

Locomotive Operation Guide

St Albans & District Model Engineering Society



Document Modifications

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Introduction

The purpose of this document is to provide the St Albans Model Engineering Society locomotive driver with advice and guidance on the operation of a loco as well as all aspects of safety as required by the Society. The document is aimed at all members of the Society that wish to drive a loco at Puffing Park as it is important all drivers have a common understanding of the recommended operation of a loco and of the safety requirements in particular. Whilst it has been written with steam locomotives in mind many of the topics covered apply equally to the operation of electric locos.

Drivers are reminded that they should read and familiarise themselves with the society's Rules for Chipperfield Track which may be found in the society constitution and rules booklet (Third edition, June 2019) and on the society website at www.stalbansmes.com

Safety

In this section specific safety practices and requirements will be highlighted in yellow

Boiler

Why is the boiler the first topic in the chapter on safety?

At a typical model loco operating boiler pressure of 80psi the temperature of the water is 160C. If the boiler ruptures it will be with explosive effect, the water flashing directly to scalding steam, potentially causing serious injury. So why would it rupture? The fire in the loco firebox will be anywhere between 850C and 1800C depending on the coal used and the brightness of the fire. In a spirited run or with generous use of the blower you will be at the top end of the temperature range. The fire will be yellow and glowing very bright. The solder used to construct the boiler melts at around 650C, so the only thing stopping the solder melting and the boiler coming apart violently is the jacket of water around and on top of the firebox, which conveys the heat away to the rest of the water in the boiler and into steam. If for any reason the water level falls to the point that the firebox isn't covered by a jacket of water then the boiler is at risk of exploding.

S1. Never let the water level fall below the bottom of the sight glass.

If it does, you must immediately open the firebox door (to allow cool air in) and drop the fire, which means removing the pin or catch that keeps the grate and ashpan in place and letting it drop onto the track. Alternatively, immediately pour cold water onto the fire through the firebox door from a bucket or watering can. Good practice would be to take action to replenish the boiler water level if it drops below the bottom 25% of the water gauge by using an axle/crosshead pump and/or emergency hand pump. However, you should be aware that on some locomotives poor boiler design means the bottom of the sight glass may actually be below the top of the firebox in which case you should maintain a correspondingly higher level of water to keep the firebox covered.

S2 You should always have a simple means of dropping the fire to hand. For example, if it's a pin that needs removing its likely to be too hot to touch and potentially fiddly, so have pliers ready or heat proof gloves.

How do you tell if the water level is too low, particularly as its likely to be bobbing up and down due to creation of bubbles and the motion of driving the loco or possibly a gradient?

If the water level has disappeared from view below the bottom of the sight glass then you are definitely in trouble. If it dips below every now and then you are in danger and should replenish the water level in the boiler quickly either through use of the axle or crosshead pump, emergency hand pump or (if you are confident it works) an injector. If the water level is hard to judge then a quick application of the sight glass blow-down valve should dislodge any bubbles and make it easier to see.

Track

The Puffing Field track is old. The support pylons can crumble or shift due to the action of tree roots. The bolts holding the rails together can break or come loose. Branches and leaves can fall and rest on the track. All these things are capable of causing a derailment.

S3 Before using the track on a running occasion it is mandatory for someone to walk around the track inspecting for dangers and removing any debris.

S4 Any driver that detects a track fault should report it immediately to the duty marshal who shall then decide the course of action and whether running can continue.

Couplings

All locomotives, driving and passenger trucks at any venue should be joined together using safe, strong and secure couplings. Failure to use proper couplings will inevitably result in uncoupling incidents. The worst of these are locomotive run-aways which are likely to end with damage to locos and/or trucks or injury to people.

St Albans club standard couplings consist of a steel coupling bar that is pinned at both ends to steel coupling blocks which are securely fastened to the locomotive and truck buffer beams. The ¼" or 6mm diameter pins are made of steel and retained by an 'R' clip or similar device so that the pin cannot work its way out while running. Retaining the pin by means of a 'Nyloc' type lock-nut is also acceptable but not a plain nut. Our standard coupling height for 5 inch gauge is 93mm above the rails (narrow gauge type locos may need a swan neck coupling bar to link up to this). If you want to run a 3½ inch gauge loco you need a driving truck with an offset front coupling to match your loco and a standard 5 inch gauge rear coupling. The normal 3½ inch gauge coupling height is 66mm above the rails and the offset from the 5 inch gauge centre line at the Puffing Field is 19mm to the right.

