May - June 2021

The PLS GAZETTE

A Newsletter of the Pennsylvania Live Steamers, Inc.

Green Signals Ahead

It has been a while since I have shared information about the Signals and Switches used on the PLS Railroad. We also have a number of new members that might benefit from some Signal and Switch information.

Let us start by understanding the three (3) block signal system that is defined by the normal GREEN, YELLOW and RED signals you see around our railroad. It might be best if we look at the signals from the train operator's (engineer's) point of view. When the engineer sees a Green signal, it is telling him or her that the two Blocks looking forward are clear. No trains on the track ahead. If a train is in the next Block the signal will be RED, if a train is two (2) Blocks ahead the signal is YELLOW, and if the train is three Blocks ahead the signal will be GREEN. Assuming that the train the engineer is sitting on is the main line track and his or her train is causing the signal he or she is occupying to be RED. I say this because in many cases the engineer is sitting at the very front of the train and will not see the signal he has just passed that is now RED. The engineer is normally not concerned with the Block he or she is occupying, only the Blocks ahead are of concern.

OK… what is considered a signal Block? This is the space between two signal posts/bridges that is an electrically isolated section of track that is being powered and detected. When a train enters a Block the wheel/axle set shorts the left and right rails together and effectively acts as an electric switch. Sounds simple, but if fact there is more to the signal system than just a simple switch and light bulb and it does not explain how a YELLOW signal is displayed. Here is how it works; each signal Block has an electronic circuit board that detects the train and controls the signals (lamps). When a train is one Block ahead, the signal will be RED. When a train is two (2) Blocks ahead, the engineer sees a YELLOW signal. The electronic circuit board that is used to detect that the Block is occupied is displaying a RED signal, it is also sending an electronic signal back one (1) Block telling that circuit board to display a YELLOW signal. Confused yet? It's simple. If there is no train in the next two (2) Blocks, the signal the engineer sees is GREEN. If the train is two (2) Blocks ahead, the engineer sees YELLOW. This also means the next Block has a RED signal. In other words, the Block behind a RED signal is all way YELLOW. There is a single wire that runs back to the trailing signal that is labeled B+1. When B+1 is activated, the signal is YELLOW. More about this later when we look at simple trouble shooting signal problems.

Here is how an engineer should respond to these three simple signals:

1. **Green Signal:** Run at normal track speed. No trains in the next two Blocks.

2. **Single Red Signal**: Be prepared to STOP as a train is occupying the next Block. In most cases the engineer can see most if not all of the Block ahead. The engineer should proceed with caution at safe speed and be prepared to stop.

3. **Yellow Signal**: This is an approach signal and it is letting the engineer know that a train is two Blocks ahead. The engineer should slow to a safe approach speed and proceed with caution.

There is a bit more to the signal system that just the three (3) occupied Block parts of the signal system. The circuit board that controls the signal lamps (Lamp Card) can also be used to control Sub-Blocks that work with other lamp cards to interlock signals and electrically interface with switches, more about the switches later. Sub-Blocks are used for voting and interlocks. To better understand how these blocks work, let's take a ride around the 7 ¼ inch gauge track. We will start on the 7 ¼" main line at the top of the grade near Beck Tower. This is a ~ 4 ½ percent down grade. As you go down grade in a left turn and under the multi-gauge bridge, you will see a goal post with two (2) signal heads for each of the two tracks. The main line track is paralleled by the Yard track lead to your left. Your signals are on the right side of the goal post. As you are on the right track, there will be a YELLOW over RED signal. If the Signal is RED over RED, there is a train in the next BLOCK and the engineer will need to STOP as this is an ABSOLUTE signal. If YELLOW over RED, you can proceed without coming to a complete stop. You can look ahead and see the next goal post. Each side of the goal post has two (2) signal heads, one above the other. Both sides will be displaying RED over RED. The left and right tracks are going to merge just beyond this goal post and these signals are ABSOLUTE. Let's assume there is no traffic on the rai road. The goal post before the track merge ahead is both a VOTING and INTERLOCK signal. Let us assume you are

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Tree Trimming Day

No, it is not a Christmas Tree. We will be having a special tree trimming project on:

Saturday, June 26, 2021

(Rain Date: Saturday, July 10)

From 9 AM - 3 PM

PLS Grounds

Help is needed to take care of some problem trees scattered throughout the property. Steve Leatherman will be bringing a bucket truck to assist in this task.

Light refreshments will be provided to workers that day.

