

The NEMES

NEW ENGLAND MODEL ENGINEERING SOCIETY INC.

Gazette

No 263

May 2018

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Gazette Staff

Editor Bob Timmerman

Publisher Jeff Del Papa

NEMES officers

President Dan Eyring

Vice President Victor
...Kozakevich

Treasurer Richard Baker

Secretary Todd Cahill

Webmaster Jeff del Papa

NEMES web site

<http://www.neme-s.org>

Contact Addresses

Dan Eyring Presidet
deyring2017@outlook.com

Richard Baker: Treasurer
treasurer@neme-s.org

Jeff DelPapa: Publisher
Publisher@neme-s.org

Bob Timmerman: Editor
editor@neme-s.org

Bob Timmerman::Program
rtimmerman@gmail.com

Program

The May meeting will be held on May 10, 2018. It will be held in the Internet Center, instead of the Jackson Room. This is one week later than our normal date, to allow Museum volunteers who are also NEMES members to attend the Museum 30th Anniversary Gala, which is on our regular meeting night.

The speaker will be Rick Ashton, the great-great grandson of the founder of Ashton Valve, a firm in Boston, and later Cambridge who made steam safety valves and gauges.

Rick will discuss the history of the company. After his presentation, we will show some of the valves and gauges from his collection that he has presented the to Museum.

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Club Business

Rich Baker

Dues. The 2018 dues are past due. Please bring your \$25 check to the April meeting or you can try out our credit card system. Or mail me a check to Rich Baker, NEMES, 288 Middle Street, West Newbury, MA 01985



President's Corner Dan Eyring

Now that Spring seems to have arrived for real, it's time to dust off the mental fog from our winter hibernation and look

forward to the coming season of shows and fine weather. An updated list of 2018 Summer and Fall events is included in this month's Gazette.

Now is also a good time to look ahead and think about what we want for NEMES in the coming year and beyond. Since the life of the Club revolves around our monthly meetings, getting interesting speakers is important. This is not a hit against past speakers, we continue to have great folks willing to come talk to us about what ever interesting thing they do. But lately it's been getting harder and harder to find them.

Bob Timmerman is our Programs Chair, as well as Gazette Editor. His job is to take ideas from the Membership about potential speakers and set up a speaker schedule. But he's not getting any help. We don't want to go back to having every other meeting be a poster session. Or, God forbid, have me present another two hour fascinating lecture on the Boston Associates or some equally thrilling topic.

You (this means YOU) can help in a number of ways, including:

- Giving a talk to the Club on your latest project or sharing your area of expertise with the rest of us. We (Bob, me, Dick Koolish, etc.) can help out with taking pictures, turning raw, handwritten notes into slides, or anything else you need.
- Give a tour of your shop or propose a tour of someone else's. They don't even have to be a NEMES member.
- Do you know of someone who has an interesting hobby or business? Just give Bob the contact info (rwtimmerman@gmail.com) or me (deyring2017@outlook.com) and we'll check it out.
- Have someplace you've always wanted to visit? Speak up and we'll see if we can set up a tour.
- Have an interesting DVD video you would like to share? Please bring it in and we'll provide popcorn and lemonade with the movie.

And now is a good time to review where NEMES stands with regard to our host, the Charles River Museum. You may have noticed an increasing number of competing Museum events taking place on the first Thursday evening in the month. Usually we can share the Museum venue with something going on down on the main gallery floor. But sometimes the Museum event is something NEMES members would like to attend also. The CRMII 30th Anniversary Gala on May 3rd is a good example. In fact, we've pushed the May NEMES meeting back a week to the 10th because of the Gala. And even on May 10th, we will have to meet in the Internet Center due to a very quiet musical event scheduled in the Museum for that night.

So, I wouldn't blame you for thinking that keeping the first Thursday of the month open for NEMES is no longer the Museums' top priority. And you would be right, because keeping the Museum fiscally healthy and the doors open is the Museum's top priority. In the Boston area, including Waltham, Thursday evenings are the most popular time for entertainment events. And the CRMII has three Thursday evening music series running this summer and Fall.

