Chiltern Model Steam Engines

Marine Single Cylinder Model Steam Engine v2 Assembly Instructions v1.5

Notes:

1. Model steam engines and boilers are NOT children's toys and should not be assembled or operated by children unless under close supervision of an adult.
2. If there are any questions or problems arising during assembly or operation of the engine please contact Chiltern Model Steam.
3. In overview the engine should first be assembled "dry" with no oil/lubricants, thread lock or gasket sealant applied, then disassembled, polished, painted as required, and finally re-assembled lubricating and applying thread lock and gasket sealant as applicable.
4. The engine will work properly "dry" but if it is to be run under load, it is recommended that thread lock, such as Loctite 222 Screwlock (or equivalent low strength locking compound) be used to stop the fasteners from coming loose. Also a very thin layer of gasket sealant, such as Loctite Instant Gasket (or equivalent), on the cylinder's mating surfaces with the end plates and Chest. Both thread lock and gasket sealant can be purchased for a small sum from automotive shops or on the internet.
5. Although all sharp edges and burrs should have been removed during manufacturing, check all parts and if any sharp edges or burrs exist carefully remove them with a metal file.
6. It is recommended that the steel parts are painted to prevent corrosion. Hammerite's range of metal paint sprays work well for this application although do take a long time to harden before final assembly can be done. Use masking tape to cover mating surfaces and inside the Slider Tube.
7. For polishing the brass components, wet and dry paper can be used - start with coarse e.g. 280 grade to get the worst marks out of the brass work and end with very fine paper, e.g. 1500 grade and finally Brasso and a rag.
8. Be careful not to over tighten or cross thread the capscrews. If excessive force is being used there is probably something out of alignment.
9. All parts are checked before shipping, so if a part does not seem to work perfectly try it in another orientation or position.
10. Always check www.chilternmodesteam.co.uk for the latest assembly drawing, instructions and tips. Any questions or comments good or bad, please don't hesitate to contact us via email: sales@chilternmodelsteam.co.uk.
11. We would be grateful if you would take some pictures of your completed model and email them to us for inclusion on our WEB site.
12. Typical tools required for assembly; 1.5mm Allen/Hex Key for the M3 grub screws, 3mm Allen/Hex Key for the M5 button socket screws, 4mm Allen/Hex Key for the M5 cap socket screws, small and/or medium crosshead screw driver(s), metal file and small pliers or M3/M2 spanner.
13. NOTE: some of the screws as provided in the kit may need to the cut or filed to length, please contact us if this presents a problem and we will work on a solution.
14. Use a light oil for external lubrication of the engine and if running the engine for an extended period install a displacement lubricator in the inlet steam line from the boiler filled with steam cylinder oil (compounded, 220 grade).

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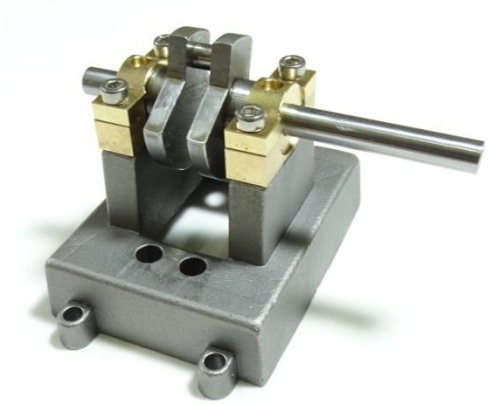
Step by step instructions:

1. Locate the parts as show in the following picture and as listed on the A3 Assembly Drawing (a copy of which will have been included with the kit but also available for download from www.chilternmodesteam.co.uk). NOTE: for shipping purposes many parts will be packed semi-assembled or in place, e.g. grub screws, bearings and eccentric rod.

2. Remove the M3 capscrews and the Main Bearing Uppers off the Base Plate. Ensure these are later replaced in the same place and orientation as they are machined in pairs.

3. Place the Crank shaft onto the Main Bearing Lowers and replace the Uppers, as shown in the following picture. Evenly and gradually tighten the 4 capscrews whilst rotating the shaft. This will ensure the bearings centre themselves properly on the shaft. Lubricate via the hole in the Upper bearings.