Upcoming Events

Sunday, June 19	Board of Directors Meeting - 9:30 AM Membership Meeting - 12:30 PM Afternoon/Evening Run (See Note)
Sunday June 27	Run Day - Members & Guests *Rain Date July 4*
Saturday, July 17	**Annual PLS Picnic - 12:00 Noon** (Train Rides will be available from Noon until 3 PM) *Picnic Rain Date Sunday, July 18*
Sunday, July 25	Run Day - Members & Guests *Rain Date August 1*
Saturday, August 7	**Perkiomen Community Day** Run Day - Township Residents
Sunday, August 21	Board of Directors Meeting - 9:30 AM Membership Meeting - 12:30 PM Afternoon/Evening Run (See Note)

Note: Rides may not be available at afternoon/evening run days following membership meetings due to possible limited participation by equipment owners. All members and their guests are welcome to attend with the understanding that rides are not guaranteed at these events.

Donation Acknowledgements

PLS wishes to thank the following for donations received during April and May: Bob Thomas, Richard Martin, Barry Shapin, Jim Barker, Don Maleta, Rick Stoughton, Sharon Connelly, Sandra Carpenter, and the Win Becker Foundation.

Thank You

As you may know, I am no longer running the kitchen during our Spring and Fall Meets. Thanks to all of you who worked with me for the past 20 years. Please support whoever may step up in my place.

Kathy Parris

Club Membership News

PLS welcomes new Associate Members Edward Overly, Gerald Farrell, Jerry Bohlander, Francis Gallo, Gerald Catanese, and Anthony Pignataro, Jr.

Membership Gauge

As of May 31, 2021 PLS has:

102 Regular Members
159 Associate Members
5 Honorary Members

Pennsylvania Live Steamers, Inc.

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on the mainline and proceeding down grade and at about the same time a train is leaving the yard on the track to your left. The first train to pass the goal post, that's the one just after you pass under the multi-gauge bridge, will win the vote and the signal ahead will change from RED over RED to Green over RED, or the condition of the track ahead. The train on the yard track will have to come to a full STOP. Why a full STOP? The reason is simple. The two tracks merge just past the signal goal post and only one train can proceed at a time. If the Yard track train passes the goal post near the multi-gauge bridge, first that engineer wins the VOTE and will get the GREEN signal and the main line train will have to STOP for a RED over RED signal. Unlike the simple single signal head shown above, the two or three headed signal heads stacked one on top of another are **ABSOLUTE SIGNALS**. RED over RED is a must STOP SIGNAL and the engineer can only proceed after the signal changes to a less restrictive indication or someone from the train walks forward and clears the track.

