TOOLS & TECHNOLOGY

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The American Precision Museum is open daily 10 am - 5pm, Memorial Day weekend through October.

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AMERICAN PRECISION MUSEUM

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Milestones in Mass Production

The Jones & Lamson Profiler - Innovation and Conservation

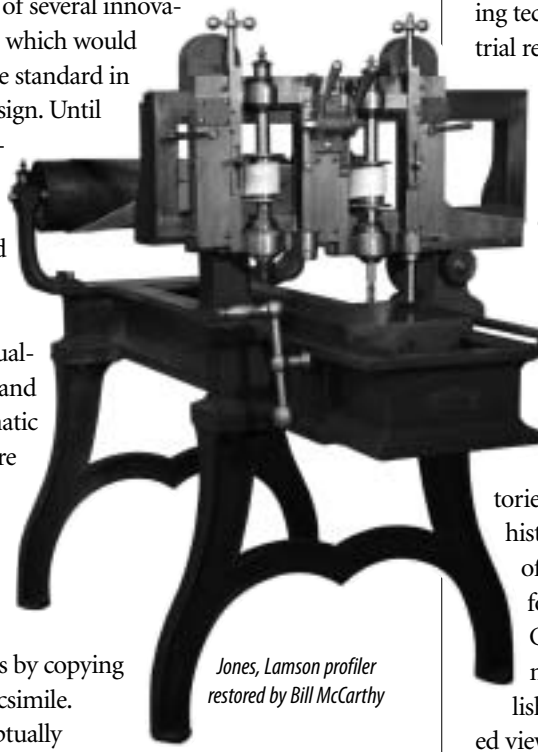
By William McCarthy

Former APM trustee, and member, Board of Advisors; Owner, Restoration Millwork, Riegelsville, PA

This article is adapted from the longer and much more detailed version on the APM website

In 2006, Earl Skokan from Torrington CT gave the museum a rare Jones, Lamson & Co. profiler/edge miller, which had been built at the Robbins & Lawrence Armory some time between 1869 and 1876 using Robbins & Lawrence's own foundry patterns. This Jones, Lamson & Co. profiler is the earliest known example of its kind.

This machine is significant because it deployed the first use of several innovative features which would later become standard in machine design. Until the development of numerically controlled machine tools in the 1960s, manually operated and semi-automatic profilers were the only means of making precise, irregularly shaped parts by copying a full size facsimile.



Jones, Lamson profiler restored by Bill McCarthy

Conceptually derived from the first and second generation gun lock

Profiler *continued on page 3*

Edwin A. Battison, Museum's Founder Dies

Edwin Alfred Battison, the museum's founder and first director died January 12, 2009. He was born in Windsor in 1915 and was the Curator of Mechanical Engineering at the Smithsonian Institution's Museum of History and Technology in Washington, D.C. until his retirement in 1973.

Ed Battison in 1966.

Battison had to forego attending college because of the Great Depression, and he began working in the machine tool industry, which prospered in the Connecticut River corridor of Vermont known as Precision Valley. He first worked at Cone Automatic Machine Tool Company (the forerunner of Cone Blanchard) in Windsor and then with the Fellows Gear Shaper Company in Springfield, Vermont. He spent his life collecting the best examples of evolving technology and artifacts from the American industrial revolution, especially watches and clocks.

Wanting to know more about cataloging his collection of clocks and watches, Battison contacted the Smithsonian. The staff soon realized he knew more than they did. Later he was offered the position of Assistant Curator of Horological and Small Machines. As Curator of Mechanical Engineering for the Smithsonian, he traveled abroad and gained a global perspective on industrial history. As an outgrowth of this research, he edited, for American publication, two Russian histories. One was a description of factories in the Urals and Siberia in 1735, the other a history of metal cutting machines up to the middle of the 19th century. He also wrote the catalog essay for a 1973 Yale University exhibit on the American Clock, 1725 - 1865 and taught a course on technology at the University of Pennsylvania. He published research that disputed the previously accepted view that Eli Whitney conceived and brought to practical fruition the idea of making muskets with interchangeable parts. By examining some of the mus-

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A Working Machine Shop at the Museum

A working machine shop, developed through a cultural heritage-manufacturing partnership between the American Precision Museum (APM), and the River Valley Technical Center (RVTC) in Springfield, VT was the centerpiece of the museum's 2008 exhibit, *From Muskets to Motorcars*. Construction of the shop itself, as well as stipends for the student interns who staffed it, were funded, in part, by the Vermont Department of Labor. Christopher Gray, an RVTC instructor and former APM Trustee, is the museum's partner in this project. Two of his students, Bryce Carter and Ben Holleran, were hired by the museum to staff the shop and demonstrate for visitors how the historic tools work and how modern computer-driven tools are based on them.

