Tinius Olsen, the Man, his Company, and the Machines Contributing to the History of Mechanical Testing
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Earl A. Ruth
Director of Technology
Tinius Olsen Testing Machine Company
• Tinius Olsen was born in Kongsberg, Norway, in 1845.
• He graduated from the Horten Technical School in 1866 at the head of his class, and became the foreman of the machine department at a large naval machine shop. Olsen did not enjoy this job, and after trying to find work in Newcastle England, left for America.
The 24 year old Olsen arrived in Philadelphia in August 1869 and found employment with William Sellers and Co as a designer.

Olsen started attending Sunday Bible classes at the local Lutheran church, where he met the Riehlés, two young brothers who were proprietors of a small scale workshop.
The Riehlés had received an urgent request for a machine to test the strength of boiler plate.

No such device existed at the time, and weak plate materials caused frequent boiler explosions, especially on steam boats that were traveling up and down the Mississippi.

The Riehle brothers asked Olsen to produce engineering drawings for such an instrument.
In his spare time Olsen designed and drew precise plans for the first boiler-plate tensile testing machine, with a capacity of 40,000 lbf. The new device, manufactured by the Riehlé brothers, proved a success, and soon there was a demand for a much larger model. The Riehle brothers employed Tinius Olsen as the Works Manager in 1872. In his eight years there he helped establish the firm as a manufacturer of both springs and testing machines.
• Olsen’s machines were exhibited and won medals at the Philadelphia Centennial Exposition in 1876. In 1879, the Committee of Science and the Arts of the Franklin Institute, Philadelphia’s prestigious center for scientific study, formed a committee to investigate Tinius Olsen’s testing machines and reported, the machines were “convenient to operate, properly proportioned, handsomely designed, …”. However, the patents remained in the hands of his employers.
• Perhaps it was such accolades that prompted Mr. Olsen to ask the Riehles’ to make him a partner. They refused, and late in 1879, he was informed that his services would be terminated at the end of the year.

• With the urging of his wife (she even hocked her jewelry) Tinius Olsen started his own company on April 1st in 1880.
Generation I, the Man
1845 - 1920

- The business expanded almost immediately as the material testing machines were exported worldwide.
- Tinius Olsen was in charge of the business until 1920 when he had reached the age of 75.
• Tinius Olsen continued to be semi-active in the Company until his death in 1932.
• During his semi-retirement he returned to Kongsberg, Norway a couple times and donated large sums of money to start a Technical School there.
The machine that put Tinius Olsen Testing Machine Company on the map was the “Little Giant”.

On March 25, 1879, Tinius Olsen received patent 213,525 for “Improvement in Testing-Machines” which patented the universal testing machine.
Generation I, the Machines
1845 - 1920
UNITED STATES PATENT OFFICE.

INVENTOR.

INVENTION.

IMPROVEMENT IN TESTING MACHINES.

Improvements in Testing Machines.

Improvements in testing machines, and particularly improvements in testing machines for testing the strength of materials, such as bars, beams, castings, and the like, are well known. Many such machines have been in use for many years, and have been improved in various ways to make them more efficient and more accurate.

The present invention relates to a new and useful testing machine for testing the strength of materials, and particularly to a machine for testing the strength of bars, beams, and the like. The machine is designed to be simple in construction, yet to be capable of producing accurate and reproducible test results.

The machine comprises a frame, which is supported on a suitable base, and which is provided with a loading mechanism, a testing mechanism, and a means for measuring the load on the specimen. The loading mechanism is arranged to apply a known and reproducible load to the specimen, while the testing mechanism is arranged to measure the load and to compare it with a predetermined load.

The machine is designed to be operated manually, and to be of such a construction that it may be easily moved from one location to another, and that it may be easily set up and dismantled as required.

The present invention is intended to provide a testing machine which is simple in construction, yet which is capable of producing accurate and reproducible test results, and which is suitable for use in the testing of bars, beams, and other materials.

