

# Miniature Steam Pty Ltd.

Bringing the Highest Quality Standards to Model Engineering

## *“Miniature Steam”* Custom Steam Plant Kit

for self-assembly in

**Caldercraft “Northlight” -Clyde Puffer**

**2” Horizontal Boiler**

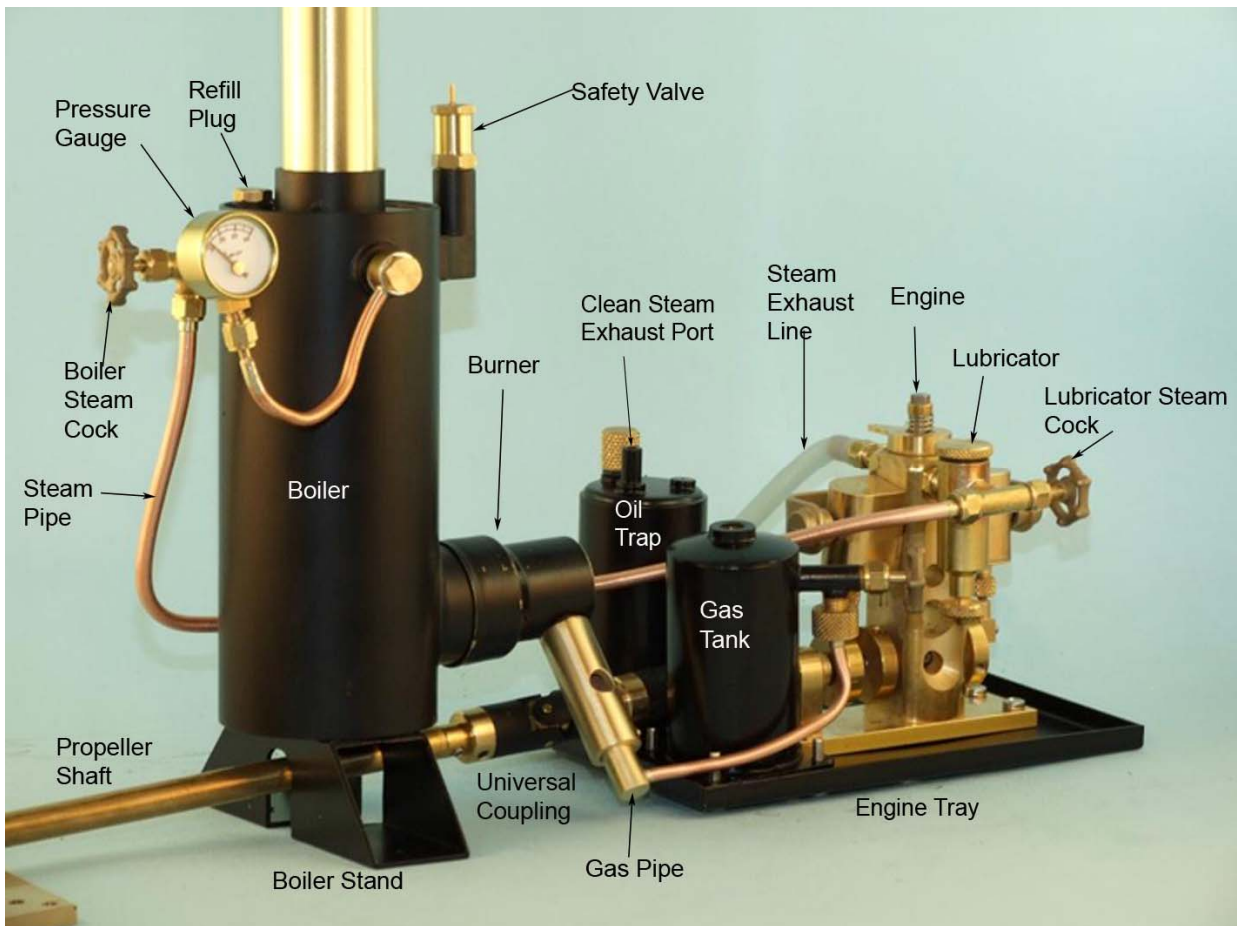
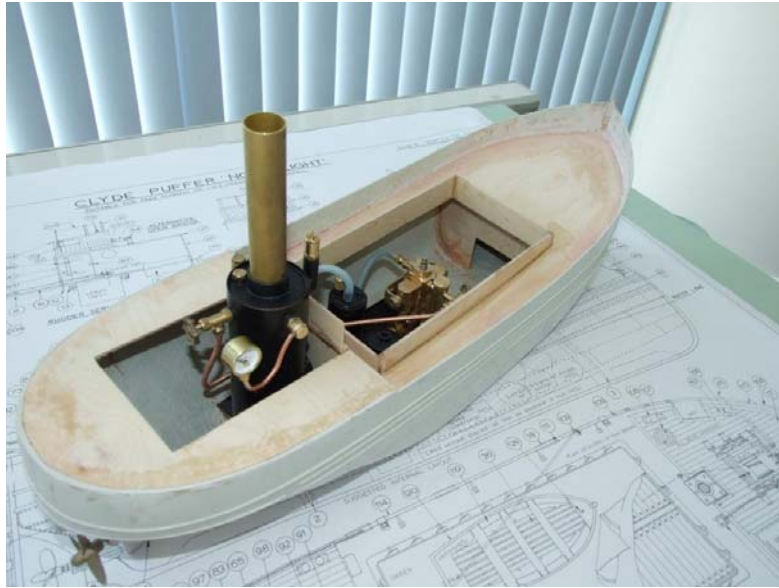
**with**

