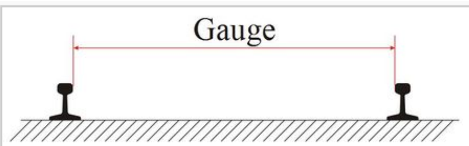
July - August 2015

The PLS GAZETTE

A newsletter of the Pennsylvania Live Steamers, Inc.

Green Signals Ahead



Back in the November – December 2013 PLS Gazette I wrote a short editorial about one of our goals being "to educate our guests and associate members about large scale model railroading". This still continues to be one of our primary ongoing goals. When you visit PLS and walk around the railroad you will see many different size trains running on a number of different tracks of various sizes (track gauges). To help our associates and visitors better understand the language of model railroading please refer to the "how track gauge is measured" drawing above and the "track gauge and scale of trains" table below. The table outlines the five different track gauges and scales we operate at PLS.

Track Gauge and Scale of Trains Running at Pennsylvania Live Steamers, Inc.			
Track Gauge	**Scale**	**Inches / Foot**	**Track Elevation - Location**
1.772" (45 mm)	1/32	3/8"	Elevated and Ground Level
2 1/2"	1/24	1/2"	Ground Level
3 1/2"	1/16	3/4"	Ground Level
4 3/4"	1/12	1"	Ground Level
7 1/4"	1/8	1 1/2"	Ground Level

The smallest and very popular trains you will see running at PLS are referred to as Gauge 1. The track gauge is 1.772 inches (45 millimeters), just a little more than 1 ¾ inches between the rails and has a scale is 1/32 or 3/8 inches to the foot. The 1/32 sometimes referred to as the ratio (1:32) makes these trains 32 times smaller than the full size equipment they represent. It should be noted that although the ratio of 1/32 is one of the more popular scales, you may see other larger and/or smaller running on the PLS gauge one track. The track located just about in the center of the PLS property is both elevated on short piers and at ground level. The elevated section is designed to make it easy for the engineers/ operators to handle the equipment without having to get down on hands and knees to service, steam up and ready for operation. For those interested in becoming involved in outdoor railroading this is a good place to get started. The equipment has the lowest cost to get into the hobby with a small engine costing just a few hundred dollars. Another Gauge 1 advantage is the size and weight of the engine, cars, tools, and fuel. All can be hand-carried to and from an automobile making the movement and storage of these small size live steamers the easiest of all trains to own and operate.

Gauge 1 engine passing over trestle

Gauge 1 trains waiting for the mainline

As many of you know PLS was established in 1946 in Berwyn, Pa and moved to its current location in Rahns in 1970. Over the years, Berwyn has been confused with its close neighbor Paoli and you may have heard it said that PLS was started in Paoli, PA. This is a misunderstanding that has taken hold after many years of poor communication. The track located in the center of the PLS property makes a loop around the Gauge 1 track mentioned above. The configuration of this track is referred to as the multi-gauge loop and consists of 4 rails fastened to shared railroad ties with spacing that allows 2 ½ inch gauge, 3 ½ inch gauge and 4 ¾ inch gauge equipment to be run on the same track. The multi-gauge track is connected to the circular steaming bay and pit area that permits the prepara-

(Continued on page 3)

Thank You!

The 2015 PLS picnic was again a success and we owe thanks to all that helped with the preparation and, of course, the cooking of the Hamburgers and Hot Dogs that all seem to thoroughly enjoy. Once again the cooking was led by Jay Shupard and, as always, he did a great job. Steve Leatherman also was another member that helped with the setup and food preparation. Thanks to all that set up the tent, tables and got bits and pieces together to make are annual picnic a success.

A very special **THANK YOU** needs to go out to Associate Member Jonathan Riehl and his family for bringing their steam tractor/engine and ice cream freezers and making us his fantastic homemade ice cream. Not only did his family setup and make the ice cream, he also donated the ingredients as well. Thank you, Jonathan!

2015 Fall Meet

As we prepare for our 2015 Fall Meet, it is again time to remind all members, Regular and Associate, that we *depend* on you to help the weekend run smoothly. Our need for volunteers to perform gate duty and/or staff the kitchen/snack areas seems to be more difficult to meet each season. So please sign up when you arrive on Friday, Saturday, or Sunday of Labor Day Weekend.Thank you.