4. Remove the M2 screws holding the connecting rod bearing halves to the connecting rod and place them around the crank shaft as shown in the following picture. Insert and tighten the screws evenly and gradually, rotating the connecting rod around the shaft to ensure the bearing halves locate centrally.

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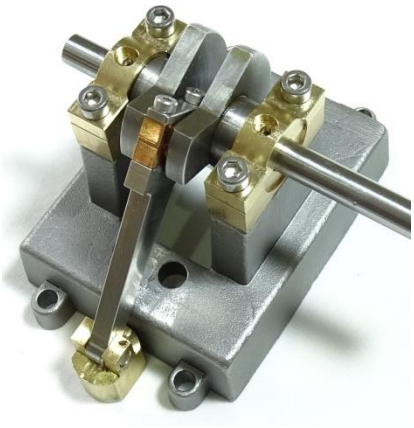
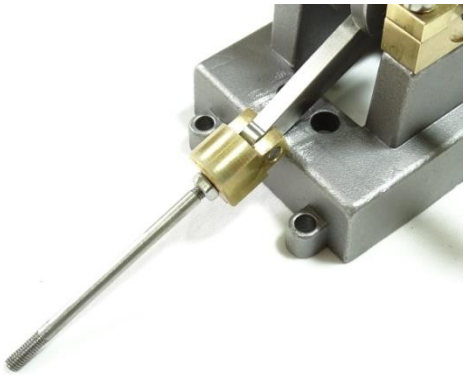


5. If not already installed, screw the M3 nut onto the Piston Shaft on the longer threaded end. The end of the shaft with the shorter thread is for the Piston.

6. Screw the end of each shaft with the M3 nut all the way into the Tube Slider and gently tighten the nut to the Slider.



7. NOTE: Usually it is not necessary but the Piston Shaft can be screwed out of the Slider to more accurately centralise the “throw” of the piston in the Cylinder.

8. Fix each of the 4 Columns loosely onto the Base using the M5 cap socket screws (not the M5 button socket screws) using a 4mm Allen/Hex key.

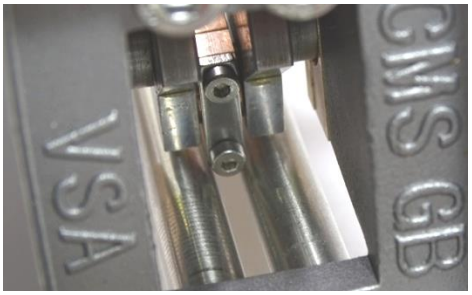
9. Fix the Slider Tube to the Top Plate using the 10mm M3 capcrews. NOTE: Capscrews as supplied may need to be shortened.

10. Check that none of the capscrews protrudes above the surface of the Top Plate. If any do remove the capscrew, file down and replace.

11. Place the Top Plate onto the Columns, insert the Slider into its Tube and fix in place with the 4 M5 hex button screws using a 3MM Allen/Hex Key.

12. Gradually tighten all 8 M5 stop and button capscrews whilst rotating the Crankshaft.

13. Whilst rotating the Crankshaft, check the Slider moves freely in its Tube. Also check that the Bearing Keep Plate on the Connecting Rod does not interfere with the Columns. If it does loosen the cap socket screws in the Base and push the columns out and apart and then retighten. The corners of the Keep Plates can also be filed off if needed.



14. Screw the Packing Nut into the Cylinder Plate Inner.

15. If it is planned to use high pressure steam - during final assembly, to improve the seal around the Piston Shaft, a small amount of PTFE tape can be wrapped around the Shaft and pushed into place with the Packing Nut. When tightening the Packing Nut into the plate ensure the Shaft can still move freely.

16. Place the Cylinder Plate Inner/Packing Nut onto the Piston Shaft.

17. If not already in place, insert the 2 nylon piston rings into the slots in the piston and screw the Piston onto the Piston Shaft. Lock the shaft to the piston using an M3 nut tightened with a small pair of pliers or spanner – be careful not to damage the piston or shaft when tightening the nut.

18. Place the Cylinder over the Piston and the End Plate on top of the Cylinder. Then loosely screw them in place using the 40mm M3 capscrews.

