

Friends of the Lester F. Larsen
Tractor Test and Power Museum
P.O. Box 830833
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NEWSLETTER NUMBER FIVE (402) 472-8389; Fax (402) 472-8367
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On January 18, 2000 at 1:30 p.m. the Annual Business Meeting of the Friends of the Lester F. Larsen Tractor Test and Power Museum will be held in L.W. Chase Hall. All members are urged to attend and bring others who may be interested in joining our group. The agenda is attached along with some related items.

A reminder January 1, 2000 begins a new membership year. Please continue your membership and send your annual \$10 dues payment to the address in the letterhead.

This is the first general usage of the newly adopted logo and letterhead. We hope that you find it appropriate. It is also the first since the organizational developments announced in the August 1999 newsletter. Dr. Bill Splinter as the Director and his staff are making deliberate progress with the museum development. They seem undaunted by the long list of things yet needed to be done. The development of the adjunct linkage with the Nebraska State Museum is a major element of progress through Bill's efforts.

An updated mission statement reflecting the organizational terminology and structural changes of recent months has been developed to state: "The purpose of the Friends of the Lester F. Larsen Tractor Test and Power Museum (Corporation) is to support the development, usage, and operations of that museum on the University of Lincoln East Campus as an adjunct of the Nebraska State Museum. The scope of interest highlights tractors, but also encompasses other sources of power including human, animal, electrical, solar, and wind. This support includes education, communication, and collaboration as well as personal and financial involvement."

Periodic visits to Lester Larson in the Homestead Alzheimer Care Unit find him weak, but mobile and apparently happy to see familiar faces even though not remembering who. He is still the great gentleman.

Two pressing needs of the museum outside of its interior development are being pursued. One is a tractor storage facility to replace the doomed old horse barn and judging arena. The other is renovation of a basically sound tandem axle equipment transport trailer which we have acquired from "surplus" property. This is important for legal and safety requirements. The Friends will be helping with this.

Financial support development for the museum will be pursued by Dr. Splinter. But you are also reminded that 'in kind' donations of tractors or other agricultural power of historic or sale value can also help the cause. The Friends group already has some duplicate tractors which will be profitably disposed of for benefiting the museum. You or your neighbors or friends may have a tax deductible item in the back of the shed.

Bob Kleis, President

Board of Directors

Robert Kleis, President - Earl Ellington, Vice President - Glenn Hoffman, Secretary - Shirley Trauger, Treasurer, (Exeter) - Leonard Bashford
Fred Chase (Fla) - Charles Fenster (Gering) - Lawrence Herman - Howard Lamb (Anselmo) - Richard Marsh (Geneva) - Steve Melvin (Nelson)
John Smith (Scottsbluff) - Norman Tooker (Ralston) - Dale Vanderholm - (Ex-officio - James Estes - Louis Leviticus - William Splinter)

AGENDA ANNUAL MEETING JANUARY 18, 1999 - L. W. CHASE HALL

Opening comments	Bob Kleis
Minutes of September 21 meeting	Glenn Hoffman
Financial report	Shirley Trauger
Directors report	Bill Splinter
Curators comments	Lou Levitius
NE State Museum Director report	Jim Estes
Nomination report-and action	Bill Splinter
Bylaw amendments action and mission statement	Bob Kleis
Program activities for 2000	Earl Ellington
Other items as desired	

RECOMMENDED BYLAW AMENDMENTS

1. Incorporate newly adopted "mission statement" as the "purpose" item in the Bylaws
2. Incorporate Lester F. Larson into the name wherever located
3. Indicate status as an adjunct of the Nebraska State Museum wherever relevant
4. In Article VI, Section 1 - Annual meeting date - change October to January
5. In Article VIII, Section 3D-Secretary term of office - delete "--- to one additional term"
6. Article IX, Section 1D - Ex officio members of Board of Directors - add the Curator and Nebraska State Museum Director
7. Article IX, Section 2, Sentence 3 - Directors terms - delete the clause "but shall serve no more than two consecutive terms"
8. Article IX, Section 4C - change to read "A quorum shall be a simple majority of the Board members of record"
9. Article X, Section 1B, to read "The Nominating Committee shall consist of the President, all participating Past Presidents and the Director of the adjunct Museum"

NOMINATIONS

OFFICERS - 2000

Bob Kleis - Pres.
Earl Ellington - V. Pres.
Glenn Hoffman - Sec.
Shirley Trauger - Treas.