We could probably avoid conflicts with Museum events by moving our meetings to FIRST TUESDAYS.....

OK, lightning didn't strike me when I typed that, so maybe we should give the idea some thought. In any event (so to speak) we will continue to need to be flexible.

Here's looking forward to a long summer and some great engine shows.

Dan



From the Editor's Desk

Bob
Timmerman

Dan Erying has provided some upcoming events. Are there any more? If so, I will add them to the June Gazette. If anybody knows of other upcoming events, be sure they get on the website.

Following up on Dan's President's column, we still need more articles. In this issue all we have is a review of a new book about Brown & Sharpe, and a sequel to Max's article about Hexapods. What about all you machinists out there—you must have some interesting projects to write about. Dan has suggested tours of some of your shops. Maybe you could do it by photos. We could either do the tours as articles in the Gazette, or as meeting topics.

Summary of April Meeting

Bob Timmerman gave a presentation on flat belt drives. After a rather long time getting the projector and computer to work together (probably due to Bob's not seeing a command on the computer to connect it to a projector), the talk commenced, complete with illustration of flat belt drives both in

Bob's shop, and in the Museum. Bob covered both flat and V-flat drives, leather and fabric belts, and how to splice them. He also talked about some of the interesting properties of crossed flat belts.

Book Review

Review of recent book *Brown & Sharpe and the Measure of American Industry*, Gerald M. Carbone and the Rhode Island Historical Society, 2017, McFarland and Company, Jefferson, NC.

Mr. Carbone endeavors to tell a good story about Brown & Sharpe. In the process, some of the technical details get short shrift. Mr. Carbone tacitly admits this in the Acknowledgements, when he mentions that two panels of experts read through early drafts on the manuscript, and states the one historian of technology, Pat Malone, empathically told him that this was not the book he would write about Brown & Sharpe! I tend to agree with Dr. Malone.

Mr. Carbone is at his best in telling the early history of Brown & Sharpe, and the story of the two founders. He describes how Brown opened a small shop in Providence, making many small products in metal. His goal was to be able to make rulers (now known as scales). Back in 1848, either one had to import one, or copy an existing one, laboriously scribing the graduations by hand. He had a better head for designing things than running a business, Carbone puts it that: "Brown had the skills to make almost anything, except for a profit".

Lucian Sharpe was a young man who's father apprenticed him to the Providence Machine Shop, where he was unhappy with the long work hours, sunrise to sunset. With the aid of an older man who mentored a number of young men, he was able to break his apprenticeship, and work for J.R. Brown. Carbone goes into some detail in the way that Sharpe worked to acquire more knowledge, including bookkeeping that make him indispensable to Brown, and rose from apprentice to partner in 5 years.

Carbone details some interesting history of the early days of the partnership, including Sharpe's invention of what became known as the Brown & Sharpe wire gauge, which is used to this day.

The book provides some information about the graduating machine that Brown built in 1850. Instead of using a leadscrew, it used an index plate with 1080 holes in it and a drive drum that was driven by the increments in motion of the drive drum, though gears. Interposing a gear train between the index plate and the drive drum was known to makers of screw cutting lathes for at least 50 years prior to Brown's dividing machine. The drive drum drove a metal band that drove the carriage that contained the device that scribed the graduations. Varying the number of holes had pegs in them and the ratio of the change gears controlled the spacing of the graduations.

Why 1080 holes? Carbone gives no answer. A little work with a calculator shows that 1080 divided by 360 gives 3, allowing a circle to be divided in divisions of 20 minutes of arc. Gearing would allow splitting the circle into finer divisions. Dividing a 12" scale into 1/64" graduations would result in 768 graduations. This will not go into 1080, but a gear train with a ratio of 45:32 would convert 1080 graduations into 768. The use of a gear train is an important step, it will show up later in the development of the Universal Milling Machine.