How did the signal system know who won the vote? Both tracks have a "Sub-Block" just past the goal post and the wheels that reach the Sub-Block first send an electrical signal to a separate Lamp circuit board and interlocks the other Lamp Cards to manage the system. I will not go into too much detail but the Lamp Cards have auxiliary inputs and outputs that lets them work together. As our train moves forward the next signal is at the entrance to the tunnel. It is also an ABSOLUTE SIGNAL. Why is this signal ABSOLUTE? The answer again is simple, the engineer cannot see past the curve in the tunnel and has no idea what lies ahead. One issue - there is a switch to a siding just on the other side of the tunnel. If an engineer were to proceed into the tunnel and come upon a train and have to stop, the people on the train are faced with smoke or fumes from the engine and this may become very uncomfortable for the engineer and the trains' passengers sitting stopped inside the tunnel. Once clear of the tunnel, there is a signal bridge about 130 feet just past the tunnel exit. The signal on this bridge looks to be a straight forward simple signal, but it is with one exception, this signal is interlocked with the siding. This siding is the only fully signaled siding on the railroad. When a train is parked in the siding, it causes the signal on the bridge to go to YELLOW (APPROACH). Actually, a train in the siding causes the track ahead to go to RED over RED. The siding signal also will be sitting at RED over RED. The mainline signals on the signal bridge and just before Mercer Bridge acts as simple BLOCK signals when there is no train in the siding, but when the siding is occupied the mainline Block and the siding Block become interlocked and again we have Sub-Blocks that VOTE on who gets the right of way. Here is an example of what can happen. A train on the siding pulls forward to a signpost next to the track to put in a request to leave the siding (it's like pushing a request button). If the mainline track is clear back to the mainline signal bridge, the signal on the mainline signal bridge will change from YELLOW to RED and the signal at the siding will go GREEN over RED or the condition of the track ahead. If there is a RED signal at the South end of Mercer Bridge, the train on the siding would have to wait until it was at not less than YELLOW (APPROACH). If a train was exiting the tunnel, the engineer would see a RED signal on the signal bridge and would have to be prepared to stop for the next signal which is likely to be RED over RED. If the train leaving the siding was on its way, the mainline engineer would have a YELLOW signal at the entrance to the tunnel. One thing the signal system avoids is throwing up a RED signal in the engineer's face. RED is always proceeded by YELLOW. Back to the voting, the engineer moves forward to request the mainline from the siding. If a train coming out of the tunnel has passed the signal bridge, the siding is interlocked to RED over RED and the mainline wins the VOTE. Why did we signal this siding? The mainline speed of a train leaving the tunnel can be at full track speed and like the siding is upgrade. The train/engineer sitting on the siding has a long way to look back over his left shoulder to see the mainline and is starting his train on an upgrade. Safety is our concern. This siding merges at a point that could be difficult for both any train leaving the tunnel and any train leaving the siding. Both of these trains could be pulling long consists of cars, seventy (70) + feet long. As our trains cross Mercer Bridge, the signal mounted on the end of the bridge is a simple signal and the engineer has a clear view of the next two blocks. The track off the end of the bridge makes a 180 degree turn to the right and will pass under another signal bridge and parallel the end of the track coming off the end of a 180 foot trestle to the left. At this point the roadbed is five (5) tracks wide running about 100+ yards side by side when including the multi-gauge track. The next signal bridge has four (4) mainline semaphores, two (2) of which are double headed (ABSOLUTE). These will be discussed when we approach them on the inter-loop. We will be passing over the top of the tunnel and under a single headed semaphore on the outer loop of the 7 ¼ inch gauge track. Since we entered the tunnel, we have paralleled the 4 ¾ inch gauge track. Passing under the signal bridge we continue upgrade to the next goal post signal, but before we reach the goal post there is an electric switch button that can be used to select a siding to the right. There is a simple siding signal head under the mainline signal head to show the state of the siding switch. Once the train enters the siding and has cleared the fouling point, the siding signal goes dark. The exit switch from the siding is not signaled. Once the fouling point is clear, the electric switch will automatically return to the mainline. We continue the upgrade for more than 100 yards to the next goal post another simple signal with one exception as we pass this goal post we enter a Sub-Block the signal we pass goes RED and as we reach the top of the grade, in a left turn we will cross a double hard crossing. The first road goes into our infield and unloading areas, the second is the driveway to our clubhouse and a few handicap parking spaces. We have a full size crossing gate at both hard crossings. Our intent was to interlock the gates in the closed position when a train was approaching the crossing, but the two gates have not been put into automatic operation as of this date. That's a story for another article. That is one reasons for the Sub-Block, to prevent the

