Chiltern Model Steam Engines

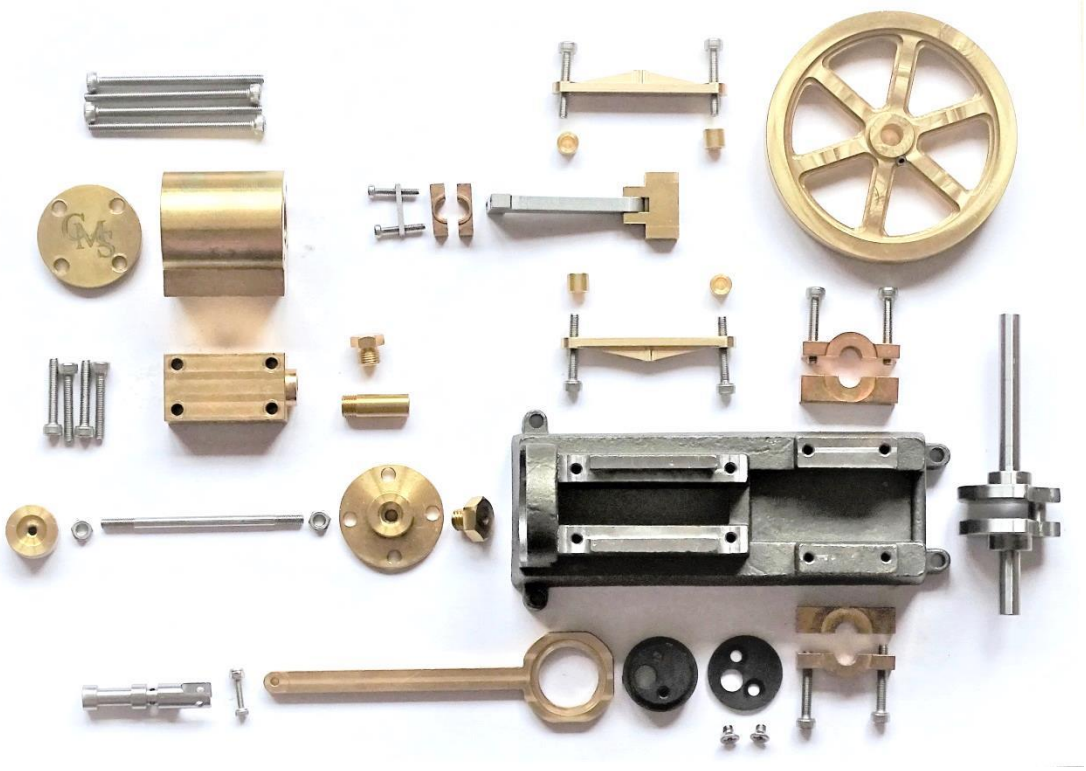
Mill Single Cylinder Model Steam Engine Assembly Instructions v1.5

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 that a gasket sealant, such as Loctite Instant Gasket (or equivalent), is used 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 base casting is painted. Hammerite's range of metal paint sprays work well for this application although does take a long time to dry between coats. Use masking tape to cover the machined surfaces in which the Crosshead Slider runs and on which the Cap Spacers sit.
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. Tools required for assembly depend on which screws have been supplied with the kit but can include; M2 (4mm) and M3 (5.5mm) open ended spanners, 1.5mm Allen/Hex Key, medium slot/cross screw driver, metal file, small pliers and metal hack saw.
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).

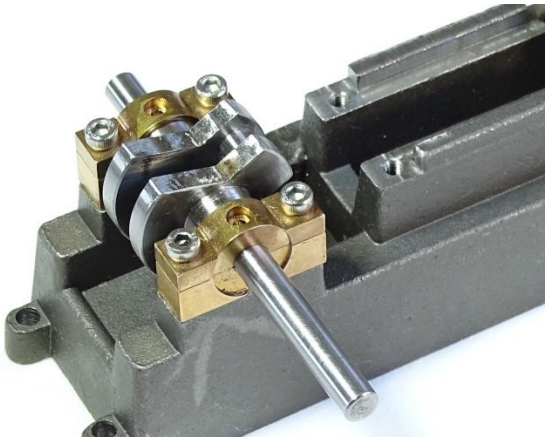
Step by step instructions:

1. Locate the parts as show in the following picture and as listed on the 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.

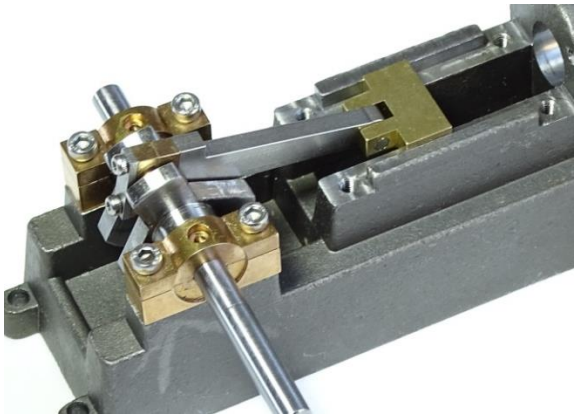


2. Remove the capscrews and both Main Bearing Uppers off the Base. Ensure these are later replaced in the same place and orientation as they are machined in pairs.