A life changing event for the young Lucian Sharpe was a visit to the Allen and Thurber pistol factory during his summer vacation of 1849, which introduced him to the Armory System of manufacture. The Springfield Armory had perfected techniques to manufacture firearms with parts made to close enough tolerance that they were interchangeable. They purposely spread their work to private gun makers, who at the time were clustered in the Connecticut River valley. The use of jigs, fixtures, and precision tools impressed the young Sharpe.

Carbone's coverage of the Willcox and Gibbs sewing machine is one of the highlights of the book. The machine was invented by James Gibbs, from what is now West Virginia. He engaged James Willcox, a Philadelphia hardware merchant to help with patenting it. Willcox's son Charles assisted with developing the machine, and it became known as the Willcox and Gibbs sewing machine. James Willcox had business contacts in Providence, and through those, came to Brown & Sharpe. In 1858, Lucian Sharpe committed Brown & Sharpe to make the sewing machine and decided to manufacture it using the Armory System. While the cost of the required jigs and fixtures nearly bankrupted the small firm, it ultimately proved to be a wise decision.

Another writer describes Singer, which ran a well-organized factory system, but one not up to Armory standards, finding itself in "replacement parts Hell" about 1880, because it did not have enough skilled craftsmen to fit replacement parts, and had to retool its factories to strict Armory standards. Because Brown & Sharpe had started out making the parts of the machine to the Armory system, they did not have this problem. Over the years the Willcox and Gibbs sewing machine proved to be a moneymaker for Brown & Sharpe, despite the vicissitudes in the business relationship.

Carbone's treatment of the development of the Universal Milling Machine is almost completely devoid of technical detail. He gives Brown credit for the knee and column design, which may or may not be correct--I could not verify it. Carbone mentions the X, Y, and Z motions, but does not mention the dividing head, or its gearing to the table feed screw. Turning the work is necessary to mill a spiral, and the ability to change the pitch of the spiral is also necessary for a flexible machine. Finally, there is no mention of being able to turn the table in relation to the cutter, something vital to being able to mill a spiral.

Likewise, Carbone gives no technical details on the turret lathes that Brown & Sharpe made, nor the development of the automatic screw machine, which presumably evolved from the turret lathe. He offers few details on the development of the Universal Grinder, or what made it universal. He does cover the attitude of the firm becoming more conservative in the 1890s, and the resultant departure of Charles Norton after the firm rejected his design for a larger, heavier grinding machine that could remove appreciable amounts of metal, instead of being limited to finishing.

One business blunder discussed in the book was the rejection by the head of their precision instrument division, Samuel Darling, of a request to manufacture a new layout tool invented by an independent inventor. Darling did not believe the tool could be manufactured accurately enough to be useful. The rejected inventor subcontracted manufacture of the initial batch of tools and went on to establish his own factory in western Massachusetts to manufacture it. The inventor was Laroy S. Starrett, the invention was the combination square. The rest is history. The area around the Starrett plant in Athol became a secondary center of tool manufacture, with firms like Union Twist Drill,

Greenfield Tap and Die, and Millers Falls setting up factories nearby.

Carbone discusses the Panic of 1893, but attributes much of the cause of the panic on RI Senator Nelson Aldrich, and the changes in tariffs he drove through the Senate, in exchange for a rather large bribe. It appears Carbone is misinformed on this point, because other sources I consulted claim the Panic was caused principally by overbuilding by railroads, and mismanagement of the gold supply by the new Administration of Grover Cleveland.

Carbone takes up a lot of pages with history of Lucian Sharps children, and in particular, brothers Lucian Jr, and Henry. The history includes details on Henry's courtship of his future wife, Mary Evans, and of the problems caused by Lucian Jr's mental illness. While a summary of this might be interesting, the account goes on and on. I would have preferred to read more about Oscar Beale, (aka "Jarno"), the de facto chief engineer of Brown & Sharpe, and inventor of the Jarno taper, a competitor to the company's own Brown & Sharpe taper.

Carbone discusses the hiring of women for production jobs during both World Wars, particularly WWI.