And, as always, your donation of baked goods for our snack area, either homemade or store bought, would be greatly appreciated.

REMINDER: During the meet, the clubhouse refrigerators are used for food and drinks sold by PLS throughout the weekend. Should you need refrigeration for either personal use or items brought for the potluck dinner, please use your cooler.

2015 PLS Calendar of Events

Saturday, August 15	Board of Directors Meeting - 9:30 AM
	Membership Meeting - 12:30 PM
	Afternoon/Evening Run*
Sunday, August 23	Run Day - Members & Guests*
Sunday, August 30	**Run Day Rain Date*
Friday, Sept. 4	***Fall Meet*** - Members & Guests
Saturday, Sept. 5	***Fall Meet*** - Members & Guests
	Pot Luck Dinner at 5:30 PM
Sunday, Sept. 6	***Fall Meet*** - Members & Guests
Saturday, Sept. 19	Board of Directors Meeting - 9:30 AM
	Membership Meeting - 12:30 PM
	Afternoon/Evening Run**
Sunday, Sept. 27	Run Day - Members & Guests**
	Members & Guests
Sunday, October 4	***Run Day Rain Date*

Donation Acknowledgements

PLS wishes to thank the following members and friends for donations received during June and July: Barry Shapin, Steve Mallon, Dick Moore, Ginny Haskell, Jonathan Riehl and family, Robert Hekemian Jr, Stephanie Firth, and the Jerusalem Lutheran Day Care.

Thank you also to Bruce Saylor, Robert Blackson, Robert Hillenbrand, Mrs. John Atkinson and Murray Wilson for their contributions in memory of Al Hein.

Club Membership News

PLS welcomes new Associate Members Thomas Settefrati, Ruth Toner, Steve Mallon, Brooke A. Moore III, Richard R. Teaff, Joseph P. Geiger Sr, and David R. Houser.

Membership Gauge

As of July 31, 2015 PLS has:

103 Regular Members

212 Associate Members

10 Honorary Members

Pennsylvania Live Steamers, Inc.

President	Frank Webb	77 Roundwood Circle, Collegeville, PA 19426	president@palivesteamers.org
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(Continued from page 1)

tion and servicing of equipment prior to entry to the multi-gauge main line. The two smaller of these three sizes can support an engineer on a riding car and the larger 4 ¾ gauge can support the engineer, several cars and passengers.

Fun on handcar on the Multi-Line

4 ¾ Gauge Steam on the Multi-Gauge

The longest two PLS tracks make a double loop around the entire railroad and consist of 4 ¾ inch gauge mainline supporting 1/12 scale or 1 inch to the foot and the 7 ¼ inch gauge mainline supporting 1/8 scale or 1.5 inches to the foot. Please keep in mind that there can be considerable difference between the sizes of engines running on the 7 ¼ inch mainline. The simple fact is the full size engines and cars from the mid 1850's were much smaller than those manufactured in the 1920's. Using a scale of 1/8 and 1.5 inches per foot means our scale models are made to the exact proportions of the full size equipment thus early engine representation are much smaller than those of a later era.

The 7 ¼ inch gauge mainline runs parallel to the 4 ¾ inch gauge track except at the main yard and station areas. The 7 ¼ inch gauge station is on the south side of the main yard and the 4 ¾ inch gauge station is on the north side. All of the yard tracks and the mainline tracks are busy on club run days.

Double-headed 1/8 scale on 7 ¼ inch Gauge Mainline

It is my hope that the table of track gauge and equipment scale help give you a better understanding of the size of the equipment that is operated on the PLS large scale railroad. In general the scales noted in the table can be seen running on the corresponding track gauges. As noted in the description of the Gauge 1 equipment, other scale (ratios) can be applied to all track gauges with some engines of an even larger scale running on a smaller gauge tracks.

Sometimes it seems that all we ever do is WORK ON THE RAIL ROAD, but as can be seen in the photos included in this article we also take time out to have fun too! Yes, it's true the railroad does take a lot of hard work to keep it looking good and in safe running order, but when you see the fun that takes place on our regularly scheduled run days and at our spring and fall meets you know why we work so hard on our Wednesday and Saturday work days.