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gates opening, the other active reason is to start the cross-buck light flashing letting an approaching vehicle know a train is approaching the hard crossings. As the train goes over the two (2) hard crossings, it begins to move down grade. It is ~another 100+ yards to the next goal post, but we do not want the flashing cross bucks to be flashing until the train clears the next block. Here again we have a Sub-Block at the trains exit side of the hard crossing. The flashing cross bucks will only be held until the train has cleared the hard crossing by about twenty-five (25 feet). Passing the goal post after the crossing and turning left, we can now see a goal post about 100 feet away, again a simple signa., The next goal post is about one hundred (100) yards away just before the entrance to the one hundred and eighty foot (180) trestle, again a simple single. The next goal post is just before we exit the trestle. We are now on the inter-loop and once again on the roadbed that is five (5) tracks wide. To the far left is the multi-gauge track. More about the multi-gauge in a later article. To the near left is the mainline 4 ¾" gauge track that we have paralleled from the time we left the tunnel. To our near right is the outer-loop mainline 4 ¾" gauge track and to the far left is the outer-loop 7 ¼" mainline track. Ahead is the signal bridge with the four Semaphores. About fifty (50+) feet before the bridge there is a push button on our left. Pressing the diverging route button will select a switch to the left that will cross over the 4 ¾" mainline. This route will take us to Building 6 car storage or Building 3 Engine storage or to the Yard. Let's look at what the two (2) headed Semaphores are signaling and how the interlocks work. Our first look will be with no other trains on the railroad. If the signal button is not pushed both the 4 ¾" gauge mainline and the 7 ¼" gauge mainline semaphores will display GREEN over RED. The top semaphore's arm pointing straight up and the bottom arm will be pointing to the right. If the 7 ¼" gauge engineer pushes the button to request the alternate route, the 4 ¾" mainline will display RED over RED and the 7 ¼" route will display YELLOW over RED and the train can proceed on the alternate route crossing over the 4 ¾" track. Let's look at the situation of a 4 ¾" engine and a 7 ¼" engine running side by side or the 4 ¾" train running just behind the 7 ¼" engine and the 7 ¼" engine rolls up on the push button to request the alternate route. The request would not be granted and the switch will not move. The reason the request is not permitted is because there is a Sub-Block that extends back on the 4 ¾" track about 100 feet from the signal bridge that locks out the 7 ¼" switch request. If two (2) 7 ¼" trains are running close together and one slows and pushes the alternate route request button the switch will not move. Movement of a switch under a train is locked out because each electric switch between the fouling point is also a BLOCK. A train engineer requesting a switch would have to wait until the switch is clear or the interlock is released. If a train is following close behind another train that has selected and is taking an alternate route, the second train will also be committed to that route as it rolls onto the switch. The switch BLOCK will still see that a train is occupying the BLOCK and will not auto return. Let's continue our trip around the railroad. As we pass the Semaphore Bridge, we come to another signal bridge with two Semaphore. These are simple signals as described above - GREEN, YELLOW or RED. Another 200 feet down the straight-a-way and we come to another simple Semaphore Bridge. The next goal post signal is an ABSOLUTE Signal just before you pass under the PLS driveway (short tunnel). It is only about 40 feet to the next signal, but that signal cannot be seen until you pass the left hand curve under the driveway. At the exit of the underpass there are three push buttons on the right side of the track and a signal post with three signal heads stacked one on top of the other. The top signal head is for the Main Line. The middle signal head is for the Station and the lower signal head is to the Yard. This is also an ABSOLUTE signal as each head has a RED and since only one route can be signaled at a time. Two heads will remain RED, however the only real danger is taking a route that was selected by a proceeding train. The default auto-return is to the Main Line. If we stay on the main line the next signal with no other trains on the track will be a single post displaying YELLOW (APPROACH). As the engineer approaches this signal, it will turn GREEN and the next signal bridge that was displaying RED over RED will change to the condition of the track ahead. With no other trains, it will turn GREEN. This is also a Voting and Inter-Locking signal. The mainline track is interlocked with the station track and just like the siding on the outlet side of the tunnel, the station track is always RED over RED until a request is made by moving the train forward to the request point. If there are no trains on the mainline before the signal bridge next to the station, the mainline trains will be held until the station train clears the goal post below just past the multi-gauge bridge. Once a train has entered the Mainline Sub-Block before the signal bridge, the station track will be held until the main line train has cleared the next signal. We have now completed a complete trip around the railroad.

Here is how an engineer should respond to an ABSOLUTE SIGNAL:

1. **RED over RED:** The engineer must bring the train to a complete stop and wait for a less restrictive signal i.e. YELLOW over RED etc. If the signal does not give a less restrictive indication the conductor or someone from the train must visually clear the track ahead before proceeding. Blind spots/obstruction on the railroad, track mergers and crossovers pose a real danger and following the signals can help prevent an accident.

What does the signal system give to the PLS railroad? First it gives visual interest for all that ride the trains to see and admire. Some will even ask questions and want to know more about the system. It also provides a way for train/engineers to pace themselves and maintain a speed that keeps trains from bunching up or having to make more frequent stops. Most importantly, it provides information to allow for safer operation on a busy Sunday Run Day.

Next time we will look at how the Lamp Card and Switch Cards works, not to be technical, but just enough to allow for some simple trouble shooting of problems

that can and do occur on the mainline track. The above information talks about isolated Blocks. The Block is made up of many rail sections and those sections need to be bonded together to act as a single piece of rail within the Block. A bond in nothing more than a short wire about 5 inches long that is fastened with two screws to join two pieces of rail together at every rail joint. Sometimes these bond wires are damaged, broken or a screw is knocked loose. There are hundreds of these bonds in each Block, the longer the Block the more bonding wires. A broken wire can cause a signal to go RED. How do you find a broken bond, how do you fix it? AC voltage is applied to each Block (most blocks). How do you measure it, what should the voltage be, and where does it come from? We will address these and other question in a latter PLS GAZETTE.

I hope you find this information of some interest, if you have any questions, please let me know. See you on the Main Line,

Frank Webb, President

Waushakum Live Steamers

2021 Meet Schedule

Waushakum Live Steamers invites you to our 2021 running season.
After a year of hunkering down due to Covid, we're excited to be on the rails again.

