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**OPERATING INSTRUCTIONS**

**“NG16 GARRATT”**

**SAFETY FIRST**

All our locomotives are safe to run, and will give many hours of pleasure, providing the following safety procedures are followed:

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1. Please read the instructions thoroughly before running for the first time.
2. Always do a complete refill of gas, oil and water. Never refill just the gas to prolong the run.
3. Never let the engine run out of water.
4. When refilling the gas, do not have any naked flame present, and **NO SMOKING!**
5. Do not pick up the engine by the bodywork, chimney or boiler, especially when hot.
6. Only pick up the engine by lifting from under the middle of the central cradle and, when hot, use old gloves or a cloth.
7. Do not stand over the chimney. Ejected boiling water or steam may cause serious injury.
8. Do not open the smoke box door while the engine is alight.

**General Hints**

As with all operating machinery, whether model or full size, wear will occur. In the model steam locomotive much can be done to help prolong its life and decrease the amount of time required in the workshop for servicing.

Keep the engine as clean as possible, and the motion free from dirt and garden debris. The valve gear, axles and crank pins should be oiled sparingly with light oil, e.g. “3-in -1 Oil”. Over-oiling attracts dirt and grit, which will increase wear.

Regularly check that all screws and motion bolts are firm. Do not over-tighten, as this strips threads and shears bolts. **When filling the lubricator, always use a high temperature steam oil; this is available from other retailers. FAILURE TO USE THE CORRECT GRADE OF OIL CAN LEAD TO BLOCKED STEAM PIPES, AND WILL INVALIDATE THE GUARANTEE.**

**NEVER USE BOILING WATER IN THE GAS TANK WATER BATH, only ‘hand hot’ water.**

When running your engine avoid excessive speed and acceleration, both will cause premature wear in the valve gear. Prototypically, narrow gauge locomotives ran at a speed of between 15 and 20 M.P.H., and never exceeded 25 M.P.H.

## Positions of Fillers and Drains etc.

The cab roof lifts up and hinges over to the right hand side of the locomotive to give access to the interior of the cab.

*The gas inlet valve* is on its own filling turret on the gas tank, which is situated in the water bath in the rear bunker. To access the filler lift up the bunker cover plate. The gas control valve is also situated in the bunker.

*The lubricator* is in the left hand side to the front of the cab, just forward of the doorway. The filler cap has a "T" bar in it to aid removal. The lubricator drains directly down beneath the cab floor. The drain valve is the lever in the left hand cab door. The closed position is with the lever vertical. To drain, turn the lever to horizontal position. To blow down the lubricator you must also have steam in the boiler and open the steam regulator, ensuring that first you have placed the locomotive in mid gear.

*The boiler water filler* is on top of the steam turret on the boiler in the middle of the cab. Undo the knurled cap to fill with water. The main steam regulator valve is the wheel valve on the rear of the boiler-filling turret.

*The direction control* is the hexagon nut in the centre of the cab floor. To put the model into forward gear put the hand wheel tool provided with the loco, over the hexagon and turn the wheel to the left (anti-clockwise). To put the model into reverse gear you must turn the wheel to the right (clockwise). Turn the wheel until the rods travel fully to the top and bottom of the expansion links (vertical slotted rods).

## Preparation for Running

Your Garratt is fitted with a water gauge; this allows the driver to keep the model in steam continuously for longer periods of time than the usual single fill system. This is done using a Boiler Top-up System provided with your model. The initial fill up with gas, oil and water is the same as for a basic run, but then to carry on and run for longer periods requires supervision of the boiler water level, topping up of the lubricator and refilling of the gas. These procedures will be explained in another section after the Running section instructions.

Always service the engine in the following order; first gas, oil then water.

*To fill the gas tank:* invert the gas can and apply the nipple to the gas inlet valve on the top of the tank turret. You will know when the tank is full; gas will blow back from the inlet valve in a strong jet. A small amount of gas and air will escape during filling, but the difference between this and when the tank is full is always clear. Always keep the gas can vertical when filling the gas tank.

*Filling the lubricator:* as you will read in the instructions for the end of the run, the lubricator should be empty of oil and water with the valve left in the open position. Now close the valve and remove the lubricator filler cap. Fill up the lubricator with steam oil to about  $\frac{1}{4}$  of an inch below the top. Leave the filler cap off for the present, so that any trapped air can escape. It can be refitted after you have filled up the boiler.

