

Miniature Steam Pty Ltd.

Bringing the Highest Quality Standards to Model Engineering



“Miniature Steam” Steam Plant Kit

for self-assembly in

Caldercraft “Imara” - Harbour Tug

Single Screw Option

with

3” Horizontal Boiler

and

“Clyde” Twin Cylinder Oscillating Steam Engine

Kit Assembly Instructions



Manufacturer:

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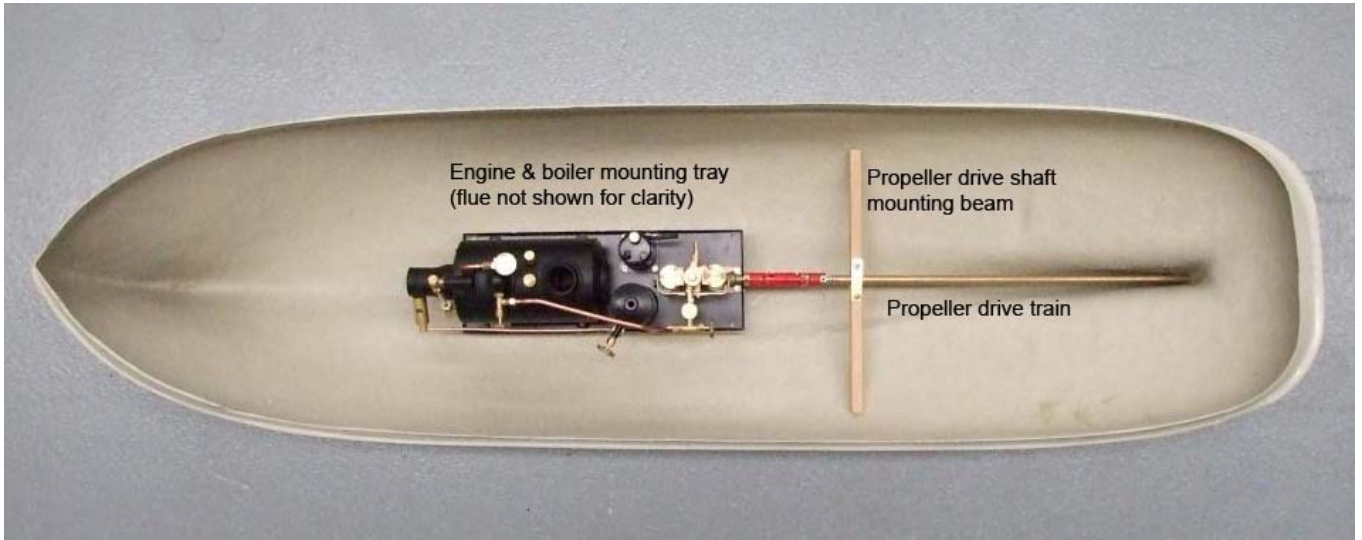
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“Miniature Steam” Custom Steam Plant for Caldercraft “Imara”



The following items are required:

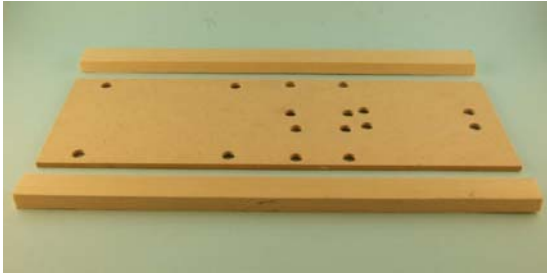
1. - 3" Horizontal boiler P/N 4060
- 2.- 3" Ceramic burner P/N 4264 & control valve P/N 4025
- 3.- Oil trap P/N 4064
- 4.- "Clyde" Oscillating engine self assembly kit P/N 5009K or fully assembled kit P/N 5009
- 5.- 1 1/2" Refillable gas tank P/N 4272
- 6 - Mounting tray, steam pipe, gas pipe, mounting screws etc. kit P/N 5037 comprising:
 - 60mm propeller P/N 1075M,
 - custom propeller shaft P/N 2317,
 - special twin universal joints assembly P/N 2313
 - mounting block P/N 3004,
 - mounting tray P/N 2848,
 - steam exhaust port brass fitting, P/N 5701
 - silicone rubber tubing, P/N 2307
 - mounting screws kit P/N 2314
 - Special flue P/N 2315
 - Propeller drive shaft mounting beam assembly P/N 2316