HONORARY LIFE MEMBERS

Lester F. Larsen
William E. Splinter
Fred Chase
Wallace Giles

BOARD MEMBERS

Chas Borcharding, Harold Borman, Ervin Rolofson
and Mark Lynott of Lincoln, and Bill Overturf of Oak NE

DIRECTOR'S REPORT

As reported in the May 7, 1999 Newsletter, the Lester F. Larsen Tractor Test and Power Museum is now operating as an adjunct to the Nebraska State Museum. Dr. Bill Splinter now serves as the Director of the museum and Dr. Louis Leviticus serves as Curator. Mr. Luis Vasquez, a graduate student in Museum Studies is inventorying our collection of early American tools and farm machines. Mr. Mark Nickolaus serves as a Docent, conducting tours and assisting with museum operations. We have expanded our open hours to 9-12 and 1-3, with visits on the weekend welcome if arranged by calling 402-472-8389, our new Museum phone number. Note that we now have our own postal address, PO Box 830833.

Our national raffle for Roger Welsch's Allis-Chalmers "Woodpecker" tractor concluded on September 6 at the Nebraska State Fair with the winning ticket being held by Harriet Holman of Plattsmouth, NE. The raffle was sponsored by Successful Farming through the assistance of Dave Mowitz, Machinery Editor. There was national interest in purchasing raffle tickets, including people from Maine to Florida to California to Washington, and nearly every state in between. We greatly appreciate the generosity of Roger, with his national reputation as author and TV personality, in attracting this national interest. The raffle brought in over \$2300 for the support of the museum.


Everyone recognizes the quality of the tractor exhibit as developed by Professor Lester Larsen, but we are finding the quality of our exhibit of early American tools and machines is also of national caliber. I visited the Shelbourne Museum near Burlington, VT and the Sloan Museum near Kent, CT in early October of this year. They are two of the three top museums with collections of early American tools, the third being at Doylestown, PA.

What I found was that our collection, while not as extensive, was of equal quality to their exhibits. We hold a number of items that are unique, including some not known by personnel at either the Shelbourne or the Sloan Museums. I attended the regional meeting of the Midwest Tool Collectors Association in Omaha recently and showed their members photos of our collection. This was quite helpful as they identified the origin of three of our tools, but we still have some unidentified.

Although not confirmed at this time, it appears that a number of the hand tools may have been brought from L. W. Chase's grandfather's farm in Vermont about 1918. L. W. Chase, of course, is the man who developed the Agricultural Engineering program at Nebraska, built the Agricultural Engineering building (now L. W. Chase Hall), instituted the Tractor Testing program and founded the Chase Plow Company.

Our next major project will be the completion of the initial endowment to support the museum and continuation of the renovation of the building.

Director



THE DAVIDSON TRACTION DYNAMOMETER

by

Dr. Louis I. Leviticus

Professor Emeritus and Curator

L. F. Larsen Tractor and Power Museum

University of Nebraska, Lincoln

The measurement of traction forces, be it those developed by a tractor, or those needed to perform various tillage, cultivation and other field practices became a subject of great interest when mechanical farm power was being developed and the industry started bringing many different machines and configurations on the market. The well known Winnipeg plowing contests and later, the testing performed near Fremont, Nebraska, showed how much interest there was, but also showed the inadequacies of the test equipment to measure draft or traction forces with consistent accuracy.

The main source for this article was a thesis for "the Professional Degree of Agricultural Engineer" by Jay Brownlee Davidson, submitted on April 20, 1914 to the Department of Agricultural Engineering at the University of Nebraska. In the thesis, called "Special Agricultural Engineering Apparatus" Davidson describes several pieces of equipment which he developed. He apparently did most of the development at, what is today called Iowa State University and called his instrument, on which he received a patent, "*The Iowa Integrating and Recording Traction Dynamometer*".

