with the original annealing of the blank when the segment portion is fused in the forming of the rough bifocal blank.

The FDA does not specify a minimum thickness requirement for either glass or plastic lenses. The manufacturer of plastic lenses needs only to indicate in some manner that the lenses supplied meet the "steel ball test."

In 1965 a patent was granted to a Mr. Webber of the Brockway Glass Works which, in essence, provides a process of chemically tempering glass employing an exchange of ions initiated by an electrolytic solution. The same year a Dr. Kissler of the University of Utah received a patent for a direct method of chemically tempering of glass. For a number of years this latter method found application in the toughening of industrial glassware such as is used in laboratories and the automotive industry or usages where durability and longevity in glass are indispensable. Its application to lenses served no great purpose in the United States. Glass lenses were not required to be tempered. The handful where tempering was indicated could be resolved easily by employing the conventional air-heat tempering process.

However, England, Japan and many other countries have had the IRL requirement for a decade or thereabout. Consequently these foreign countries expressed a prior interest in this chemical process. Japan in particular developed an apparatus which could treat batches of lenses in quantities of approximately 25 of 500 and 1800 per cycle of 20 hours $\pm$ 2 hours. (See illustration).

The chemistry which provides an end product in which the resultant lens is easily twice as tough as the prior air-heat tempering method involves an ion exchange in the surface of the glass. These chemically strengthened lenses offer a substantial and consistent advantage which include: 1) FDA requirements can be met and surpassed with much thinner lenses. (1.0 mm have been tested in the writer's lab with excellent results). 2) Lightness of weight factor comparable to plastics. 3) Warpage virtually eliminated. 4) Highest in scratch resistance. 5) Minimum internal stress. 6) Notched rimless can be strengthened equally. (drilled lenses require some experimentation). 7) No change in water-clear color of lenses.

1916 - Dr. E. D. Tillyer came to AOCo. From Bureau of Standards, Washington, D.C.
E. L. Schumacher came to AOCo.
Royal Parkinson came to AOCo.
Calobar Patent – Tillyer.

1917 - Cole interest secured.
Bugbee Nokrome Patent 1,397,920 - Nov. 22, 1921, filed Nov. 24, 1917.
Ultex litigation – Onepiece – 1917 – 1919.
Co. vs. B. Mayer.
Inner Rim Patent 1, 219,254 – Clulee.
3/13/17 – Process.
Adt. vs. Kirstein Litigation.
Inner Rim or Windsor spectacles.
Calobar Patent – Tillyer 1,222,049 – Issued 4/10/17.

1918 - Tillyer Trial Set – Effective Power.
M28 Litigation – Paige vs. Brown.
AOCo. Defended Brown 1918.
First Windsor Litigation – AOCo vs. Universal.
Stevens vs. AOCo. – Day & Carson Patent
1918 – 1920.
Bilt-In Bearing Litigation – 1918 – 1920.
Five Party Interference – Haynes Patent.

1915 - 1918 World War I.

1919 - Cruxite Glass Patent – A. B. Wells.

1920 - Bilt-In Bearings – Fingerpiece Patent 1,345,488 – 7/6/20 – C. M. Haynes.

1920 - Sales – 9 million dollars.
Federal Trade Commission vs. Onepiece Company.
Litigation – December, 1920.
Bilt-In Bearings on market.
Albert Julia opened our Branch in B. A., Argentina.
Heat Screen Patents issued – 1920, 1921, 1922.

1921 - Lensometer on market.
Heat Screen Patents – Bugbee and Tillyer.
Inner Rim Patent – Clulee – 1,366,768.
1/21/21, Article.

1922 - 1923 Bought our Branches.
1922 – Scheuerle vs. Ultex Company Litigation.
Bought our Distribution.
We bought 14 Branches in 1923 with 119 outlets.
Phoroptor – Additive Power – Tillyer – Patent 1,455,457 – 5/15/23.
Scheuerle vs. Onepiece Company Litigation.

1926 - Julius Neumuller first worked for AOCo. - 10/2/26.
Dr. T. L. Story came to AOCo. – March 1st.
Pearl Pad Patent – Boutelle 1,581,163 – 4/20/26.

1928 - C. O. Cozzens made Sales Manager.

Ful-Vue Patent – Emmons 1,685,192 – 9/25/28.
Bowl Feed Patent – Maynard, Patent 1,666,713 – 4/17/28.

1929 - Polaroid Patent.
Ful-Vue Patent – Smith 1,739,049 – 12/10/29.
Iseikonic Patent – 1,933,587 – 11/7/33 – Filed 8/13/29 – Ames.
Sales – 16 million.
Panic in fall of year.
Panoptik Bifocal Patent – Hammond – 1,740,298 – 12/17/29 – Filed 4/6/27.

1930 - Heat Screen Litigation.
Acme vs. DeVry.
Ful-Vue Frame License.

1931 - Univis Litigation – 1931 – 1934.

AMERICAN OPTICAL SAFETY FIRSTS

Safety Goggle
Heat-Treated Lenses
Calobar Glass Lenses
Cruxite Glass Lenses
FV7 Lens Shape
Executive Bifocal Glass Lenses
Executive Bifocal Polycarbonate Lenses
The Lensometer
Stylish Safety Frames: F2000 & F3000
Weld Cool Plates
Airlite Goggle (only goggle to accommodate Rx lenses)
White Fiberglass Welding Helmets
Riot Guard Helmets
Lock-A-Lens Frame Design (higher back bevel)
Duragrip Screw
7-Barrel Hinge Construction for Frames
Ventilation for Hard Hats
710B Chemical Splash Goggle with Indirect Ventilation
Artificial Head for Objective Testing of Hearing Protection
Floating Snap Fastener of Faceshield Visor for Expansion Due to Heat
Aluminized Coated Face Shield
Poly-Snap Lens System
Slotted Hard Cap for Attaching Accessories
Sized Respirator Face Pieces