With contemporary sources available, including interviews with retired employees, Carbon's treatment of the last years of Brown & Sharpe as an independent company is a bit more lucid. He focusses on labor-management relations as much as on product development. It appears that labor-management relations deteriorated once the company was unionized. Having worked in both union and non-union workplaces, I can agree that managing a unionized workplace takes more skill than managing a non-union workplace. It would appear that Brown & Sharpe's management did not posses the necessary skill and carried an adversarial attitude towards labor.

In the last days of Brown & Sharpe as an independent firm, the made some small measuring tools in China, with lower quality than they made them in the US. Carbone's description of Henry Sharpe III buying a Chinese-made Brown & Sharpe combination square for his son is sad.

I followed the last struggles of Brown & Sharpe in the Boston business press. Carbone gives a good account of the rebuffed proposal from Thermo-Electron, and the final deal from Hexagon AB. My

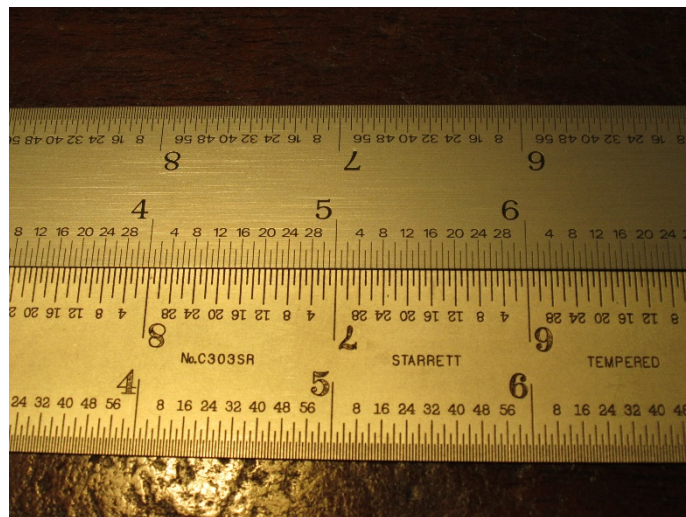
late father had a motto, that you should quit when you were ahead. Regrettably for the stockholders, the Brown & Sharpe did not believe in this.

The book is well illustrated with pictures from various sources, including Peggy Sharpe, the wife of Henry Sharpe Jr.

While the book gives more than enough family history, and covers the beginning and end fairly well, it is weak in the history of the middle, most prosperous years. Detail on the machine tools is almost non-existent. There is nothing at all about the necessary redesign of the whole machine tool product line after the introduction of high speed steel, which permitted doubling of cutting speeds, and a consequent increase in horsepower.

Brown & Sharpe today

I bought many of my machinist tools new, around 1976, several years before they went on strike. All but my dial test indicator were made in USA. The test indicator said Made in Switzerland, presumably by Tesa. At that time, I considered them slightly better than Starrett. I bought few new Brown & Sharpe tools after the strike started, although I bought a few used ones, made before the strike. My interest in today's incarnation of Brown & Sharpe began when I bought a 12" inch-metric rule for my son for Christmas, buying Brown & Sharpe as it was cheaper and more readily available than Starrett. I was impressed with the quality. Some months later, to confirm my opinion of the recent quality, I bought a new 12" rule from Brown & Sharpe. Below is a picture of the rule, alongside a 12" Starrett I have had for about 8 years.



The Brown & Sharpe is on top, the Starrett is on the bottom. The graduations on the Brown & Sharpe are precise, but smaller than the Starrett. I find the Brown & Sharpe rule easier to read than the Starrett, especially at 1/64".

A look through their current catalog on-line shows most of their product line split between the US, and Switzerland (Tesa). Google Earth shows that their former plant in North Kingstown, RI is now occupied by Anvil International (successor to Grinnell piping co.). Surprisingly, the US headquarters of Hexagon Measuring Intelligence is still in North Kingstown, RI, in a smaller building than Precision Park.