- **June 27- Van Brocklin Meet** - members, family and friends and other live steam clubs
- **July 18- Hub Division Open House** - members, family and friends and other live steam clubs
- **August 26 -Thursday Dinner** (if we are allowed to gather)
- **August 27**- Members, family and friends and other live steam clubs
- **August 28** - Open to the public Will be listed on website
  Members, family and friends and other live steam clubs
- **August 29** - Members, family and friends and other live steam clubs
- **September 19 - Family Run Day** Members, family and friends and other live steam clubs



Management of Small Live Steam Locomotives

Part 4

By Bob Thomas

More Supplementary Topics

CONVENIENCES

Previous sections, on *Express Running* and *Refined Running,* frequently referred to adjustment of the bypass valve and reverse lever to achieve peak performance from the engine, which translates directly to exquisite pleasure for the engineer. This does not pose a problem when running on an elevated track, or for engineers riding on the tenders of larger locomotives on ground level systems where major operating controls are within easy reach. That convenience may not be available to an engineer sitting on a riding car behind the tender, especially with a locomotive sporting a scale-like backhead and near-scale controls. Those handicaps can be circumvented by control extensions and imaginative control location.

Consider the location of the bypass valve. There is no compelling reason to mount this essential control on the locomotive when a more convenient location from a riding car is at the rear of the tender, where it will always be within easy reach of the engineer. Even if a bypass valve is already mounted on the engine, no locomotive modifications are required; the engine bypass is simply opened wide, and overall control of the bypass function is transferred to a new valve located at the rear of the tender. This causes the bypass hose carry boiler pressure, possibly requiring a heavier hose and clamps, but that should present no obstacle. The bypass valve knob or actuating lever can be made removable or disguised as a prototype appliance so as not to detract from the scale appearance of the tender.

Extension of the reverse lever from the cab of an existing locomotive might require considerable mechanical ingenuity, depending on the type of reverser already in place. Possible approaches might involve a thin music wire extension, a small diameter Bowden Cable (push-pull armored cable), or a flexible shaft. A new locomotive intended for control from a riding car should certainly incorporate some method of adjusting cutoff from the car for, regardless of how it is accomplished, the effort involved in making the reverser accessible from the operating position will be more than compensated by the ability to extract peak efficiency from your locomotive.

ACCESSORIES

Fire Lighter. You can often light a fire by simply tossing a burning match, or six matches into the firebox, or even resorting to a flaming bit of newspaper but that is hardly an elegant method. To make your own safe, convenient fire lighter, take about 15" of $^{1}/_{16}$" music wire and form a ring at one end to make a convenient handle. At the other end, bend about 1½" of the wire back on itself (you will have to anneal the wire at the bend to prevent fracture). Wrap several layers of fiberglass tape around the bent-over end after first capturing a few turns in the gap of the bend. Fiberglass tape in 1" width is available from most suppliers of model airplane supplies. Wind-on enough tape to make a wad about ½" in diameter and 1½" long. Secure the tape with a few turns of fine copper wire. In use, the lighter is dipped in kerosene, set on fire, then waved around in the firebox to ignite all of the kerosene-soaked charcoal. While this item is not essential, it adds a bit of finesse to your operation.

Air Lance. An effective air lance for cleaning flues and blowing away external debris can be made with a $^{1}/_{8}$" o.d. stainless steel tube a few inches longer than the combined length of the firebox and flues. Silver solder one end of the tube into a threaded adapter screwed into a commercial push-button air blowgun from which the standard nozzle has been removed. The tube will flex around obstructions sufficiently to slide into flues not directly in line with the firehole. Push the lance all the way through the flue to ensure all ash has been ejected. Each flue should be individually cleaned at the end of the run day, with additional attention devoted to blowing debris-out of the smokebox, cab and other places where ash has accumulated.

Steam-up Blower. Everyone seems to be familiar with external blowers that plug into the stack for draft to start the fire. It might consist of a small electric motor driving a centrifugal fan. There is also a much simpler type that employs compressed air, if available at the steaming bay, to generate draft from a venturi tube placed in the locomotive's stack. If you use one of those, be sure the tube is a good fit inside the stack, otherwise the draft will be weak and might fluctuate from incidental movement of the tube. The most convenient blower system is the one already built into the locomotive itself. To exploit this "built-in" blower, a pipe is branched off the locomotive's main blower pipeline and connected through an auxiliary valve to a standard (Schrader) threaded air fitting with a $^{5}/_{16}$"–32 male thread. When starting a fire, compressed air is connected through the threaded fitting and the auxiliary valve is opened to give the desired draft. When boiler pressure rises high enough to change over to the locomotive's steam blower, the locomotive's blower valve is opened, auxiliary valve is closed, and air hose disconnected. This scheme produces efficient draft from the locomotive's standard smokebox blower nozzle without a lot of extra paraphernalia.