The instrument was built by a company in Chicago under a licensing agreement and "*the patents of this instrument are to be consigned by the author (Davidson) to the Agricultural Engineering Section of the Iowa Agricultural Experiment Station*". The thesis includes photographs and detailed drawings, which, amongst others, specify that the handles of the carrying case should be purchased from Hammacher Schlemmer Company in New York City.

The requirements of an instrument to measure traction developed or draft force required were set out to be:

1. "*Convenient*" to attach to various implements
2. "*A close hitch*" meaning as short an instrument as possible so it would not interfere with implement adjustments.
3. "*An instrument of variable capacity and adaptable to a wide range of use*"
4. "*An instrument giving the average draft over a self measured distance*"

Whereas requirements one and three are not too difficult to attain, numbers two and four required an ingenuity which was amply displayed by Mr. Davidson. The resulting dynamometer, of which we have a display in our museum is an example of outstanding engineering. The instrument is only 10 inches in length between its two hitch points. That is very short for a mechanical dynamometer. The fact that it could average the draft force over a given distance is nothing short of amazing.

Averaging the draft force requires the force to be integrated with respect to the distance traveled. What this means is, that the force is measured over a very short distance and is assumed to be constant over that distance. The multiplication of that force times the small distance is the work performed over that distance. By adding up all the work sections done over all the short distances we obtain the total work done over the total distance. If we now divide that total work by the total distance we obtain the average force. The genius of Mr. Davidson was that he managed to incorporate measuring device plus mechanical integrator into a small compact package.

The force was measured by a system of parallel linkages pre-loaded by a calibrated spring. Different springs could be used for different loads. When a force was applied to the linkage, the spring was compressed and the movement of the links was transferred to a linkage with a needle which transcribed the movement onto pressure sensitive paper, which was fed to the writing area by a pair of cylinders, which were driven by a set of gears. The gears were in turn driven by a drum which had a special strong rope on its periphery. The end of the rope was attached to a fixed point in the field and the movement of the team (or tractor) and the implement unwound the rope and drove the drum. The integrator was driven by a special disc covered with a fiber. This disc was also driven by the drum. On the face of this disk and perpendicular to it ran a small wheel, whose position on the disk was determined by the movement of the load spring. The further the load spring contracted, the further away the small wheel operated from the center of the disk, thereby increasing the number of revolutions. The number of revolutions, which was proportional to the spring compression, were counted by a mechanical rotary counter.

It was of course necessary to calibrate the spring and use several constants to calculate the average force from the final count. However, this instrument was a tremendous achievement. Take into account, that the Nebraska Tractor Test Lab used a paper trace for many years, but did all their final calculations of the average force after integrating the trace with a planimeter in the office. The same thing the Davidson dynamometer did on its own.

The photograph from the thesis (figure 1) shows the recording side of the dynamometer with the protective cover removed. The integrator assembly has been removed to show the flat disk which drives it. The pen linkage can be seen as well as the proportioning bar, which is the center link on the pen. Three rolls can be seen. The left roll is the support for the writing pen, the center roll stores the paper with the trace and the right roll has the new paper. The parallelogram linkage can clearly be seen. The bolt through the center of the spring is anchored on the lower block to which the links are attached. The spring is held by the upper block. When pull is exerted on the two pins by the implement and the towing vehicle, the two blocks separate, they remain parallel because of the links, while the center arm, which is attached to the lower block moves the pen arm. The pulley and the rope are on the other side of the dynamometer.

The thesis also analyzes the accuracy of the system which turns out to be one percent. This is extremely good, considering the difficulties encountered in field testing in general. The dynamometer was used at the University of Nebraska for implement testing over a period of years. Proof of this was found in a thesis by John W. Sjogren, dated 1934, titled "*Plow draft as influenced by soil compactness and soil shear*". During field tests it was discovered that the integrator was inaccurate - probably due to vibration and shock, which is normal in field operations and which may have affected the contact between the driver and driven wheel of the integrator. It is reasonable to assume that this dynamometer was also used by other researchers, especially at Iowa State University, although we have, at this time, not yet found any confirmation of that.