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APPLICATION SUBMITTED JUNE 30, 1896

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Generation I, the Machines
1845 - 1920
Tinius Olsen soon had hundreds of different machines and instruments available.
By 1906, Tinius Olsen had 8 different catalogues covering:

- Universal Testing Machinery and Instruments
- Spring Testing Apparatus and Spring Machinery
- Cement and Concrete Testing Machinery
- Cloth, Yarn, Paper, Rubber and leather Testing Machinery
- Wire, Chain and Anchor Testing Machinery
- Oil Testing Machinery
- Transverse Testing Machinery
- Special Testing Machinery (Including Impact, Indentation, Vibratory, Bending, and Torsion Testing Machinery)
Generation I, the Machines
1845 - 1920

• Tinius Olsen’s exhibit at the Panama-Pacific Exposition in San Francisco in 1915
Generation I, the Standards
1845 - 1920

- References to National or International Standards in Tinius Olsen Catalogues were just beginning in 1906.
• Thorsten Olsen, the son of Tinius Olsen was born in 1879.
• He was Vice –President from 1912 to 1920 and ran the Company as a Co-President with his father from 1920 to 1929 and continued on as President until 1955.
Generation II, the Son
1920 - 1955

- During his tenure, the Company continued to grow. In 1923 the corporation had 250 employees and was the world’s biggest factory for material testing machines.
- In 1949 the Company moved from Philadelphia to its present location in Horsham, PA.
• During this time many advances were made in force measurement beginning with the pendulum operated dial weighing system.
Hydraulic Machines, weighing with hydraulic pressure gauges were developed.
- Olsen had been making Impact testing machines since the early 1900’s, but Olsen’s first Charpy Impact Tester was designed and built in 1926.
• During the 1920’s Olsen also developed a line of balancing machines which became 50% of its business by the 1960’s
Generation II, the Machines
1920 - 1955

- In addition hundreds of other devices were developed during this time period. Here are just a few.
By the late teens, Olsen’s Catalogues were mentioning standards much more frequently.
Generation II, the Standards
1920 - 1955

- Also, Calibration was being discussed.
- ASTM E4 and E8 were originally adopted as tentative standards in 1924
ASTM E 23 was not issued as a tentative standard until 1933. In this 1932 catalogue there is no mention of a standard.
However, you can see in this 1941 catalogue, ASTM E 23 is clearly referenced.
In the discussion of this electronic extensometer system in a 1943 catalog, there is no mention of E 83 as E 83 was not published until 1950, however, it did reference Federal Specifications QQ-M-151A that specified the Offset for various types of materials for military applications.
Generation III, the Grandson

1955 - 1972

• Thorsten Olsen had 5 daughters and a son, the grandchildren of Tinius Olsen.

• The grandson of Tinius Olsen, Tinius Olsen II, was President of the Company from 1955 to 1972.

• The husbands of 3 of the daughters also participated in running the business:
  – C. Robert Tait – Vice President of Manufacturing
  – Walter P. Haun – Secretary Treasurer
  – Willits P. Haines – Manager, Balancing Department
Generation III, the Machines
1955 - 1972

- During this period the Super L Hydraulic Testing Machine was developed. These machines had a 28” servo motor driven dial of which thousands are still in use today.
Generation III, the Machines
1955 - 1972

• Developments during this period also included
  – A line of equipment for testing plastics
  – Automatic crankshaft balancing machines using LVDT’s and analog computers
  – Extensometers using LVDT’s
  – Electromechanical testing machines with torque-bar weighing systems
Generation IV, the Great-Grandsons
1972 - 2004

• In 1972 two of Tinius Olsen’s great-grandsons took over the management of the Company.
  
  – John A Millane – President, retired 2001
  – C. Robert Tait Jr.– Vice President of Manufacturing President in 2001 to his retirement in 2004
Generation IV, the Machines
1972 - 2004

• Developments during this period also included
  – Servo controlled testing machines
  – Automatic extensometry
  – Analog digital indicating systems
  – Microprocessor based auto ranging indicating systems
  – Computer controlled testing equipment
  – Automated testing machines, utilizing robots
Generation IV, the Standards
1972 - 2004

• Changes to ASTM E 4 and E 83 due to auto ranging
• Changes to ASTM E 8 due to servo control
• Changes to many ASTM D-20 standards on testing plastics due to increased accuracy capabilities
In 2004, the great-great grandson of Tinius Olsen, C. Robert Tait III became President of Tinius Olsen Testing Machine Company.
Generation V, the Machines

2004 -

- Developments during this period also included
  - Improved accuracy and speed of measurement
  - Second generation of automated testing machines utilizing robots
  - Increased software functionality
  - Expanded utilization of microprocessors
Generation V, the Standards
2004 -

- Changes to ASTM E 4 and E 83 due to uncertainty
TESTING MATERIALS
STRENGTH and PERFORMANCE