I opened this editorial by stating one of our goals at PLS is "to educate our guests and associate members about large scale model railroading". Another of our goals can be seen in a number of the photos on this page. That goal is to introduce the younger generation to large scale outdoor model railroading. We are very happy that boys and girls can both have a great time riding and running various types of trains on the PLS mainline.

I look forward to seeing you at PLS and encourage all that are interested in large scale model railroading to come join us at one of our work or run days to learn more about our hobby and how you might become involved.

See you on the Mainline,

Frank Webb - President

Young engineers on the 4 ¾ inch Gauge Mainline

All photos courtesy of Allen Underkofler

An Outline of Boiler Feedwater Systems

An article a few issues back gave a brief historical review of boilers and some of the considerations of their design. As boilers have become more complex so have their feedwater systems.

The pressure in the earliest boilers was scarcely above atmospheric, so a hand pump was probably used to feed them, if not the head pressure from the water source. As steam engines developed and pressures went up then usually the engine drove its own pump. This arrangement is satisfactory with boilers having a high circulation ratio, that being the number of times the feed water circulates in the boiler before being evaporated. In a tank type of boiler such as the Lancashire, or even a fire tube locomotive boiler, this ratio might be as high as 100, in a water tube boiler perhaps 5 and in a 'once through' boiler of course it is 1. With a high circulation ratio the boiler may be fed intermittently, as it is in a steam locomotive, but with a low ratio such as 5 the boiler must be fed continuously.

The invention of the steam injector in 1858 settled the question of how to feed locomotive boilers. It was simple, compact, inexpensive and dependable if operated correctly, but it was not generally adopted for other boiler types for two reasons:

1. An injector is not suitable for continuous operation, it will stop working if it or the feed water gets too hot.
2. It is inefficient. At first glance it may appear this cannot be so because the steam it is using is heating the feed water, but thermo dynamics is not that simple. For a steam locomotive, already being very inefficient, a further loss was not considered significant.

So steam driven piston pumps came into general use for stationary and marine boilers. These were linear, not rotative. The steam cylinder drove a piston pump which shared the same piston rod. The familiar Simplex and Duplex pumps. As the increasing power of engines demanded more steam and at a higher pressure, multi stage centrifugal pumps were adopted. For large stationary boilers these might be driven by either electric motors or steam turbines, but for marine use turbines were the choice.

Most steam locomotives had a simple "total loss" water system and did not use any feed heating. Cold water was fed to the boiler and the engine exhaust escaped to the atmosphere. Stationary plants have varied very much in the degree of feed heaters use. In plants such as paper or textile mills which use a lot of process steam it is customary to generate the steam at a comparatively high pressure and to expand it down to the required process steam pressure using a steam turbine as an expander. The turbine drives an electrical generator and as the electricity generated tends to be regarded as a cost free bonus there had often in the past not been much interest in increasing the plant efficiency by using feed heaters. That attitude has changed. Electrical utilities on the other hand have always had everything to gain from increased efficiency and so invested in advanced feed heating systems.

A detailed description of them is outside the scope of this short article, but usually there are two sets of heaters, low pressure and high pressure, perhaps a total of seven. The 'high' and 'low' refer to the pressure of the feedwater at this point in the feed system. Low pressure feed water is being supplied by the condenser extraction pump to the main feed pump. After the main feed pump the water is of course at high pressure. All the heaters use steam bled from different stages of the turbine to do the heating, it being more efficient to use partially expanded steam to heat the feed water rather than let it expand all the way through the turbine and then reject its latent heat to the condenser cooling water. The heat balance calculation considers many factors and includes the whole plant.