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 screws holding the connecting rod bearing halves to the connecting rod and place them around the crank shaft as shown in the following picture. Keeping the Bearing Keep in place, insert and tighten the screws evenly and gradually, rotating the connecting rod around the shaft to ensure the bearing halves locate centrally.



5.

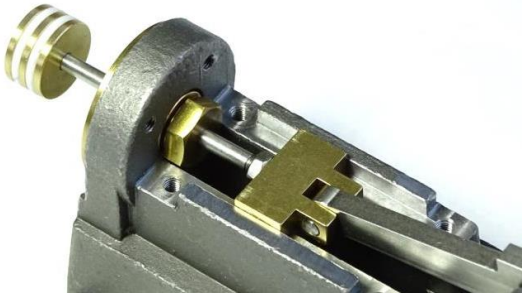
6. Check the slider runs smoothly in its machined slot by rotating the crank. The slot may need some lubrication to clean it out and ensure smooth operation.

7. Screw the Piston Shaft into the Piston – shortest threaded end of the shaft, as shown in the following picture. Lock the shaft to the piston using an M3 nut tightened with a spanner or small pair of pliers. If not already in place, insert the 2 nylon piston rings into the slots in the piston.

8. Insert the Piston Shaft into the Cylinder Plate Inner and push the Packing Nut onto the shaft and screw into the Cylinder Plate Inner. Screw an M3 nut onto the end of the Piston Shaft (longer threaded end).

9. If it is planned to use high pressure steam - during final assembly, to improve the seal around the piston shaft, PTFE tape can be wrapped around the shaft and Packing Nut thread. When tightening the Packing Nut into the plate ensure the shaft can still move freely, that is, do not screw tight.

10. Insert the above subassembly into the Base and rotate the Piston Shaft screwing it into the Crosshead Slider, until reasonably tight as shown on the following picture.

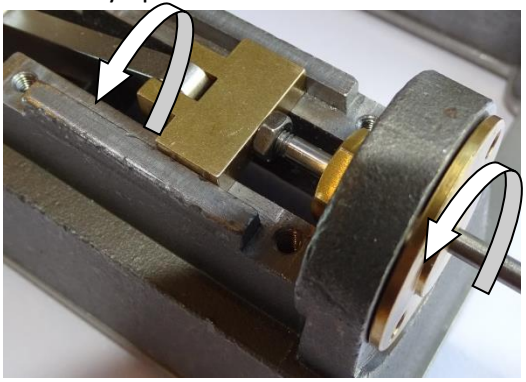


11. The Piston Shaft is locked to the Crosshead Slider using an M3 nut and a small pair of pliers or spanner. Usually it is not necessary but the Piston Shaft can be screwed into or out of the Crosshead Slider before locking in position to more accurately centralise the “throw” of the piston in the Cylinder.

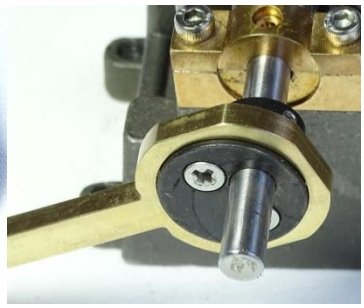
12. Place the Cylinder onto the Cylinder Plate Inner and Piston and place the Cylinder Plate End on top of that. Align the holes in the 2 Cylinder Plates and Cylinder with the threaded holes in the Base and screw in the M3 45mm capscrews as shown in the following picture.

13. Before tightening the 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.

14. 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 and Connecting Rod and its bearings the other way up.



15. Put the Eccentric Wheel and Eccentric Wheel Plate together with the Eccentric Rod loosely using the counter sunk M3 screws. Push the sub-assembly onto the crank shaft to ensure the wheel and plate are aligned before tightening the screws, as shown in the following picture. Then if not already in place, screw a 3mm grub/setscrew into the Eccentric Wheel which will be used to lock the wheel onto the Crank Shaft.

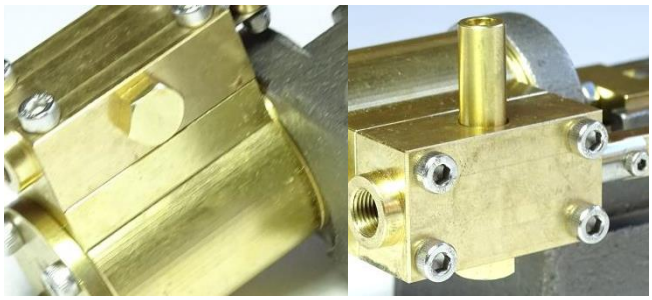



16. Connect the Valve with the Eccentric Rod using an M2 10mm capscrew and lock with a nyloc nut as shown in the following picture.