If the back of your loco has a scale coupling hook then you will need a suitable coupling adaptor block which is retained by a pin and clip through the hook slot. You must ensure that such a block cannot lift and work its way off the hook under varying coupling loads. Never use chain to couple onto a coupling hook.

Remember that the track marshal of the day has the right to stop you running if he feels your coupling arrangements are not safe.

Lights & Whistle

S5 Every train should have a red rear light (typically a bicycle light) to ensure the train ahead is always as visible as possible to the following driver. The light should be on all the time the train is on the track. In natural daylight the visibility in the tunnel is virtually nil, particularly if you have steam billowing in your face, so the rear light is a critical safety measure.

S6 Every locomotive should have a whistle or hooter. On the curve approaching the loading bay and station, visibility ahead is poor. A driver should always approach slowly and blow the whistle as directed by the whistle notice by the side of the track.

Getting the loco on and off the track

Drivers arriving at the Puffing Park have two options for unloading their locomotive. You can if you wish reverse your vehicle down to the steaming bays and transfer your loco directly to a steaming bay using the loco lifting trolley. Alternatively you can reverse your vehicle up to the transfer track at the side of the car park area, unload your loco onto the transfer track, and then roll it down to the steaming bay area (it is recommended that you roll your loco, tender and driving truck down separately). Then you should transfer your loco to a steaming bay using the loco lifting trolley.

After raising steam you should obtain permission from the track marshal to move your loco to the track. Then move your loco from the steaming bay to the track using the loco lifting trolley. This can be a little awkward so do ask for assistance from the track marshal or other members if you need it.

Fire Risks

A running loco will be dropping glowing cinders through the fire grate into the ashpan. Most ashpans are designed with a slope so that the vibration of the loco will shake the cinders onto or in fact through the track rails and sleepers onto the ground. Glowing cinders will also be ejected from the funnel, many of which will also settle on the ground, still glowing. The track is surrounded by leaves and wood, which in the summer is tinder dry, leading to a very real fire risk. When running locos at Puffing Park buckets of water should be placed at intervals around the track. In the summer months it is also advisable to use a spark arrestor to curtail the emission of sparks from the chimney.

S7 In the summer months and at any other time when the ground conditions are tinder dry ensure the fire buckets are in place and full of water before commencing running.

Passengers

As driver you are responsible for the safety of any passengers you carry. As a user of the Puffing Park you also have a responsibility to passengers in general, whether they are on a train or boarding or alighting. If your train has more than one passenger car then a guard must ride at the rear and share responsibility for passenger safety with the driver. All steam locomotives must use a spark arrestor or chimney blast deflector device when passenger hauling.

A carriage can wobble or tip if the load is too one sided so passengers need to be told to board carefully and once on board, stay upright and central to the carriage, and not lean to the side. They also need to be told to keep their feet on the foot boards and not to put their arms out as the clearance in some places, particularly the station area and the tunnel can be

tight. Finally they should not alight before the train has halted and the driver given the instruction.

S8 Ensure you take full responsibility for passengers by managing their boarding, alighting and riding behaviour.

Records

For insurance purposes the club needs to know who has used the track, when they did, which loco was used and its boiler certificate number. These details need to be recorded in the running book kept in the shed by the station. Use a new running sheet for each puffing session. Drivers must record their details on the front of the sheet whilst the track marshal of the day will fill in the health and safety checklist on the reverse.

Any visitors to the Puffing Field who take a train ride or otherwise participate in our activities should be asked to sign the visitors book, kept in the shed by the station. This is normally the responsibility of the track marshal.

In the event of an accident occurring the details must be recorded in the accident book kept in the shed by the station and the Honorary Secretary of the society informed. Details of what is required are with the accident book but are essentially a record of what happened, to whom, and what injuries were sustained. Also, the names and contact details of all witnesses should be recorded. This is normally the responsibility of the track marshal unless that person is incapacitated. A first aid box is kept in the shed by the station for treating minor injuries. Should any injury require outside medical assistance then those present should nominate one of their number to call an ambulance. Note that use of a mobile phone may require them to leave the Puffing Field in order to get an adequate signal.