**“Avon” Twin Cylinder Oscillating Steam Engine**

**Kit Assembly Instructions**



## Caldercraft "North Light" With "*Miniature Steam*" Custom Steam Plant



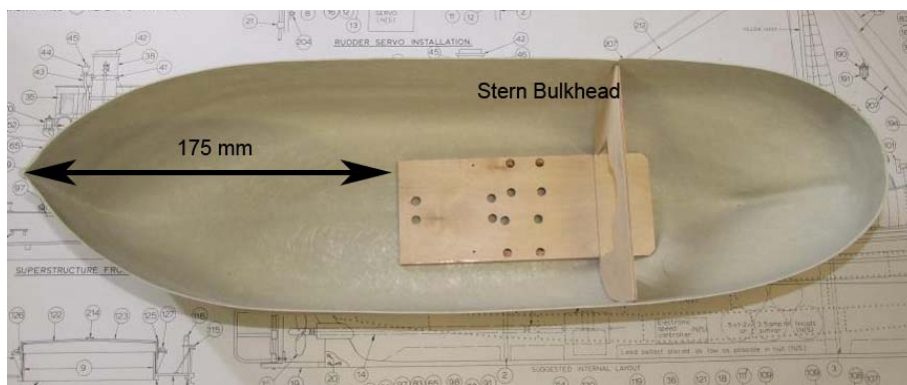
The position of the boat superstructure and boiler exhaust flue at the stern of the hull required the engine to be fitted forward of the boiler, while still delivering power to the propeller at the stern. As illustrated in the picture, this is accomplished by mounting the boiler on a stand that allows the propeller shaft to pass under the boiler. When the installation is complete the engine is accessed by removing the forward hatch cover and the boiler accessed by lifting the superstructure. Cleaned steam from the oil trap is discharged through a port on the side of the hull.

## **Assembly Instructions:**

The kit is delivered in six boxes as follows:

- Refillable gas tank P/N 4271
- 2" Vertical boiler P/N 4057
- 2" Ceramic burner P/N 4264 & control valve P/N 4025
- Oil trap P/N 4062
- "Avon" Oscillating engine self assembly kit P/N 5027K
- Accessories: 40 mm propeller P/N 1068M, custom propeller shaft P/N 5358, mounting block P/N 3003, mounting tray P/N 2846, boiler stand P/N 2847, steam pipe P/N 3022, gas pipe P/N 3023, exhaust port brass fitting, mounting screws.

### **Step 1. Fit the mounting tray mounting block**



For older models, using the template supplied, mark out the area of the stern bulkhead to be cut out to allow for insertion of the mounting tray mounting block; on more recent models this clearance hole has been cut during manufacture. As shown above, glue the block in position on the centreline of the hull as shown above with a 2 pack epoxy adhesive. Put the hull aside to allow the adhesive to set.