Parts NOT supplied

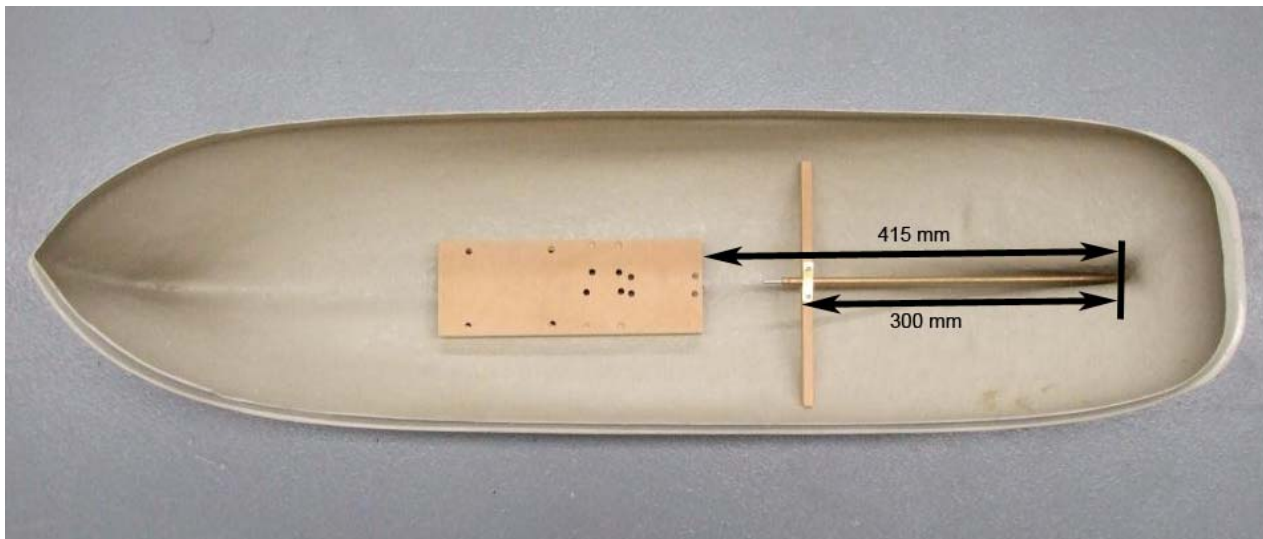
- Steam Oil
- RC Radio (2 channel min)
- RC Linkages

Assembly Instructions:

Step 1 Glue the plant mounting board and fit it in the hull



Glue the support rails to the base plate, as illustrated, with two pack epoxy. When the glue has set coat the assembly with varnish to seal the surfaces against future moisture and oil penetration that could occur during operations. When the varnish has dried, glue the mounting block assembly with two pack epoxy onto the centreline of the hull, positioned as pictured below—415 mm, measured from the vertical line of the stern well to the stern edge of the mounting block.



Step 2 Fit and Glue the propeller shaft mounting beam as follows:



The 300 mm dimension line pictured above defines the positioning of the propeller shaft support beam to the forward edge of the beam.