Preparation for Steaming

This section applies to drivers that have arrived at a track and who are preparing for steaming. For the new driver once the fire has been lit and the pressure begins to rise, focus tends to be exclusively on the increasingly hot and hissing loco, so it is important to have taken care of all those other things that need to be sorted out before lighting up. With more experience, a driver may undertake several of these tasks while the fire and steam pressure are building.

1. Enter your loco details in the Puffing Field record book. The Society requires this to be done for insurance purposes. You will need your valid boiler certificate number to hand.
2. Plan how you will get your loco from the steaming bay to the track. The Society has a hydraulic loco lifting trolley that is designed to allow a loco to be rolled off the steaming bay track, transported to the running track and rolled off onto it. Ensure you know how to use this trolley before steaming up. Watch out for safety valves popping/blowing off in your face or simply

making you jump! 😊.

3. If you plan on using any of the club's rolling stock ensure you have a secure method of coupling to hand. The club requires the use of metal bars and clevis or secured pin methods. More guidance can be found here: <https://stalbandsmes.com/wp-content/uploads/2019/02/St-Albans-DMES-Standard-Couplings.pdf>
4. Fill the boiler such that the water gauge is in the 50% - 70% range. Avoid over filling the boiler with water prior to raising steam as the water will expand on heating and lead to priming.
5. Top up the tender, side tanks or bunker tanks with water and connect to the pumps and injectors if required.
6. Top up the mechanical or displacement lubricator with steam oil. You can buy steam oil from the club, for more info go here: <https://stalbandsmes.com/for-sale/>
7. Oil the motion, eccentrics, axle boxes, coupling rods, etc. These items take a lot of force during running and will wear out fast if they aren't lubricated generously, so give them a good coating of oil before steaming up; one less thing to think about when raising steam. Opinions vary on what is the best oil to use for lubricating the motion. Ordinary mineral machine oil is fine but other options include car engine oil or chainsaw oil which claims to have "anti-fling" characteristics.
8. Fixtures and fittings secure? Its good practice to check everything is secure and tight that should be. You will soon learn the parts of your loco that tend to need regular attention. Areas to focus on can include:
 - a. Piston and valve glands – these can work loose and steam will begin escaping
 - b. Water pump – the balls in the pump can get stuck. Usually a smart tap with a spanner or similar will free the balls.
 - c. Lubricator— if its ratchet driven then check the ratchet is succeeding in turning the pump action. If it's a displacement type make sure any water has been drained out before filling it.
 - d. Regulator gland – this can work loose and steam can escape here, burning fingers.
 - e. Coupling bolts and pins – Issues here are dependent on type of coupling but always ensure any couplings are screwed tight and safety clips and rings are applied. Check no corrosion threatens the integrity

of the coupling materials.

- f. Hand pump – if the ball is stuck in the hand pump it might be difficult to access to give a sharp tap to. One solution is to drain the tank containing the hand pump and add in hot water. The effect of the expansion on the pump metal should dislodge the ball.
 - g. Wheel bearings/mountings – If driving wheel bearings or mounts become loose this will give way to excessive movement in the position of the wheels and the motion will begin to bind. Quite apart from the possibility of a serious accident!
9. Check you have a means of dropping fire to hand, not back in your toolbox!
10. Do you know what method you will use to stop your locomotive quickly if you need to? Brakes on the loco? Brakes on the driving truck?

See appendix A for a Pre-Steamming Checklist.

See Appendix B for a list of items that might be needed on a steaming outing.

Raising Steam

With everything else sorted out, you can begin raising steam. Techniques vary and with experience you will find a method that works well for you and your loco. Some locos steam up in ten minutes, others take up to twenty minutes or more. There is no right amount of time needed for raising steam. This section outlines the basic approach.

How do I get the fire started?

Starting with an empty grate, add in the kindling. This can be anything that lights easily and is capable of getting the coal alight. There are two common choices of kindling:

1. Small pieces of wood soaked in paraffin or barbecue lighting fluid – Sometimes meths is used instead, though this is frowned upon by some due to its relatively invisible flame and its volatility.
2. Instant lighting or paraffin soaked charcoal – Quick and easy. Charcoal is preferred by some because of it burns at a higher temperature than wood, which is thought to light the coal more quickly. It also produces less smoke when raising steam.