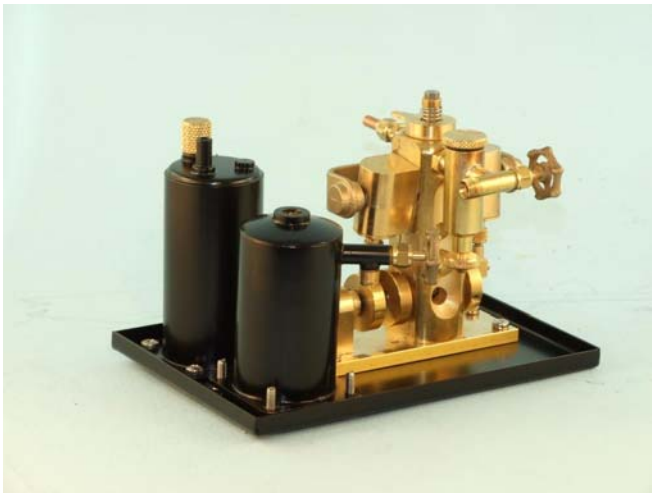
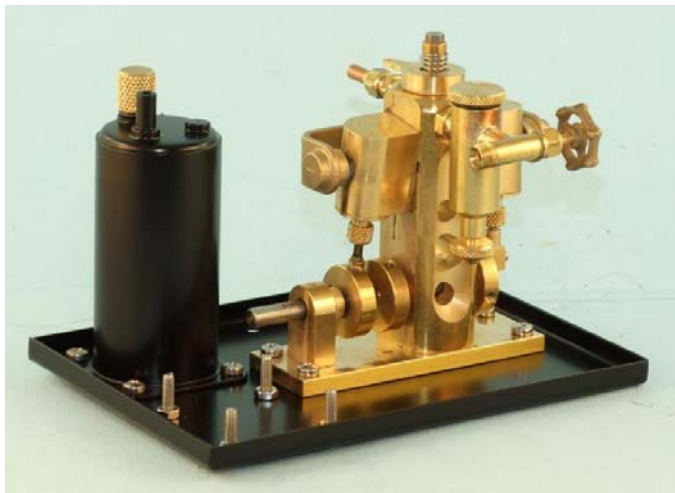
Lay out the screws and nuts. There should be at least 4 wood screws for securing the tray and the boiler stand to the mounting block, 4 x 6 mm screws for securing the oil trap to its tray, 2 x 8 mm screws to secure the boiler to its stand and 4 x 12 mm screws to establish a removable fixing for the gas tank. With the exception of the latter it is recommended that the screws be inserted from the top of the tray with the nuts on the underside of the tray. (You may find we have supplied surplus nuts or screws—just in case some get lost!)

The 12 mm screws for the gas tank should be inserted from the underside and the nuts tightened from the top before placing the tank on the screw ends (see picture following). This provides for easy removal and reinsertion the tank during refilling operations. Filling instructions are detailed in a facts sheet supplied with the tank.

***DO NOT EVER BE TEMPTED TO REFILL THE TANK WHILE IT IS IN POSITION***

***IN THE BOAT—YOU RUN A SERIOUS RISK OF TRIGGERING AN***

***EXPLOSION WHEN RESTARTING THE BOILER.***



### Step 2 Assemble the mounting tray. (See picture above)

Assemble the engine as set out in separate instructions supplied with the engine.

Make sure the engine is spinning freely before **and after** screwing it to the tray. If there is any uneven tightening the engine may stiffen and no longer run efficiently. Secure the oil trap to the tray and connect the steam exhaust line to the engine.

### Step 3: Start up the plant:

A separate document “**OPERATION OF “*Miniature Steam*” PRODUCTS IN A STEAM PLANT**” is included in the accessories box to guide commissioning of the plant.

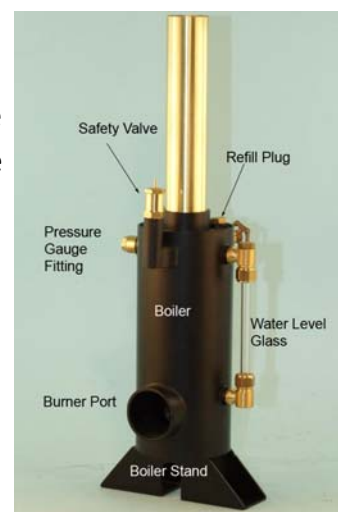
***It is recommended that the calibration and engine run-in be completed before final fitting of the assembly in the boat hull***

Screw the boiler to its stand as illustrated. Place the engine tray and the boiler assembly on a flat wooden surface and connect the steam line and gas line to both units. Using the wood screws supplied, lightly screw the trays and the boiler assembly to the surface.

Fill the gas tank and calibrate the ceramic burner as per the instruction sheet supplied in the burner box:

#### Running the Boiler

- Remove the refill plug on the top of the boiler, and using the syringe supplied, fill the boiler with clean water to approximately 75% of full volume. The water level in the water level sight glass should be visible close to the top. Make sure you can see the water level in the sight glass. The boiler requires space above the water level to accumulate steam; if you can't see the actual water level remove some water with the syringe until you can. Replace the refill plug and lightly tighten.
- Check that the steam stop cock on the boiler is closed.
- ***If the boiler is cold***, remove the gas tank from its mounting pins and the burner from the boiler, open the gas valve a little, light the burner directly with a gas gun, reinsert the burner into the boiler while it is burning and replace the gas tank onto its mounting pins. Ensure the knurled nut connecting the gas pipe to the gas tank is firmly tightened before opening the gas valve fully.