17. Push the Eccentric Wheel on to the short end of Crank Shaft and then insert the Valve into the Chest. The Chest can then be fixed to the Cylinder using 4 M3 18mm setscrews as shown in the following picture.

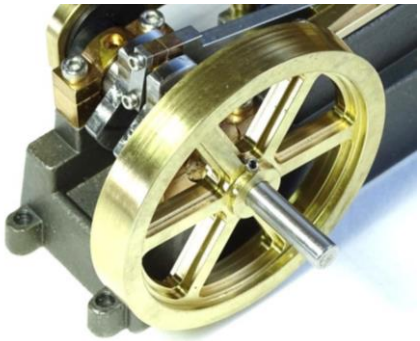
18. Set the angle of the Eccentric Wheel to the Crank as shown in the following picture and on the Assembly drawing. Tighten the grub/setscrew.

19. Screw the Inlet (stub) Pipe and the Chest Plug into the Chest. The pipe and plug can be reversed depending on if the chest is fed with steam/air from the top or bottom of the engine. The threaded holes in the chest are ¼" x 40 tpi ME which will accommodate the most common connection to a model steam boiler such as the Chiltern Model Steam boiler.

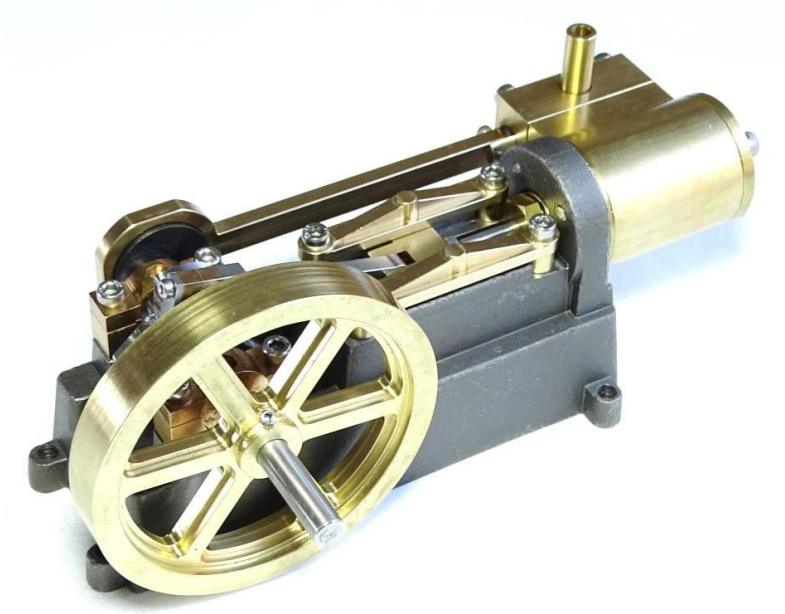


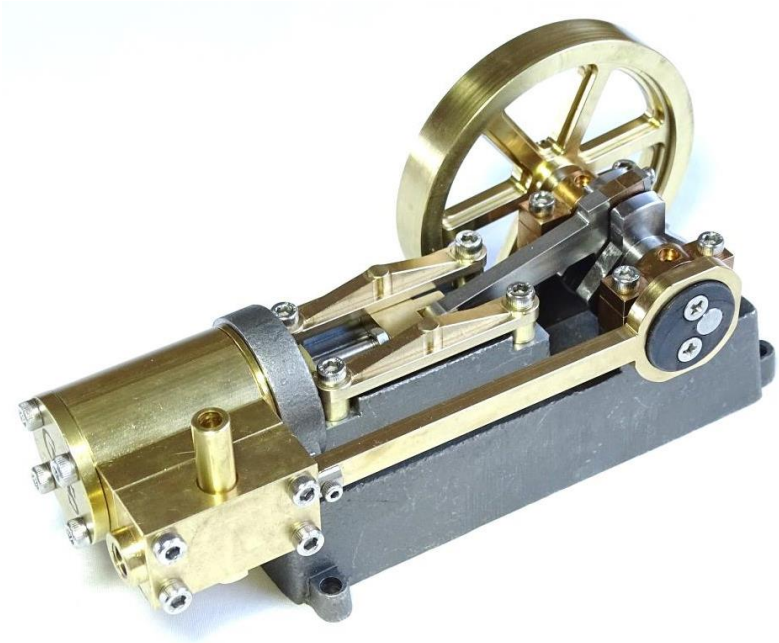
20. Fit the 2 Slider Caps together with the Slider Cap Spacers onto the Vertical Base Top using M3 capscrews.

21. If not already fitted, screw the grub/setscrew into the hole in the Flywheel and push the Flywheel onto the Crankshaft. Tighten the setscrew.



22. Lubricate the engine to ensure it operates freely.





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

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

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