Either light a small amount of the kindling in the shovel and then put the burning contents into the firebox or light the kindling directly in the firebox (match or gas lighter will do fine) then apply the fan to create a draw on the fire, close the firebox door and wait for the fire to get going. If using wood you can balance one piece on the fire-hole, light it and then tap it into the firebox. Try not to use too powerful a steam raising fan – you want a healthy draught, not a howling gale! Experience will help you learn what is required.

How do I create a draw on the fire?

You will need a fan to place on the loco funnel in order to create a draft on the fire. Battery powered electric fans designed for raising steam on locos can be purchased from a number of suppliers and will usually require an adapter made up so that the fan has an airtight fit on the funnel.



Once the kindling is thoroughly alight, add a shovel or two of coal, making sure to shut the firebox door again. From this point onwards, periodically add more coal, one or two shovels full at a time as the fire builds up. After a while the smoke and smell of the burning kindling coming out of the funnel will subside and at that point the coal should have begun to glow. You should be able to feel the temperature of the boiler rising and eventually the pressure gauge needle will move away from its rest stop. Keep the fan going and every now and then check the fire is still healthy and building.

When the pressure gets to about 30 psi you can take the fan off (watch out it will be very hot) and open the blower valve to create the draft instead. You should create a fairly

vigorous draft with the blower and after a short pause, the pressure should resume rising again and the fire should look bright and healthy. You will notice the blower making more and more noise as the pressure rises so you will need to adjust it to keep the fire from becoming unnecessarily bright. Eventually the pressure will reach the point when the safety valve blows. This can be quite a dramatic event, particularly if you have a pop valve!

IMPORTANT: In the process of steaming up your loco will use water. If you started raising steam with the water gauge reading around 50% and it all went smoothly then the boiler water level should be fine as the water will have expanded as it heated up. However, if you needed a lot of blower and the raising steam process took a long time then you may need to add water to boiler with the hand pump. **Start managing boiler water level as soon as you begin raising steam.**

When is the loco ready to go?

If your loco's maximum working pressure is 80 psi then you should be able to drive your loco quite easily on 60 psi or less. You don't need the safety valve blowing off before you start running. Its more important to ensure that the fire is bright and burning well and the water level in the boiler is healthy, which means in the 50% to 80% range in the water gauge. However, the safety valve does usually end up blowing at some point before you get your loco on the track!

Running the loco

Setting off

Your loco has good boiler pressure and healthy water level so you are almost ready to go. Before taking the brakes off and opening the regulator you must ensure the cylinders are clear of water which may have condensed in them from a previous run, or as a result of opening the regulator while raising steam. Water doesn't compress like steam and attempting to operate the loco with water in the cylinders won't work at best or at worst, could damage the loco. The method of clearing the water from the cylinders varies according to how the loco is built. There are two common methods:

1. If you have cylinder drain cocks on your loco then you should open them before opening the regulator. So when the regulator opens the condensate in the cylinders is expelled from the drain cocks. After a short while the drain cocks can be closed.
2. If your loco has slide valves then these are designed to lift in order to allow moisture to be expelled. The condensate will end up being blasted up the funnel along with steam. Watch out for a shower of hot oily water when you move off!

In both cases it is important to open the regulator gently and sense the loco beginning to move forward. You may need to push the loco the first yard or two when you first set off but once the cylinders have warmed up and cleared any condensate the loco should be self-starting. As you develop a draft from the exhaust you can reduce the bower if you haven't already done so.

Managing the Fire, Water & Pressure

Apart from checking the road ahead for hazards, the challenge of running the loco is to manage the fire, the water level and the steam pressure. Your objective is to maintain:

1. the water level around the mid-point of the water gauge,
2. a fire that is breathing well and fairly bright and
3. a healthy boiler pressure, ideally above 60% of the maximum operating pressure.

Water Level: As the loco is run, or the blower is used, the water level in the boiler will drop so you will need to replenish your boiler water level by using the axle or crosshead pump, the injector (if fitted) or the hand pump. As you pump cold water into the boiler the temperature of the water in the boiler will go down and the steam pressure will fall. That's why it is important to have a healthy fire that is capable of keeping the steam pressure up as water is pumped in.

Fire: A healthy fire will need a good supply of oxygen through the grate in order to be capable of maintaining the steam pressure. There are two main ways of forcing oxygen through the grate, one is the draft caused from the steam exhausted by the cylinders and the other is the blower. If you aren't generating a good draft from the cylinders because you are stationary or moving slowly or coasting downhill, then you should use the blower.