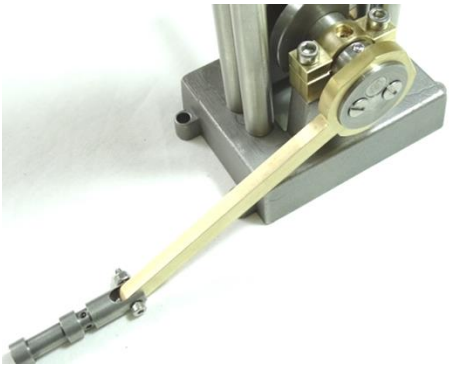
19. Before tightening the 40mm capscrews rotate the Crank Shaft to ensure the Piston can move freely in the Cylinder. There is some tolerance in the Cylinder and Cylinder Plate holes to allow them to be moved into a suitable position to allow free movement of the piston. Then gradually tighten the 40mm capscrews.

20. If after tightening the Cylinder the engine does not turn over freely try rotating the Cylinder Plate Inner by 90°. Similarly try refitting the Slider Connecting Rod and its bearings the other way around.

21. Put the Eccentric Wheel and Eccentric Wheel Plate together around the Eccentric Rod using the counter sunk M3 screws, as shown in the following pictures. Use the Crankshaft to ensure the parts are aligned and can rotate freely before fully tightening the screws. Then, if not already in place, screw a 3mm grub/setscrew into the Eccentric Wheel which will be used to lock the wheels onto the Crankshaft.

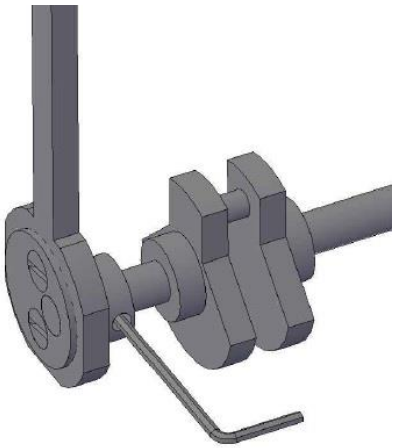
22. Connect the Valve with the Eccentric Rod using a M2 10mm capscrew and nyloc nut as shown in the following picture. The nut should be very slightly loose to ensure free movement of the Valve on the Eccentric Rod.

23. Push the Eccentric Wheel on to the short end of the Crank Shaft

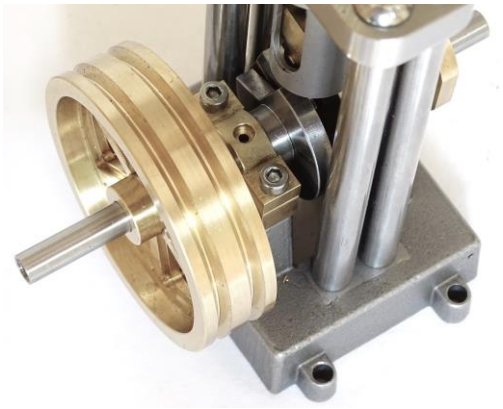


24. Insert the Valve into the Chest. The Chest can then be fixed to the Cylinder using 4 M3 18mm capscrews. Screw the Chest Plug and Inlet/Outlet Pipe, used for testing on compressed air, into the Chest. The Chest Plug can be on either side of the Chest depending on which side the steam pipe from the boiler needs to be connected. Likewise the top outlet/exhaust ports.
NOTE: The threaded holes in the Chest are ¼" x 40 tpi ME which will accommodate the most common connection to a model steam boiler.

25. Rotate the Eccentric Wheel and Shaft until they are 90° to each other, as shown in the following picture. NOTE: When the Eccentric Wheel is fixed 180° to the position shown the engine will run in the opposite direction.



26. If not already installed, screw the 4mm grub/setscrew into the hole in the Flywheel and push the Flywheel onto the Crankshaft. Tighten the grub/setscrew.



27. Lubricate the engine to ensure it operates freely.

28. To test the engine, a compressed air source such as a bicycle stirrup pump can be used to turn the engine over.

29. Disassembly is a reverse of the above instructions. Once disassembled each component can be cleaned, painted or polished. See www.chilternmodelsteam.co.uk for examples of completed models.

30. Please send some pictures of the completed engine to email: sales@chilternmodelsteam.co.uk.