*To fill the boiler:* remove the filler cap. Fill up the boiler to about  $\frac{2}{3}$  to  $\frac{3}{4}$  the way up the water gauge – ideally use filtered rainwater or distilled water using the large syringe provided. Replace the boiler filler cap, check that the lubricator does not need topping up, and then replace its filler cap also. Filler caps should be firm finger tight. They are sealed with a trapped 'O' ring and, therefore should not be over-tightened.

## Lighting Up

As the gas tank is remote from the heat of the boiler, the gas will not vaporise easily in cold conditions, i.e. below 20 degrees centigrade (68 degrees Fahrenheit). To help this problem the gas tank is placed in a water bath. When you have filled the tank with gas add **HAND HOT ONLY** water to the water bath to about  $\frac{1}{2}$  an inch up the gas tank. **NEVER USE BOILING WATER. Do not do this before filling the tank as you may have difficulty in filling the tank.**

Open the smoke box door; just pull it open by the door handle. Light your lighter/match etc. and gently open the gas control valve until a gentle hiss is heard in the burner. Apply your light into the smokebox and the flame should ‘pop’ down the fire tube and ignite the burner inside the fire tube. Alternatively you can leave the smoke box door shut and light the engine via the chimney.

If the gas valve is opened too much the flame will not pop back; it will either fail to ignite, will roar in flame out of the smokebox, or there will be a ball of flame around the front of the engine, which will then blow the whole fire out (after giving the driver a fright)!

When the fire sound has stabilised, after about 30 seconds the gas can be turned up until a healthy roar is heard. The smoke box door may be shut after about two minutes. Now leave the locomotive to raise steam.

### **Running**

When the engine has raised about 60 to 70 psi, you are ready to start running. The Garratt is fitted with cylinder drain valves to aid the removal of condensed water from the cylinders, until the engine has warmed through. Looking under the cylinders you will see a long rod with a lever at one end. These are the drain valve control rods, the closed position is with the lever in the vertical position and open is with it in the horizontal position. Before commencing your first run of the day, it is advisable to open all the cylinder drain valves, and also put a cloth loosely over the chimney for a few minutes, as condensed water may be ejected from the chimney. This will help to keep your model cleaner. This is quite normal; the motion of the engine will be jerky until all condensate has been ejected. **DO NOT stand over the chimney as ejected boiling water/steam could cause serious scalding.**

Turn the direction wheel in the desired direction and ensure the engine is in full gear, and then open the main steam valve. The engine should start to move. When starting from cold it can be jerky, this is normal, as it has to clear the condensate from the system. The more the main steam valve is opened, the faster the engine will go; our advice is to start slowly and learn the road with your engine

After a minute or so, remove the cloth and continue running. In running it is correct practice to balance the boiler pressure against the load being pulled and the track conditions. With a light load and level track the pressure may need to be only 50-60 p.s.i. therefore, turn the gas control down to keep this pressure. When running a heavy train with steep gradients, increase the pressure by turning up the gas.

The ideal running pressure can be learnt by experience and is one of the pleasures of running a live steam engine. There is no need to have the safety valve constantly blowing off (it is what its name implies – a safety vent for excess steam pressure). In all our designs, the gas has been programmed to run out just before the water, thus it is important not to refill with gas alone in order to lengthen the run by a few minutes. When the gas runs out a complete gas, oil and water service must be done (remember GOW, also remember to shut the gas regulator before refilling, and **DO NOT** refill with gas near any other live steam loco). When the locomotive slows as the pressure falls at the end of a run, stop the engine. Gently open the lubricator valve and blow out any condensed water. If you intend to continue running, close the drain when you see oil coming out of it and carry out a general refill. If it is the last run of the day, leave the lubricator drain valve open and blow the lubricator completely clean.

### **Continuous Running**

To run for longer periods of time than the normal “one fill” system you will require the Boiler Filling System supplied with your loco.

This new boiler filling system has been specially developed for the Accucraft NG16 Garratt. It features an all metal vertical hand pump; the ram is fitted with an ‘O’ ring to improve seal and allow higher pressures to be handled. The filler valve is of the ‘Goodall’ type but features the special ‘Finescale’ bayonet attachment. This ‘push and twist’ fitting means you no longer have to hold the hose in the filler valve while pumping.