Steam Pressure: Vigorous running will place a heavy demand on steam and will cause the boiler pressure to drop, however there is a slight compensatory effect as the funnel blast will liven up the fire. Other times your pressure may drop as a result of a poor fire. Using the blower to suck hot air through the tubes to raise steam pressure will work but if the fire has been neglected it will be a short lived effect.

Important conclusions for managing fire, water and pressure are therefore:

1. Don't neglect the fire such that it requires a large amount of coal to be added. It will take time to get the fire healthy again and you won't be able to generate enough reliable steam pressure to run while you are rebuilding your fire. Learning what your particular loco needs is a matter of experience and practice, and partly depends on how big the grate is. Until you know what the loco needs it is best to **add coal little and often, which in practice can mean once or twice per lap of puffing park.**
2. Don't let the water level drop too near the bottom of the gauge. If you do you will need to take prompt action to add a significant amount of water which will reduce your steam pressure. You may even need to stop to add the water by hand pump. **Add water little and often. If you can, adjust your axle/cross head pump to a rate of feed that keeps the water level roughly constant.** Another method that may suit your loco is to use the axle/cross head pump on downhill stretches when the loco is working less hard and open the bypass valve on the uphill stretches when you need more steam.

Finally, as a summary:

| Symptom | Action | Note |
|---|---|---|
| Fire weak (thin layer of mostly burnt coals or perhaps high proportion of new coal) | Use blower to raise the fire | With a low fire and a roaring blower your steam pressure is likely to continue to drop until the fire gets going again. |
| Water Level Low | Add water using axle/crosshead pump, injector or hand pump. | Steam pressure will drop so use blower to help fire heat the added water and restore steam pressure |
| Steam pressure low | Use blower to help fire heat water in boiler | |

Its good practice to ensure air is being drawn down the fire tubes at all times, even when you are stationary and your fire is bright and pressure high. The reason is that without the draft, unburnt gases can dwell until they go pop. If the firebox door is open, the flame can leap out into the cab. On a full sized loco this blowback can be lethal but on a model loco it can only embarrass the driver.

Whenever you bring the loco to a halt you will need to open the blower valve a little to maintain a draft through the fire. With practice you may learn to use just enough blower to keep the loco simmering – i.e. keep the steam pressure hovering just below the point when the safety valve blows off, thus saving water until you want to set off again.

If you do find yourself stationary but with bright fire and high pressure and you expect to be stationary for a while, you can open the firebox door and by using gentle blower you will draw cool air across the top of the fire and down the tubes, keeping the boiler pressure and fire under control. Adding coal and or water will also help to calm things down and prepare the loco for when you can move off again, but don't over fill the boiler or firebox.

Stopping the Loco!

Other locomotives on the track ahead of you can stop for a variety of reasons, sometimes without any notice (derailment, lack of steam, obstacle on track, picking up/dropping off passengers, unloading from the track etc) so make sure you know how to stop your train quickly.



Your locomotive, its tender, your driving truck and you can easily weigh 400Kg (2/5 ton) which will take a lot of effort to bring to a halt. Unfortunately many locomotives do not have brakes other than a sort of parking brake which is impractical to use while in motion. It's common for a driving truck to have a simple lever operated brake, though their effectiveness will vary a lot. Make sure you know the limitations of your train and drive appropriately; i.e. drive such that you can stop within the length of track you can actually see ahead of you.

Looking out for Abnormalities

Take the time to learn what is normal about your loco then you can spot more quickly anything that might be going wrong. Not an exhaustive list but as examples:

- When you turn on the axle/crosshead pump do you notice the loco working harder? Or perhaps there is a noise it regularly makes? Check the water level in the boiler is rising and notice the drop off in steam pressure.
- Is steam escaping from the piston, valve or regulator glands? A whisp of steam is common but jets of steam are not good.
- Does the loco sound different? For example, if something starts making a knocking sound stop and look for something wrong with the motion while pushing the loco slowly forward.

- Is there still oil in the exhaust? If the steam oil has run out or the lubricator stops working the chimney will become dry and the loco may make a ‘barking’ noise when running.