Hexapods II

In March 2003, Carl Mikkelsen, then a member of NEMES, gave a spectacular talk about a hexapod milling machine he was then in the process of refining. I found it, to be, (to coin a phrase) mind-blowing. Now, fifteen years later, I am coming to shamelessly plagiarize myself, for the benefit of members who never heard the original talk. (Gazette, Vol. 7 #85, March 2003)

If the usual X-Y-Z slides of a machine tool are considered to be "analog", like a LP record, then the hexapod concept may be considered to be 'Digital' - just as the digital "pits" on a CD disk replace the mechanical "wave" on the vinyl. In this light, the ramifications of Carl's achievement in realizing the hexapod concept for the amateur workshop were staggering.

In hexapods, there are six actuators, giving the tool six degrees of freedom, X, Y, Z, pitch, roll and yaw. Stewart platforms are currently used in the amusement park industry, to give a sensation of movement while the rider is actually relatively stationary. An example of such a ride is "Body Wars" at Disney World in Orlando.

The hexapod miller consists of:

- A 'Stewart Platform' positioning system
- A machining head
- Computer controls
- Work clamps and
- A supporting structure.

At one time Giddings & Lewis tried marketing a hexapod. Cincinnati Milacron was interested too, but their enthusiasm seems to have cooled.

The hexapod technology could not have been possible before the computer revolution because of the considerable computing power required for CAD tool-path determination and the large numbers of trig functions and matrix operations to be computed. You would also need 6 hands to move each control arm simultaneously in order to make a linear cut. These days, the availability of powerful desk-top PCs and laptops have allowed this technology to become feasible, even for amateurs, but it never seems to have caught on.

Carl wanted to build a computer-controlled machine tool; he confessed that, although his father had been a machinist, he himself he did not have either the skill or resources to build a traditional CNC with machine slides. He wanted a machine that was flexible, computer-controlled, needed no precision parts, and was dependent on electronics and software rather than a machinist's skill.

He decided that there must be an alternative: to exploit the skills that he had; electronics and programming, and the availability of cheap computing power. This led him to consider Stewart platforms. His self-confessed "weakness" (lack of capability to make precise large machine slides) was turned into strength, by using his ability to make a computer jump through hoops. Successfully turning a weakness into a strength is a rare and admirable trait.

It is fortunate for us, as a tool-making and tool-using species, that mechanical bootstrapping is possible. Without it we would not have any precision tools. Spheres and flats can be generated from scratch (no pun intended). A very primitive lead-screw can be used to make a more precise one. Similarly, with dividing circles.

As an ex-programmer, for me it is an article of faith that that the concept of bootstrapping is of fundamental importance; I believe that all great ideas have to have this property. Carl was able to use "primitive" tools to make a more sophisticated "abstract-software-driven" hexapod, which he then used to make a better one, a new and innovative form of bootstrapping.

Carl's initial goals were to build a basic platform consisting of:

- 6 legs, controlled by stepper motors
- A base, with gimbal mounts to the motors
- A top, with gimbal mounts to the tops of the legs
- Stepper motor driver electronics
- A computer interface to drive electronics
 - A Linux kernel driver for driving motions linear in leg space
- User level software to control motions linear in X-Y-Z-Roll-Pitch-Yaw space
- A frame for the above to hold it suspended above a working surface.

The first generation version was designed to use a Dremel hobby rotary tool as its head. The legs turned out to be too flexible, the motors were too wimpy, it was too slow, and the Dremel tool was inadequate. These flaws were apparent very soon and this version was never completed.

Version II, "Bluemonster", was intended as an EDM test fixture, and to begin process of EDM machining. It used a Porter Cable laminate trimmer as the tool. The trimmer held a 1/4" shafted tool, and spins up to 30K RPM. Since it had a universal motor, it was easily speed-controlled, although he had no mechanism to servo the speed. It had a pen holder tool to let this serve as a plotter, and a router holder to allow routing of wood, and, maybe, aluminum. The first cuts, made in wood, were very satisfying, but pointed out some problems. What "went wrong" was more interesting than "went right". (The "bugs" are where the learning is!).

Carl found that there was an accumulating error in Y-axis positioning, which was causing the tool to drop lower and lower, eventually cutting into the work surface. He tracked this down to "off-by-one" errors in the lowest-level motor driver, coupled with the fact that the actual position was not used to run the motor driver. Problem solved by changing the way the motor driver worked; the absolute position in steps was used to determine the motor phases.