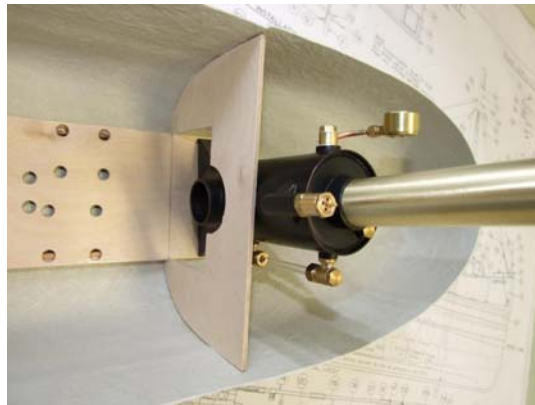


- ***If the boiler is warm***, open the gas valve a little and hold a gas gun (NOT a lighted match or the sparking type of gas gun) to the top of the stack. When the burner ignites open the gas valve fully. It can seem noisy but this is normal. (A suitable gas lighter can be purchased at most Supermarkets)
- The boiler should reach its maximum working pressure of 40 psi (2.8 bar) in about 5 to 6 minutes. If it is filled with warm water this time can be reduced to 3 to 4 minutes. When the pressure gauge reaches recommended operating pressure fully open the steam cock on the boiler and adjust the steam cock on the lubricator to allow some steam to flow through to the engine to heat the steam pipe and the engine cylinders. When these are cold some condensate will blow out when the steam reaches the cylinders. This is normal.
- Adjust the lubricator steam cock to produce the power required for the engine. This setting can be retained for future running since the boiler steam cock is used as a Start/Stop valve. If the safety valve blows off after the engine reaches the desired operating speed adjust the gas valve to reduce the gas supply as well.
- Note that in the early stages of running up the boiler, the rate of gas consumption will cause the gas tank to cool down – possibly to the point where frost will appear on the outside of the tank. This is normal and in practice will cause a reduction in burner performance at the time. Don't worry – the boiler is mounted close to the gas tank and it will soon warm sufficiently to keep the tank delivering maximum gas to the burner.
- To stop the boiler, turn off the gas cock and wait for the steam pressure to drop to zero before closing the boiler steam cock ready for the next run. The lubricator steam cock should remain as set to provide the same operating power on the next run.

Before fitting the assembly in the boat hull run the plant for at least six boiler fills to remove any stiffness in the engine. This is a good opportunity to practice controlling the engine speed and boiler power adjustments.

#### Step 4: Fit the tray assembly & boiler in the boat hull:

Locate the **boiler stand** to butt up against the stern side of the bulkhead as illustrated. Lightly secure the stand to the mounting block with the wood screws supplied. Position the **engine tray** so that it fits neatly on its mounting block. Connect the steam pipe from the boiler to the engine and the gas tank pipe to the boiler. These connections should be easily made with the engine tray nuts fitting neatly into the recessed holes made in the mounting block. If there is a mismatch please make corrections as appropriate. The design is intended to place the stern edge of the engine tray 40 mm from the forward edge of the bulkhead. Secure the tray to the mounting blocks and loosely attach the propeller shaft coupling and its related fittings to the engine drive shaft. If working with a new boat kit the standard propeller shaft tube should be discarded and replaced with the engine matched propeller shaft and propeller supplied with the steam plant. When the boiler is secure bend the pressure gauge siphon to a position where the gauge can be seen through the hole in the superstructure.



If retro fitting the plant carefully remove the existing propeller tube and proceed as follows. Fit the propeller supplied to the propeller shaft and pass the shaft through the stern such that the propeller thrust will be taken up by the propeller shaft thrust bearing and there is some longitudinal slack between the propeller shaft and the propeller shaft couplings. Secure the propeller shaft with epoxy putty and when set, tighten the grub screws on the propeller shaft components.

**RC Controls & Ballast:**

Before installing the deck, fit all the RC components in place (battery, servos & links, & wiring ), and conduct a buoyancy balance test. Glue appropriate ballast in positions to provide even displacement of the loaded hull. Some fine adjustments can be made later but it is better that this process is undertaken before gluing the deck in place.

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#### Refilling the gas tank:

Disconnect the gas pipe from the gas tank and remove the tank from the mounting tray before filling as instructed in the Test Certificate. When refilling the gas tank it is normal for the tank to cool down. This may aggravate the condition noted above when starting the boiler. In very cold conditions it may be necessary to warm the filled tank to room temperature before re-fitting it on to the tray.

#### Test certificates for each pressure vessel:

Formal Test Certificates, general safety recommendations and filling instructions for the boiler and gas tank are enclosed in each pressure vessel box. These should be read carefully and stored in a safe place for future reference.

#### Recommended Propellers & Drive Shafts:

To obtain maximum performance from your plant we strongly recommend you avoid using fabricated propellers. Precision cast Caldercraft/“*Miniature Steam*” propellers and matching propeller shafts will deliver top performance from your steam plant.