Running for Extended Periods

After running for an extended period some things are likely to need special attention:

- Lubrication: The motion will need further oil to ensure every component is well lubricated. Top up the lubricator with steam oil from time to time.
- Smoke box: The smoke box will gradually fill up with ash and eventually the volume of ash could interfere with the lower boiler tubes or foul the blower or blast pipe causing a drop in performance. If you intend to continue running, the solution is to stop, open the smoke box door and quickly sweep out most of the ash and re-close.
- Grate blockages: The quality of coal available varies enormously. Anthracite is commonly used and some batches have a tendency to form clinker – a glassy layer of fused ash on top of the grate reducing the flow of air. Periodic deep raking of the fire may help to break this up and help it drop through the grate bars into the ash pan but don’t over-do it. Other batches of anthracite just make a fine ash and are no problem at all. If the grate gets blocked by bits of partially burnt coal stuck between the grate bars it will reduce the oxygen flow to the fire. If the fire is raked often it can lead to a compacted layer of small fragments of partially burnt coal on top of the grate which can also impede oxygen flow. This, or a thick layer of clinker, is difficult to fix without dropping the existing fire and re-building a new fire. The best solution is to ensure that all coal is burnt thoroughly by avoiding “stoking” too much. The



motion of the loco is usually sufficient to agitate the burnt particles down through the grate into the ash pan. It is also worth occasionally checking the ash pan is not full. The photo on the left shows the underside of the club loco Polly after running for five hours on the rolling road at Oaklands steam fair in 2019. There is a solid layer of clinker remaining in the firebox after the grate and ashpan have been removed!

Shutting Down & Cleaning Up

Blowing down

When shutting down a loco it is accepted good practice to blow the boiler down, at least partially, at the end of a session. The club does not have an official view on how to go about

it – it's a matter of personal preference - but there may be pitfalls in not dropping the fire. If you can drop the fire before blowing down then that is undoubtedly the best and safest option, and if from high pressure then that is probably beneficial as you are likely to get more crud out. However, there are locos around where you cannot drop the fire or it is difficult to do so, in which case you have no safe option but to let the fire cool down before blowing down.

Under no circumstances should any boiler be blown down while any orange still shows in the fire. Obviously the main issue here is not to overheat the firebox crown and sides but if the fire is no longer orange (i.e. completely black after raking) and you leave the firebox door open then for a fully silver soldered boiler it should be OK to use whatever pressure is left to blow the boiler down. The one proviso here is that some boilers have the side and/or crown stays caulked inside the firebox with soft solder and you don't want to melt that (it should be Comsol which melts at 297 deg C). Ditto boilers with a fusible plug in the firebox crown. So, if you just let the fire cool down you want to be confident there is not sufficient heat left in the fire to melt any Comsol before opening the blow down valve - and that is a bit of a guess. Providing the fire has gone black the lower the steam pressure has fallen the less the risk of melting any Comsol, but the less effective the blowing down will be. If you open the steam blower a little that will help draw cool air in through the firebox door but if there is any orange left in the fire and the door gets closed, or you turn the blower up too high, you could risk waking the fire up again and generating heat at a time when you really don't want it.

Once the boiler has been blown down and all pressure lost it is a good idea to slightly open the regulator and the blower valve so they do not stick shut as the boiler cools. Other steam valves, etc, can be left closed.

Wiping down the paintwork

After your run the loco is likely to be covered in fine ash, oil and water so you will want to wipe it down with a soft cloth to clean it up and make it presentable. It is far easier to do this whilst the loco is warm and the oil still relatively fluid. Do it at home when the loco is cold and you will find the ash is stuck in a much more sticky goo and may scratch the paintwork more when you wipe it down.

If you wish you can use a mild solvent to wipe down, such as white spirit or paraffin, especially if you want to get all the rust from the rails off the motion, cylinders, etc. Remember to wipe over everything with a light oil after using a solvent for cleaning.

Clearing the grate

Hopefully you were able to drop the fire at the end of your run to blow the boiler down. In that case all you need to do is check there are no bits of coal or clinker stuck between the grate bars. If loco is designed such that it is not possible to drop the fire then clearing the grate is a bit more problematic. Give the fire a good raking over to knock as much ash, clinker and coal as possible through the bars into the ash pan, then rake that out of the ash pan. Once it is cold, with a suitably shaped nozzle you might be able to suck the remains of the fire out with an old vacuum cleaner.