SAFETY CONSIDERATIONS

Despite being relegated to the end of this monograph, ***safety is the most important element in the operation of small locomotives***. Furthermore, safety is the personal responsibility of each and every individual on the property, especially locomotive engineers. It is a crucial component of every phase in the design, construction, maintenance, and operation of a miniature railroad.

Miniature steam locomotives should be designed with the same robust frame, rugged mechanism, and unquestionable boiler integrity as their full-size counterparts. A

good design should not then be compromised by shoddy workmanship that might put people at risk from a catastrophic failure. But regardless of how well a locomotive is designed and built, deterioration and mechanical wear due to continual hard service eventually will require expert maintenance to ensure continued safe operation. That necessity has long been recognized and implemented by builders of their own locomotives. Owners who have purchased their engines and lack the skill or capability to properly care for them should seek assistance from friends or even resort to a commercial machine shop to set matters right.

Mechanical safety issues such as boiler hydrostatic testing, brakes, couplers, and safety chains are addressed by explicit rules promulgated by clubs and private track owners. Implementation of these requirements is beyond the scope this article, however, it is worthwhile for locomotive owners to go beyond institutional regulations for additional personal assurance that safety is maximized. Test procedures for new and aged boilers are well documented in the model press and should be consulted for application to your locomotive even though they may not be "officially" required.

Descriptions of locomotive operation in earlier sections did not emphasize the necessity for continual awareness of conditions on and around the track. Signal aspects, facing-switch positions, stalled or derailed trains, people, pets, or debris on the track, grade crossing obstructions, and all other hazards are *your personal responsibility*. Additionally, if you haul passengers without a conductor charged with passenger safety, you must maintain an awareness of what is going on behind you. No one can prevent a stupid passenger from suddenly standing up at the entrance to a tunnel, but you should watch out for fingers near trucks, feet or clothing dangling outside riding cars, casual grabbing at weeds, and other hazardous behavior that sometimes emerge from passengers. Do not permit children to run alongside your train; an accidental trip and fall could cause serious injury. Finally, is there a train right behind yours? Find out. If you must stop for an emergency at a place where your train is obscured from the following engineer, immediately run back and flag him down; worry about re-railing a car or restoring a fading fire after you have warned the following engineer, not after his pilot is in your caboose! From this, it follows that if stopping on the main line is unavoidable, try to do so where visibility is not restricted.

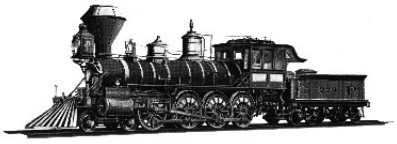
Locomotives employ a *heat* engine – a fact that may not be familiar to all spectators. Since they cannot see the heat, or might not appreciate the temperatures involved, spectators – especially children – standing near your locomotive should be given advanced warning of an impending safety valve discharge or cylinder drain relief. Be careful where you leave your hot poker after tending the fire and warn spectators about hot ashes and partially burned coal that sometimes fall at trackside.

EPILOGUE

Explaining the elements of small locomotive management can be vexing for author and reader alike. Step-by-step procedures quite often take longer to describe than to actually perform – not unlike written instructions for tying shoelaces! The important thing is to recognize fundamental issues and learn to utilize their underlying principles, after which appropriate operating strategy will follow quite naturally.

The name of the game is having FUN. If you find any recommendations in this monograph (other than those related to safety) that detract from enjoyment of your locomotive, don't bother with them. But, if you can surmount the hurdles associated with maximizing locomotive performance, your efforts will be rewarded many times over!

HAPPY STEAMING!



PLS Library

In addition to the many railroad books in the PLS Library located in the Club House, are hundreds of back issues of railroad periodicals that contain large numbers of drawings and technical specifications on a variety of the many aspects of model railroading. This collection is housed in the club caboose and is also available to all members.

Periodicals Include:

- The Model Engineer
- Live Steam
- Garden Railways
- Engineering in Miniature
- Modeltec
- Home Shop Machinist

For information contact:

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