High pressure heaters understandably are considerably more expensive to make than low pressure ones, so as much heating as possible is done at low pressure. There is a limit to how much heating can be done there though because the water must not become so hot that it risks flashing into steam at the main feed pump's suction inlet. The important factor is the Net Positive Suction Head (NPSH), a function of both pressure and temperature, which must not be lower than the minimum specified by the pump manufacturer. Cavitation in a high pressure centrifugal pump due to steam or air bubbles is very damaging to the pump. One of the low pressure feed heaters is, by the way, also a deaerator. Some stages of the turbine operate below atmospheric pressure so there is inevitably some air drawn into the system, the condenser air ejectors and the deaerator feed heater remove almost all of it. Boiler water treatment is a large subject in itself, suffice it to say oxygen scavenging chemicals such as sodium sulphite or hydrazine may be injected into the boiler to remove the last traces of dissolved oxygen, though as boiler pressure goes higher every effort is made to minimize the quantity of water treatment chemicals used. At the very highest pressures such as generated by super critical pressure boilers, a quirk of chemistry can make it necessary to reverse the process and inject oxygen into the feed water in order to reduce corrosion in the boiler and turbine.

The main feed pump delivers the feedwater through the high pressure heaters and then to the Economizer section of the boiler. These days the Economizer is an intrinsic part of the boiler, but in the early days it was a unit added into the flue gas ducting of existing boilers to increase efficiency and the name has been perpetuated.

Now the water is in the boiler, but a remaining problem is knowing just what the water level is. Today there are several types of water level gauges which indicate indirectly, for instance by magnetism or microwaves, but the ASME code requires at least one level gauge in which the water can be seen. Understandably this becomes increasingly difficult at high pressure, the

(Continued on page 5)

(Continued from page 4)

familiar tubular gauge glass of our locomotive boilers is limited to 250psi and above that pressure a gauge is usually made by clamping two flat pieces of glass between steel plate frames, but the accurate indication of water level remains a challenge. Fortunately the highest pressure boilers of all, the super criticals, do not require a level gauge as there is no boiler drum.

So a boiler feed system may vary from the very simple to the complex. Today even quite modest industrial power plants are likely to be monitored remotely from an air conditioned control room and it is all too tempting for the operators to ignore the old adage that machinery likes to be visited. There's no substitute for a visual check of the plant at least once a shift. The instruments don't see everything, but that is another subject.

Murray Wilson

For Sale

Gauge One Accucraft T1 Steam Locomotive

and

11 Custom Coaches with the Loewy two tone paint scheme by renowned custom builder, David Leech

Locomotive, cars and cases will be at the PLS Labor Day weekend Steam up!

Contact Will Lindley at Thumper12225@prodigy.net

For Sale **1" Scale 0-4-0 Steam Locomotive with Tender** **$3,500**

- L.E. Chassis with a Steel Boiler and a Dry Back Head
- Equipped with one Injector, Axle Pump and Tender Pump
- Vacuum Brakes on Tender

See Ron Shupard at PLS or Call at 610-945-7366 (evenings only)

Free to Good Home

PLS has replaced a single track car storage building with a new two track building. The building seen in the photo on the left is in good/fair condition and is now surplus. The building measures 15'-5" over the top of the roof and is about 14'-4" inside. It is designed to set on simple runners (we used railroad ties) like a 4"x4" on a ballast bed. It is wide enough to hand our MMC Dash Nine so most engines will fit through the existing door without issue. The building could be cut in half or shortened and used to store to shorter locomotives or cars. It is yours free if you want it and can be picked up at PLS with advance notice. First come, first served!

Flags, Fusees and Torpedos

Safety on the Railroad

Bob Thomas

Although they might seem archaic in this age of instant communications, flags (and locomotive classification lights) once had a crucial role in train dispatching and safety. Flags or classification lights were placed on the locomotive of a train to inform crews of other trains, towermen, and station agents, of the train's status when railroads were operated by timetable-and-train-order.

Figure 1 Blue sign clamped to rail

A blue flag, sign or light on a locomotive or car, or at trackside next to one, indicates that work is in progress on, around or under the engine (or parked car). Lately blue lights or signs are usually mounted on supports clamped to a rail (Figure 1). On coupled multiple units a blue flag or placard is placed on the control stand of each unit. Trains approaching a blue flag/light must stop 150 feet away. When an entire section of track has to be protected in a blue flag situation a derail or opposing switch is set with a "Blue Flag Lock" to absolutely prevent entry in to the flagged section. To further ensure the safety of maintenance personnel, blue indicators can be removed only by the person setting them or by an employee in the same craft. Rules on observance of blue flags and lights are explicit and have always been strictly enforced, with direst consequences if they are not.