The beam is supplied (illustrated to the left with fittings), over length. The ends of the beam should be trimmed to seat the beam centre at 50 mm from the bottom of the hull to the top of the beam, with the ends of the

beam shaped to the hull. Before gluing the beam in place cut a 8 mm x 8mm gap in the centre of the beam to hold the propeller shaft. These positioning's are critical to the correct alignment of the engine drive shaft and the drive train detailed later. When assembling the propeller drive train the plate and screws shown are used to lightly secure the propeller shaft

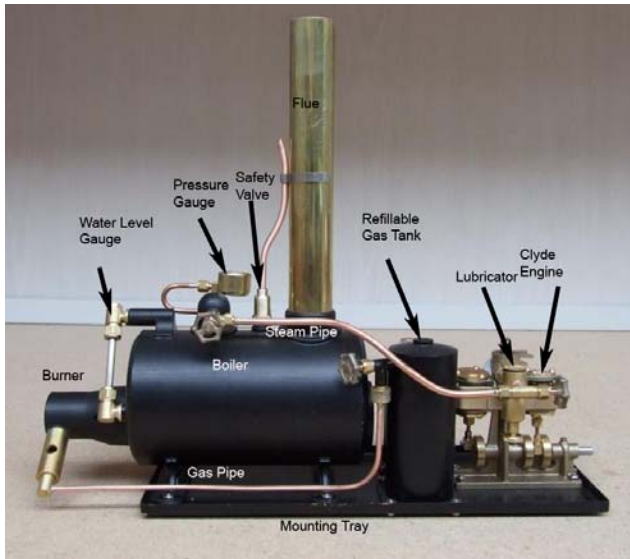
Step 3. Lay out the screws & nuts supplied:

There should be at least 2 wood screws for securing the mounting tray to the mounting block, 4 x 6 mm screws for securing the oil trap to its tray, 8 x 8 mm screws to secure the boiler and engine to the mounting tray and 4 x 12mm screws & nuts to provide a mounting for the refillable gas tank. (Some extra items are included in this kit in case some get lost!)

Step 4 Assemble the mounting tray components onto the mounting tray:

If working with a self assembly engine kit, assemble the engine as set out in separate instructions supplied with the kit. With either engine assembly, secure the engine to the mounting tray with the 8 mm screws and nuts supplied.

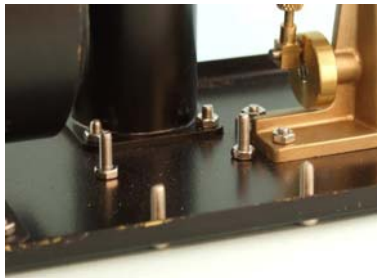
Make sure the engine is spinning freely before **and after** screwing it to the tray. If there is any uneven tightening the engine may stiffen and no longer run efficiently.



Fit the refillable gas tank as follows:

The gas tank screws are 12mm long and are inserted from the underside of the tray and secured with nuts BEFORE the gas tank is fitted. This is illustrated below. This allows the gas tank to be easily removed for refilling while maintaining a firm seat for the tank during use.

DO NOT BE TEMPTED TO REFILL THE TANK WHILE IT IS IN POSITION IN THE BOAT: YOU RUN A SERIOUS RISK OF TRIGGERING A GAS EXPLOSION WHEN RESTARTING THE BOILER.



Secure the oil trap to the tray with the 8mm screws and nuts supplied.

Fit the gas and steam pipes as shown above.

Step 5: Commissioning:

A separate document "OPERATION OF *"Miniature Steam"* PRODUCTS IN A STEAM PLANT" is included to guide commissioning of the plant. This is a document that advises general background information for building and operating a *"Miniature Steam"* plant.

The following pages have specific instructions for this steam plant

This should be done before finalising the fitting of the assembly in the boat hull

- Calibrate the Ceramic Burner as per the instruction sheet supplied with the burner.
- Place the boiler and engine tray on a flat wooden surface and screw the tray to the surface with the wood screws supplied.