Photo by Medora Hebert

Ben Holleran working in the machine shop.

"This museum is an awesome place," says Carter. "My father is a timber framer and woodworker, and I have been building things all my life. When I heard about this summer job opportunity from Mr. Gray at RVTC, I jumped at the chance of being here and learning even more."

Before working at the museum, Holleran had visited with his family several times. "My grandfather was a machinist, and he still rebuilds motors in his own machine shop. I have been interested in engineering all my life and hope to be able to continue with this when I graduate." Carter and Holleran became good friends through their RVTC classes, and they were eager to apply for the two intern positions the minute they heard about them. "Imagine getting paid to do something you love," says Holleran. "We like the daily interaction with everyone at the museum and being able to help visitors understand and experience how things work is just great. This is an exciting opportunity for both of us."

Photo by Medora Hebert

Ben Holleran and Bryce Carter

Visitors commented that these trained and enthusiastic interns made their experience at the museum come alive. Partial funding is in place from Vermont's Department of Labor to expand the program to four interns for the 2009 season.

"Ben and Bryce were so helpful and informative. They approached us and showed us how the machines actually worked. That made a very big difference than just looking and reading about the machines ourselves. We would really like to thank them for a wonderful afternoon."

"My students did not want to leave they were having such a good time. They especially liked the demonstrations by Ben and Bryce."

Profiler *continued from page 1*
inletting machines developed by Thomas Blanchard in the 1820s and Cyrus Buckland at Springfield Armory in the 1840s, profilers became an essential part of the American system of interchangeable parts. Machines such as the Jones, Lamson/Robbins and Lawrence profiler made the modern age of mass production possible.

Missing Parts Cast in Pennsylvania and Machined in Vermont

When the machine arrived at the museum, it was clear that it needed significant work before it could go on exhibit. Although it had been stored in less than desirable conditions for some 75 years, it was in remarkably good condition. It had obviously been well oiled when last used. The oil, in combination with the accumulated dust, dirt and grime, had formed a protective shell, which helped to minimize the rust damage that usually affects uncoated surfaces of metal objects stored in unheated buildings. McCarthy, working with Executive Director Ann Lawless and Collections Manager, Melissa Wilson, developed a conservation plan for the profiler, which would concentrate on cleaning the machine, repainting it and replacing missing parts.

The left hand spindle depth stop and lowering mechanism were missing. Since the right hand spindle was intact, it could serve as a pattern for the left side. The lowering mechanism consisted of a sector gear lever and a short piece of gear rack. "I made a wooden foundry pattern and found an Amish iron foundry in Pennsylvania that was the only place I knew of where I could get just one casting and use patterns that are not mounted on match plates," said McCarthy.

In 2008, the museum built a working machine shop on the exhibit floor in partnership with the Springfield, VT River Valley Technical Center and instructor Chris Gray with partial funding from Vermont's Department of Labor. McCarthy was anxious to involve Gray's students in this new project, and they were enthusiastic about participating. McCarthy supplied the drawings, Gray provided the guidance, and the students cut the gear teeth on the sector gear lever and rack.

McCarthy then made the ball handles along with the missing fasteners. The small and medium fasteners were made on a turret lathe, a machine which later became a Jones & Lamson specialty. "Large fasteners were evidently made one at a time on a lathe, because they all had center holes on either end," McCarthy commented. "I made all the replacement fasteners out of 12 L 14 grade steel on two of my vintage lathes. Some of the small fasteners had *standard* pitch screw threads, while all of the large bolts had *bastard* threads. With *bastard* threads, the bolt threads had to be cut on a lathe, not using a thread cutting die."

After this, came the rust removal, re-painting, mild polishing, and the profiler was re-assembled and adjusted. Belting was purchased, cut to the correct length and installed. "It was a pleasure to work on this historically significant machine tool," said McCarthy. "It is my hope that this important machine will be tooled up and run once, recording the event so that museum visitors can see first-hand a truly significant milestone in the history of American manufacturing." The museum agrees and is currently looking for funding to make this happen for the 2009 season.