Flags or classification lights on the front of a locomotive indicated the type of train it was hauling. An "extra" train, that is, one not listed on the timetable, was identified by white flags or classification lights. Green flags or lights were placed on the first section of a train listed on a timetable when another train running to the same schedule was following. The second section displayed green if still more sections were following, or red when it was the last section. The consequences of inattention to classification flags was tragically illustrated on February 21, 1901. The engineer of a Trenton local to New York pulled out of a siding near Bordentown onto the PRR main line after the second section of the three-section *Nellie Bly* bound for Atlantic City had passed, correctly flying *green* flags. The resulting head-on collision with the third section caused twelve deaths, including the engineer of *Nellie Bly*.

"In the day" it was thrilling for a kid hanging out in the evening at Ardmore Station on the PRR main line when a K4, green classification lights displayed on its pilot beam, thundered through with the *Broadway Limited,* only to be followed ten minutes later by a second K4 with red markers on the point of *Broadway's* second section. *That* was railroading! Current dispatching practices do not require visual train identification so classification lights and flags have vanished.

One of the most important uses of a flag was for protection of the rear of a stopped train. When his train had to stop unexpectedly, the engineer gave five short toots with the whistle. That informed the rear brakeman (or "flagman"), who was riding in the caboose, to get on the ground and start walking back to flag-down a possible following train. The distance he had to go back and other safety related duties required of a brakeman on his walk will be described later. In any case, brakemen had to be real men capable of trudging over uneven roadbed at night in the foulest weather for distances of a mile or more. When his train was ready to move again the hogger gave five long blasts of the whistle to let the brakeman know he should hustle back to the cabin car. On single lines with two-way traffic, and in certain other situations, a front end brakeman (or the fireman if a brakeman was unavailable) was sent forward by the engineer to protect the train from movements ahead.

Figure 2 Lighting a flare

At night when flag signals were ineffective, their function was taken over by a red lantern or flares, known on American railroads as *fusees,* which generate a brilliant red light. Flares were originally made of a rolled waterproof paper tube about a foot long and an inch in diameter. The bottom end of the tube is closed by a wood plug with a sharply pointed spike extending from its center. The other end of the tube is covered by a cylindrical cap, about two inches long that can be easily twisted off the tube. The outside end of the cap is coated with material similar to the striking surface of a match box; the uncovered end on the fusee has a button of highly combustible material like a match head. Striking the cap's end against the end of the fusee (Figure 2) ignites a pyrotechnic mixture packed inside the tube, causing it to start burning, eventually reaching almost 3000 degrees Fahrenheit.

Oxygen released by a chemical in the burning mixture makes it almost impossible to extinguish a burning fusee; strong wind

(Continued on page 7)

(Continued from page 6)

and heavy rain have no effect on its self-sustaining combustion. Most railroad fusees burn for ten minutes. Those used for long periods of signaling or general illumination during nighttime switching moves had longer burn time and sometimes were yellow rather than red to enhance visibility in bad weather. That spike in the bottom of a railroad fusee is intended to keep the fusee upright in ballast but its most fascinating function was used in the old days when skillful brakemen who, standing on the rear platform of a jouncing cabin car, could toss a lighted fusee like a dart so it stuck upright in a tie!

Fusees are still used at night to warn motorists at otherwise unprotected grade crossings while train movements across the road are in progress. One veteran brakeman tells an amusing story about this: He was waving-down traffic as his train was about to back across the road. The driver of a top-down convertible was too impatient to be delayed by a mere, disrespectful railroader so he drove around the brakeman and cross the track. Well, brakemen don't like it when that happens. This one demonstrated his displeasure by hurling his lighted fusee at the convertible, where it landed on the back seat, setting the car on fire! The train crew, with no interest in what was to happen next, made a hasty departure, returning later to complete their switching orders.

Figure 3 Torpedo strapped to rail

Another item in the arsenal (literally) of safety appliances housed in a caboose storage locker was the *torpedo*. Torpedoes were invented in England in 1874 and arrived in the U.S. shortly later. They are made of a heavy paper container, typically 2" square and 5/8" thick with a thin strap of lead or soft aluminum about 8" long attached to the bottom. The device is held securely on the top of a rail by bending ends of the strap around the sides and under the bottom of the railhead (Figure 3). The container is filled with an explosive that will not detonate if handled roughly, but will go off with an ear-splitting BANG when impacted by a locomotive wheel. The detonation is loud enough to be heard through nosiest conditions in a steam locomotives cab but with improved acoustic isolation of modern locomotive cabs, torpedoes might not be heard by the crew so their effect can be marginal these days.