The pump body base is tapped M3 so it can be secured wherever you want. We have supplied a small aluminium water pot which has been centre punched on the correct centres for the pump fixing holes. Should you wish to use this container, drill out the centre pops on the underneath of the pot to 3mm dia and using the washers provided as seals on the inside of the tank. Bolt the pump down using the bolts provided. You will have to shorten the bolts by about 10mm. We have provided long bolts in case you want to screw the pump down to a thicker base material and use a different water source.

To use the pump first fill the water container. It may then be necessary to prime the pump by sucking through some water. Fit the new filler valve in place of your existing boiler filler cap. To connect the pipe to the loco for water transfer, locate the fitting on the hose over the boiler filling valve, ensuring the slots on the hose fitting line up with the guide pips on the filler valve, push down and twist clockwise to seal. Then just pump. To disconnect after pumping just twist anti-clockwise and lift off.

For the first fill, service in the normal way. Then run for about 15 minutes, now have a look at the water level. You will probably need to pump some water into the boiler. Connect the tube fitting onto the loco and pump water into the boiler until the gauge glass is showing about  $\frac{3}{4}$  full. Keep an eye on the water gauge and try to run between  $\frac{1}{2}$  and  $\frac{3}{4}$  of a glass.

After another 15 minutes running you will need to refill the lubricator and top up the gas tank. Also check the water level and top up if necessary. Stop the loco in a convenient location, away from other locomotives and turn off the gas. Ensure the fire is completely out and then top up the gas tank.

Blow around the engine so there is no residual gas about, then re-light the fire. To refill the lubricator, first put the loco in neutral (mid gear). Open the drain valve then gently open the steam regulator. When the lubricator has been blown clean, close the regulator and remove the lubricator cap. Now close the drain valve and refill with superheat steam oil to the correct level. Re-fit the lubricator cap. All this time the engine has had the fire alight and will have a good head of steam, so now carry on running.

Keep an eye on the water level at all times and try to refill the gas tank and lubricator every 20 minutes to half an hour.

### **End of Run**

As previously mentioned, the locomotive will slow (due to pressure dropping), when the fire has gone out, stop at a convenient place and open the lubricator drain valve. Blow out all condensed water and the remaining oil. Leave the drain valve open and allow all the remaining steam to blow out. The locomotive should be allowed to cool. When cool, clean the engine, check the motion and oil if necessary. The locomotive should always be put away in a clean condition as it attracts less dust and is always ready for the next run (or to be shown to an admiring friend). Always leave the lubricator drain valve and the boiler blow down valve open, so that the boiler will not be strained if subject to any temperature change. It is advisable to store the locomotive where any residual drips of oil or water do not matter.

### **Blocked Gas Jets**

The gas jets of your Garratt are fitted with jet filters so in normal operation blocked jets should not be a problem. However if the gas jet becomes completely blocked with particles of dirt within the gas, the jet will have to be removed and cleaned. Pulling gently backwards remove the pipe and jet holder assembly from the burner. You may find it easier to also remove the cab roof and rear cab back.

Holding the jet holder gently in a pair of pliers, unscrew the jet. To clear, place the jet nozzle against the inverted gas can nozzle and clear the jet with a blast of gas. Under no circumstances use a pricker wire, this will damage the jet hole. Replace the jet in the holder, ideally using a thread sealant sparingly on the threads. Ensure it is tightened up firmly. Now test **CAREFULLY** for gas leaks, first with a 50/50 mixture of washing up liquid and water, and then if no bubbles are showing, with a flame and the gas "just on". Tighten if required. Now replace the jet assemblies back into the burners.

### **Gauge Changing**

All Garratt locomotives are supplied set to 45mm gauge, but a “gauge change” kit is supplied with each engine. This will allow you to run on either 32mm or 45mm gauge track. All wheels are insulated as standard. To change the gauge, lay the engine gently on its side, on a thick cloth, loosen all the grub screws in the boss on the back of the wheels using the Allen key provided. The axles are dimpled for each gauge, so you do not have to measure for the right gauge. Slide the wheels to the gauge required and tighten up the grub screws. **These should be checked as a routine at the start of each running session.**

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As with all comprehensive models, we strongly recommend a full demonstration (by our agents) before purchase, enabling you to get the best out of your model right from the start.

*HAPPY STEAMING!*