Museum's Founder Dies *from page 1*
kets, he demonstrated that Whitney's claims were unfounded. His research was published in 1966, the year the American Precision Museum was founded, in the *Smithsonian Journal of History.*

That same year Battison enlisted the help of U.S. Senator Ralph Flanders to save the building that now houses the American Precision Museum. The building, which dates from 1846, once housed the Robbins and Lawrence Company, one of the earliest manufacturers of firearms using the concept of interchangeable parts.

Battison worked tirelessly to build a collection of machine tools to rival that held by the Smithsonian. He acquired working models, including the famed Aschauer Workshop collection, as well as rifles, sewing machines, and typewriters of historic significance to Windsor and the Precision Valley. He also collected library and archival materials to support his collections and authored *Muskets to Mass Production: The Men & The Times that shaped American Manufacturing,* published by the American Precision Museum in 1976.

From his Washington years, he learned the importance of recognition of the site's significance as a means of ensuring its long-term preservation. The National Park Service designated the Robbins & Lawrence Armory a National Historic Landmark in 1966. In 1986, the American Society of Mechanical Engineers recognized it as the First International Mechanical Engineering Heritage Site and Collection.

Battison directed the museum until 1991 and served as a Trustee until July 2006, when the museum honored him by naming him Founder, First Director and Trustee Emeritus.

Despite failing health, he continued to pursue his passion for collecting and history. He founded a second museum in Windsor a mile upstream from the American Precision Museum at the Ascutney Mill Dam and factory sites. The Franklin Museum of Nature and the Human Spirit houses his personal collection of 80 years, his research and papers, including diaries he began in 1924.

Museum Notes

The museum's unique ***Etheric Force Machine,*** invented by John Worrell Keely in the late 1800s, was part of **The Fleming Museum's** 2008 exhibit *"Between Soft Machines and Hard Science: The Interstitial Art of W. David Powell"* at the University of Vermont During his lifetime the controversial Keely built over 2,000 different machines in his quest to develop a device which could commercially harness his 'etheric' force. APM's ***Etheric Force Machine*** is one of two Keely machines known to exist today. The Fleming exhibit incorporated charts and devices from both obsolete and contemporary scientific sources and looked at the ways that art and science can clarify or confuse that understanding.

photo courtesy of the Fleming Museum

The Etheric Force Machine invented by Worrell Keely

Vermont Inventors at the **Fairbanks Museum,** St. Johnsbury, VT, was a tribute to some of Vermont's early creative geniuses whose ideas (were sparked in this state and who) contributed to far-reaching change throughout the country and the world. Featured in the exhibit were several artifacts from APM's collection including Asahel Hubbard's model of a 'Revolving Hydraulic Engine.'

L.S. Starrett Company headquartered in Athol, MA, has a long history with the museum. They recently donated an engraving machine that had been in use since the early 1900s for engraving the Starrett name on their micrometers. This gift will complement the extensive collection of Starrett micrometers, calipers, indicators and squares already a part of the museum's collection of measuring tools.

Laroy S. Starrett's goal, when he founded the company in 1880, was 'to invent something useful that people would want.' His first invention was the 'hasher,' a meat-chopping machine, which can still be found even today at country auctions. The company is now led by Douglas Starrett, a fifth-generation family member. L.S. Starrett manufactures more than 5,000 variations of precision tools, gages, measuring instruments and saw blades for industrial, professional and consumer markets worldwide and has been an industry leader for over 128 years.

Starrett Engraving Machine

Bequests Strengthen The Museum's Future

Over the years the museum has received several significant bequests that have allowed us to add to our endowment, begin special projects and establish new programs. Charitable bequests are gifts to the museum at the time of death under a will or trust agreement and are fully deductible for Federal estate tax purposes. A bequest may be made in the form of cash, securities, or real estate and provides tax advantages while providing for the long-term health of the museum.

It is easy to add a codicil to your will or trust naming the American Precision Museum as a beneficiary of your estate.

"I give to the American Precision Museum, Windsor, Vermont _____ dollars ($____), or _____percent (____%) of my residuary estate, to be used for the benefit of the American Precision Museum, Inc. as the Trustees thereof may direct."

Now, partnering with the Vermont Community Foundation, the museum can offer donors the opportunity to make a gift through a charitable gift annuity (CGA) to benefit the museum. This is a lifetime gift with fixed payments to the donor or another beneficiary during his/her lifetime and is guaranteed by the assets of the Vermont Community Foundation.

Rates (as of February 1, 2009):

Age	Rate	Age	Rate	Age	Rate
60	5.0%	70	5.7%	80	7.1%
65	5.3%	75	6.3%	85	8.1%
				90+	9.5%

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