Railroads differ on how far the flagman has to walk back and where fusees and torpedoes are to be placed behind stopped or slow-moving trains. Many early roads specified those distances as the number of "poles" passed for flagging or setting out fusees and torpedoes. Telegraph poles next to railroads were ordinarily spaced 60 feet apart so a company rule might have stated, "Go back with flag 40 poles from rear of train and set two torpedoes." Those prosaic regulations were superseded in 1900 by *Rule 99,* which established uniform regulations for protection of stopped and slow moving trains.

Rule 99 has been revised several times since its introduction. A rough average of its requirements in its early stages required the brakeman on a stopped train to walk back one mile, place a torpedo, then go another mile and place one or two additional torpedoes and a lighted fusee. He then had to return one mile toward his train and wait until recalled. If his train moved slowly after restarting, the brakeman had to toss out a lighted fusee every ten minutes. Later versions of Rule 99 added more specific regulations for flagging and deployment of torpedoes and fusees depending on type of traffic on the line, terrain, and existence of block signals, as well as numerous rules applying to trains operating at restricted speed.

Legacy protection methods like flagging are now moot on routes with high density, high speed traffic, like the Amtrak Northeast Corridor with automatic train control, and most sections of railroads with block signaling. However, manual protection, despite its ancient roots, is still practiced on divisions with block signals where track curvature, severe grades, or other conditions create safety hazards. Taken together, flags, fusees and torpedoes, as crude as they might seem today, continue to have a place in railroad safety. The only thing capable of thwarting their successful application is human error!

Attila Varady

Attila Varady's obituary was published in the Summer 2015 issue of the PRRT&HS publication, *Keystone.* He was born in Budapest and became a member of the Hungarian Freedom Fighters resistance group during WW-II. After the war he lived as a refugee in several European countries before coming to live permanently in the U.S.

Attila had rather strong leftist political views that were (ahem), "not well received" by most PLS members, but he possessed good humor and was a regular participant in work sessions. He was an accomplished draftsman and a meticulous, highly skilled machinist, talents he lavished on design and construction of a superbly detailed 3/4" scale live steam locomotive chassis. He drifted away from the hobby, but not steam, after devoting hundreds of hours to that chassis. Nevertheless, he remained a member of PLS until his death, but redirected his passion to prototype railroading. Attila Varady was a resilient, passionate man who will be remembered with utmost respect by all who really knew him.

B.T.

The

PLS GAZETTE

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FIRST CLASS

STILL HUNGRY?

Because of the *positive* response to meet our kitchen staffing needs at the Spring Meet, we do not plan further limiting of serving hours or menu offerings for our Fall Meet. However, PLS needs you to continue volunteering and hopes others will join us. Just one hour of your time will allow the PLS kitchen to function smoothly.

The kitchen will be open until 3 pm on Saturday and 2 pm on Sunday. Below is a sample of activities where help is needed:

1. Friday 9 am 1 or 2 people, set up, etc.
2. Saturday 9 am – 10 am 1 person kitchen prep
3. Saturday 11am – Noon 2 people serving & 1 cashier
4. Saturday Noon – 1 pm 3 people serving & 1 cashier
5. Saturday 1 pm – 2 pm 3 people serving & 1 cashier
6. Saturday 2 pm – 3 pm 3 people serving & 1 cashier
7. Saturday 3 pm – 4 pm 2 people clean up
8. Sunday 9 am – 10 am 1 person kitchen prep
9. Sunday 11am – Noon 2 people serving & 1 cashier
10. Sunday Noon – 1 pm 3 people serving & 1 cashier
11. Sunday 1 pm – 2 pm 3 people serving & 1 cashier
12. Sunday 2 pm – 3 pm 2 people clean up/tear down

Please contact Kathy Parris via email at parrisk415@gmail.com with any questions and to indicate your availability for volunteering.