Sweeping the tubes & the smokebox

Open the smokebox door and clean out any ash and cinders lying around inside. An effective way of doing that at home is to use an old vacuum cleaner with a small crevice tool but be careful not to disturb the pipework inside the smokebox, especially the steam blower nozzles around the blast pipe nozzle. Do not use your general household vacuum cleaner or you will soon be in trouble for spreading oily soot everywhere indoors!

Now run a suitable diameter flue brush through all the boiler tubes to clear any ash and cinders from inside them. If the loco has a super-heater you probably can't sweep its flue but the vacuum cleaner can help suck any ash out of it by poking the crevice tool up inside the firebox onto the end of the flue.

Check nothing has worked loose

Now is a good time to examine the loco closely to check nothing has worked loose during your run. Check over the whole loco looking for anything that does not look right, especially all the motion joints. Are any nuts coming loose or taper pins coming out? As you get to know your loco you will learn of any parts that have a habit of coming loose.

Emptying the boiler

If the loco has a copper boiler and will not be used for some time it may be a good idea to empty the boiler of water to reduce the risk of corrosion and de-zincification of boiler fittings. If the loco is stored in an unheated shed, workshop or garage then it is advisable to drain the boiler to avoid it freezing up during the winter months.

Glossary

| | |
|-------------------|---|
| Regulator | The valve control in the cab that admits steam to the cylinders. |
| Blower | The system for creating an adjustable jet of steam up the funnel in order to create a draft on the fire. Controlled by a valve in the cab. |
| Priming | When water instead of steam is sent to the cylinders when the regulator is opened, which is bad practice and could cause damage to the loco. |
| Valve Chest | Adjacent to each cylinder, the valve chest is where the steam is admitted to and exhausted from the cylinders according to the position of the valve. |
| Drawbar | The rear beam of a locomotive to which the coupling is anchored. |
| Firebox | The space in the boiler that contains the fire. |
| Smokebox | The cylindrical space at the front of the boiler under the funnel. Within the firebox you will always find the blower outlet nozzle and the blast pipe nozzle. The fast jets of gas from these two nozzles create a vacuum in the smoke box that draws air through the tubes. If the firebox door is closed the air comes up through the grate, adding oxygen to the fire. If the firebox door is open, a large portion of the air will come through that route and across the top of the fire. |
| Blast pipe | The pipe that combines the exhaust from the cylinders and directs it up the funnel |
| Blast pipe nozzle | The tip of the blast pipe, which is designed to force the exhaust through a narrow hole, speeding up the ejection of the exhaust up the funnel |
| Drop the fire | The process of releasing the burning fire, the grate and ashpan out of the bottom of the loco in one swift action. Typically done in an emergency to avoid boiler damage when the water level drops too low. Can also be used as part of a particular routine for shutting down the loco at the end of running. |

Appendix A – Pre-Steamng Checklist

| Item | ✓ |
|---|---|
| Enter details into track log book | |
| Method of getting loco onto and off of track | |
| Couplings prepared | |
| Sufficient water in boiler | |
| Side tanks / tender topped up | |
| Lubricator topped up with steam oil | |
| Motion oiled | |
| Fixtures and fittings secure | |
| Method of dropping/extinguishing fire to hand | |
| Method of stopping train | |
| | |

Appendix B – Items to take on a steaming trip

| Item | |
|--|--|
| Firing irons | |
| Matches / gas lighter | |
| Coal (usually steam coal or anthracite) | |
| Rain/distilled water | |
| Steam oil | |
| Lubrication oil | |
| Heat proof gloves (but not too thick) | |
| Fire lighters (e.g. paraffin soaked wood etc) | |
| Spanners (safety valve, gland nuts, coupling etc) | |
| Screwdrivers | |
| Coupling bars and pins | |
| Steam raising fan & battery | |
| Boiler certificate (hydraulic and steam tests in date) | |
| Cleaning rags | |
| Boiler tube brush | |
| Driving truck | |
| Stirrups for driving truck | |
| Refreshments! | |
| Graphite yarn | |
| Rear red light | |
| Spare parts (e.g. fibre/copper washers, O-rings, etc) | |

Appendix C – Mounting Platform

The diagram below is provided for guidance in making sure any foot rests / stirrups of a driving truck clear the mounting platform in the station along with the sleepers and other aspects of the railway construction.