Running the Boiler

- Remove the water refill nut 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 safety valve and lightly tighten with a spanner
- Check that the steam stop cock on the boiler is closed.
- **If the boiler is cold**, remove the burner from the boiler, turn on the gas valve a little, light the burner directly, reinsert the burner into the boiler and open the gas tank valve fully.
- **If the boiler is warm**, open the gas valve a little and hold a gas gun as illustrated (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)

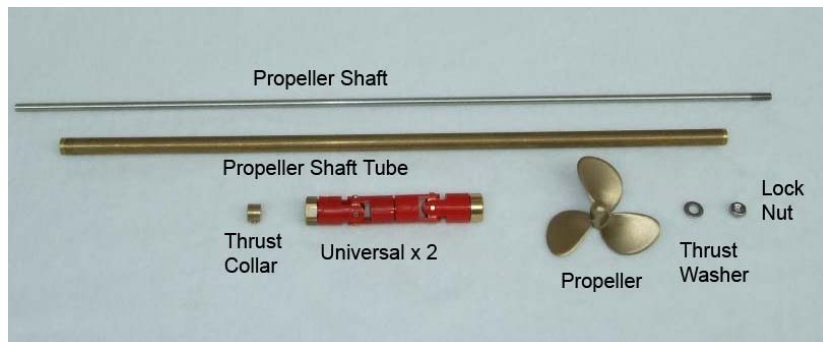


- The boiler should reach its maximum working pressure of 40 psi (2.8 bar) in about 5 to 6 minutes. If it is filled with warm water this time can be reduced to 3 to 4 minutes. When the pressure gauge reaches recommended operating pressure fully open the steam cock on the boiler and adjust the steam cock on the lubricator to allow some steam to flow through to the engine and heat the steam pipe and the engine cylinders. When these are cold some condensation 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.

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 6: Install the propeller drive train:

For new hulls, drill a hole in the stern of the hull as per the boat assembly instructions to enable the fitting of the propeller tube/shaft. For retro-fitting the steam plant to an established boat it is recommended that the existing propeller shaft be removed and replaced with the components illustrated below. Please note that the propeller shaft and tube come as an assembly and should not be disassembled unless there is a specific need.



Slide the thrust washer onto the threaded end of the propeller shaft assembly, followed by the lock nut and then screw the shaft into the propeller as far as it will freely go. Tighten the lock nut against the propeller hub to secure the propeller to the shaft, insert the assembly into the boat hull, slide the thrust collar onto the other end of the propeller shaft and secure it to the propeller shaft with the grub screw so that there is no lateral movement of the propeller shaft. When the drive shaft assembly is in position clamp it onto the propeller support beam with the plate and screws supplied. Insert the propeller shaft into the universal joint end that has the smaller bore and lightly secure it with the grub screw in the universal. (the propeller shaft is 4 mm diameter and the engine drive shaft 5 mm diameter).

The other connection of the engine drive shaft to the universal will be done as the boiler/engine tray is installed in the next step.

Step 7 Install the boiler/engine mounting tray:

Position the tray so that it fits neatly on its mounting block while sliding the engine drive shaft into the universal joint. Lightly tighten the grub screw in the universal into the flat that is machined on the engine drive shaft. Before securing the tray to its base with the wood screws supplied, check that the drive train has no "run out" This occurs when there is a misalignment of some of the drive train components. This can be checked by holding the mounting tray in one hand and rotating the propeller with the other. If uneven running is detected adjust the position of the mounting tray or propeller shaft to eliminate it. Secure the tray with the wood screws supplied. Secure the propeller shaft into the hull with epoxy putty and progressively check that there is no run out as the putty sets. When set, tighten the grub screws on the propeller shaft components



Fit the steam exhaust nipple into the hull on the left side of the hull generally as illustrated. The position is not critical to the operation of the boat. Neatly fit a length of silicon rubber tube between the nipple and the oil trap exhaust port.

Before installing the deck, fit all the RC components in place (battery, wiring, servos & links), 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.

Step 9 Steaming Trials:

When the deck and superstructure is securely in place you are ready for steaming trials!