He modified the way the motor phases were determined to add a calibration factor that tells which phase of the motor corresponds to the physical stop. If the stepping motors had been 200 step-per-revolution motors, the error might not have

been as great. With 72 step-per-inch motors, it could have meant an error of .005-.006 inches.

Carl wrote C code to cut circles and spirals. The next step was to find a good way to turn font and string information into control programs. He added X-10 control over two systems, using a lamp module to supply power to the spindle, and an appliance module to switch the AC to the motor power supply.

He used the Linux program "heyu", which was open source available for download. It provided a command-line interface to control X-10 compatible devices. Commands, "S1" and "S0", added to the program stream turned the spindle on and off. Since the lamp module allows slowing of the spindle motor, Carl wanted change it to take a floating point number to represent the fraction of full speed, thus "S0.5" for half speed.

Carl went on to build version III, an improved successor system. His web-site at:

<http://www.foxxid.net/cmm/platform/project-notebook.html>

seems to be dead.

There are many new ideas that are minor (or sometimes, major) twiddles of older ideas. Earth-shattering ideas are very, very rare. Carl serendipitously stumbled (this is intended to be poetic rather than pejorative) on an idea that has the potential to be a paradigm-buster of epic proportions.

I often wonder what happened to his efforts. I forbear from calling him because I think that my idle curiosity is insufficient cause for invading his personal space.

Max ben-Aaron maxxam.357@gmail.com

Tool Shed Vacation Schedule

The Tool Shed will be going on vacation the first week of May. Since the NEMES meeting is postponed one week, the Tool Shed will be open for business the day of the NEMES meeting.

Future Events

May 2018

May 5 & 6 Saturday and Sunday, CAMA
Spring Power-up
Route 7 north of Kent, CT
<http://ctamachinery.com/2014-spring-power-up.html>
Contact: John Pawloski, PO Box 425, Kent
CT 06757 860-927-0050
email j.a.pawloski@att.net

5 - 6 May Zagray Farm Museum Spring Gas-
Up and Swap Meet
544 Amston Rd. Colchester, Rt. 85 north from
Colchester, 1-1/2 miles on right.
Contact: Ed Bezanson, 85 Dayton Rd.,
Waterford, CT 06385; 860-208-2422;
email: edwin_c_bezanson@sbcglobal.net
<http://www.zagrayfarmmuseum.org/resources/spring-show-flyer-2018.pdf>

6 May New Hampshire Power of the Past
Collectors Dunstable Show, Dunstable MA,
Rts.3 and 113, 1 mile west on Rt. 113, follow
signs.
Contact: David Beard, 584 South Mammoth
Rd., Manchester, NH 03109 603-623-2217

May 6 ATCA Western MA. 14th Annual Antique
Truck Show
Location: South Deerfield, MA At the Yankee
Candle Corp Headquarters, Yankee Candle
Way, off Rt 5 and 10.
Rain or Shine! Free admission and registration.
Contact Name: Craig (vendors) or Doug Vendors
call Craig 413-834-1677 or Doug 413-522-4092

19 May Scantic Valley Antique Engine Club
41st Annual Antique Engine and Tractor Show
Tolland County Agricultural Center, 24 Hyde
Ave. (Rt. 30). Vernon CT
From 1-84 exit 67 onto Rt. 31 toward
intersection of Rts. 30 and 31, 150 yards east
on Rt. 30 toward Tolland, show is on the right.
Contact: Joe Perko Jr., 168 Monson Rd.,
Stafford Springs, CT 06076 860-558-3043
email: tiredironcollector@hotmail.com
www.svaec.com

20 May 12th Annual Hillside Tractor Ride
Cumington MA
Rt. 9 to Fairgrounds Road, to Cumington
Fairgrounds.

Contact: Francis Judd, 145 Berkshire Trail w.,
Goshen, MA 01032; 413-268-3264
email: gduddandsonsl@verizon.net

Bristol's Round-up and Tractor Pull, May 20,
2018, JR Bristol's, [80 Witches Spring Rd, Hollis,
NH](http://www.80witchespringrd.com).

May 26 - 27 Bernardston Gas Engine Show
and Flea Market
NEW LOCATION, Pratt Field 219 South Street,
Bernardston MA Exit 28 off I91
Contact: Vickie Ovitt (engine show) 413-834-
0103
Harvey Phelps (flea market), 413-648-9551
<http://unitedchurchofbernardston.org/>

June 2018

Granite State Gas and Steam Engine
Association, 47th Annual Gas and Steam
Spring Show, June 2-3, 2018, (setup Friday,
show Saturday and Sunday) Note New
location: JR Bristol's, [80 Witches Spring Rd,
Hollis, NH](http://www.80witchespringrd.com), Contact: Andy Mackey 603-878-
2845, Brian Barden, 603-563-8006, Richard
Keegan, 603-899-5285
[https://granitestategasandsteamengineassociati
on.com/2018-show/](https://granitestategasandsteamengineassociation.com/2018-show/)

East Coast Antique Tractor Club, Spring Tractor
Pull and Swap Meet- (Rain or Shine), June 3,
2018, J.R. Rosencrantz, Kensington, NH,
Contact: Jim Rosencrantz [603-765-8235](http://www.603-765-8235)

June 3 AHS Ocean State Vintage Haulers
24th Annual Antique Truck Show
Johnston War Memorial Park,
Johnston, RI 8 am to 2 pm. Contact Joseph
Pingitore, Pres. 401-692-0095

JUNE 3rd 2017 British by the Sea Car Show
HARKNESS MEMORIAL STATE PARK,
WATERFORD CT

<https://www.classiccarperformance.com/blogs/news/2018-british-by-the-sea-car-show-june-3rd-waterford-ct>

3 June Annual Spring Tractor Show and Farm Open House
Roxbury CT
1-84 exit 15. North on Rt. 67 to Roxbury, right on 317, left on Painter Hill Road to Toplands Farm at the top of the hill.
Contact: Nikki Hine, 102 Painter Hill Rd., Roxbury, CT 06783 860-354-0649;
email: ddlivinghistory@aol.com
www.toplandsfarm.com

8 - 9 June Charter Day Antique Tractor Pull and Show
Granby MA
Feature: Allis-Chalmers; Case; Farmall; Friday; International Harvester; John Deere
Dufresne Recreation Area, Taylor Street entrance.
Contact: George Randall, 52 Taylor St., Granby, MA 01033 413-467-9541;
email: george.randall3@comcast.net

June 9th (setup on Friday) Maine Antique Power Assn. 45th Annual Show
Skowhegan ME
Skowhegan State Fairgrounds, St. Rt. 201, Madison Ave., use Beech Street or main gate at Walmart entrance.
Contact: Joe Kelley, 25 Wessnette Dr. Hampden, ME 04444; 207-862-2074
email: wildirishman52@gmail.com
<http://maineantiquepower.org/wp-content/uploads/2018/01/Show-poster-2018.pdf>

June 9 - 10 ATCA CT Yankee Chapter Show
At the Bethlehem Fair Grounds, 384 Main St Bethlehem, CT
Contact Bill 203-739-0118
Show flyer at
<http://www.antiquetruckclub.org/forms/CT2018.pdf>

23 - 24 June 42nd Annual Central Massachusetts Steam Gas & Machinery Association Yankee Engine-uity Show
80 Airport St. Orange MA
Feature: Allis-Chalmers; Abenague engines.
Contact: Grover Ballou, PO Box 32, Orange, MA 01364; 413-249-2895
email: info@cmsgma.com www.cmsgma.com

June 24 ATHS Nutmeg Chapter Antique Truck Show
Brooklyn, CT At Route 169. Antique Truck Show, Flea Market and Toy Show.
<http://nutmeg.aths.org> Contact John Raymond 860-608-5033

Later

East Coast Antique Tractor Club, 142nd Deerfield Fair- September 27-September 30th, Deerfield, NH- Contact: Jim Rosencrantz, [603-765-8235](tel:603-765-8235)