



THE BASICS

OF

MODEL MARINE STEAM PLANTS

INTRODUCTION TO MSM MODEL MARINE STEAM PLANTS.



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Welcome to our guide on building a steam-powered model boat using MSM Steam Plants. If you're new to the hobby of model boat building, this guide is perfect for you! We'll take you through the basics of what you need to know to get started. From understanding the different components of the steam plant and how they work, to selecting the right size and type of boiler and tank for your project, this guide has everything you need to know.

We'll also provide some tips on fitting the steam plant to your boat and give you an introduction to radio control systems.

By the end of this guide, you'll have the knowledge and confidence to start building your own steam-powered model boat."

Some things to note before we get started are as follows: MSM does NOT SUPPLY;

- the boat hull and related materials
- the propeller and drive shaft components
- radio control (RC) equipment for controlling the movement of the boat on the water.

We do provide advice as to the type of boat our Steam Plants are suited to and recommendations about the arrangement of the propeller and drive shaft. A comprehensive introduction to RC systems can be accessed on the resources page *

Title

The Basics of Model Marine Steam Plants

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THE MAJOR COMPONENTS OF AN MSM STEAM PLANT

At a glance

The major components of an MSM Steam Plant are a boiler, a gas burner and a refillable gas tank.

A Boiler generates steam to drive the engine, it is heated by the gas burner that is fed from the refillable gas tank containing a commonly available butane gas.

The steam generated in the boiler is passed through a displacement lubricator before entering the engine. After the steam has driven the engine, it is exhausted through an oil trap that extracts the oil from the exhaust steam before venting it into the atmosphere. The Steam Plant components are fitted to a tray that enables easy installation in, and removal from the boat hull for maintenance. All the components are connected with piping, and valves for controlling the operation of the Plant.

Lets take a dive into all the components.

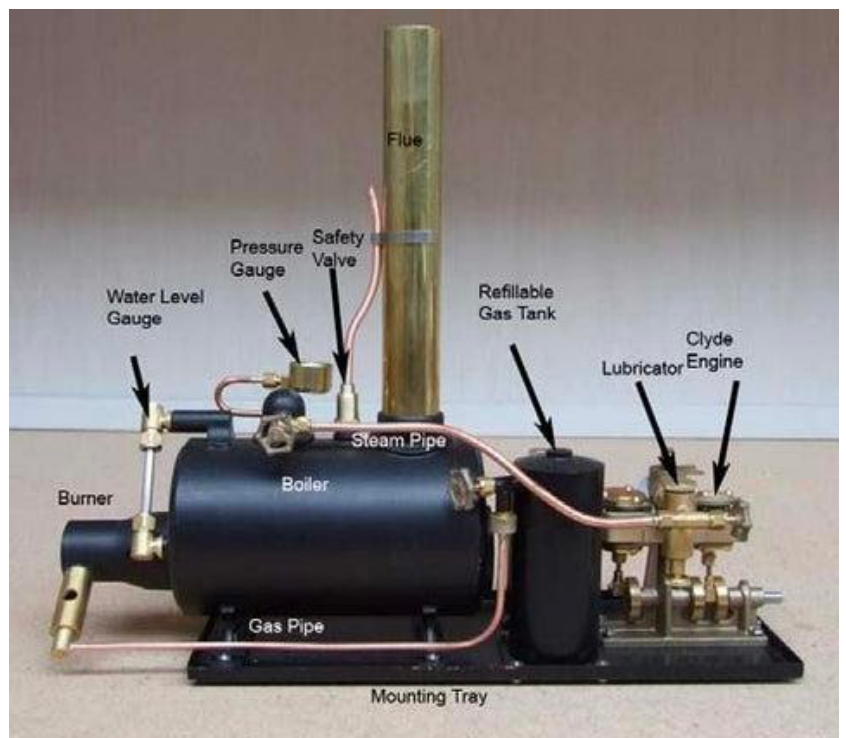


Figure 1

shows the essential parts of an MSM Steam Plant showing both sides of the same Plant. Front side



Figure 2

shows the essential parts of an MSM Steam Plant showing both sides of the same Plant. Back side

BOILERS

Our boiler sizes are defined by the diameter of the boiler body. Following are pictures of three inch³ (imperial inch symbol) horizontal and vertical boilers. All boilers have the same features.

For these pictures the burner has been removed to show the inside component – a cast ceramic insert that shapes the flame, and projects into the center flue to heat the water in the boiler. Inside the boiler, the center flue has a series of cross pipes that increase the area of water subjected to heating, making steam generation more efficient.

The cross tubes are not visible in the above presentations. The brass item at the rear of the burner pictures is one part of the air/gas mixture adjustment mechanism. This can be better seen in the image on the first page, as part of the gas pipe, attached to the refillable gas tank.

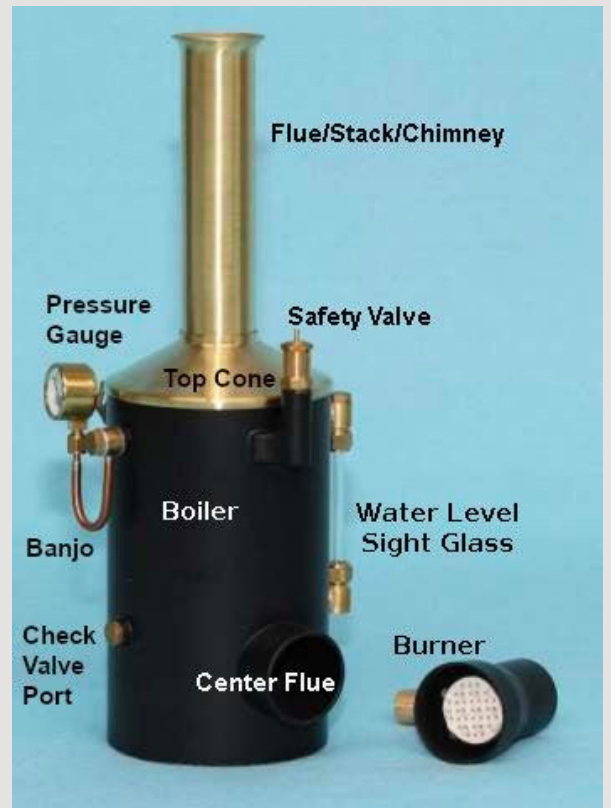


Figure 3

Shows a 3 inch vertical boiler

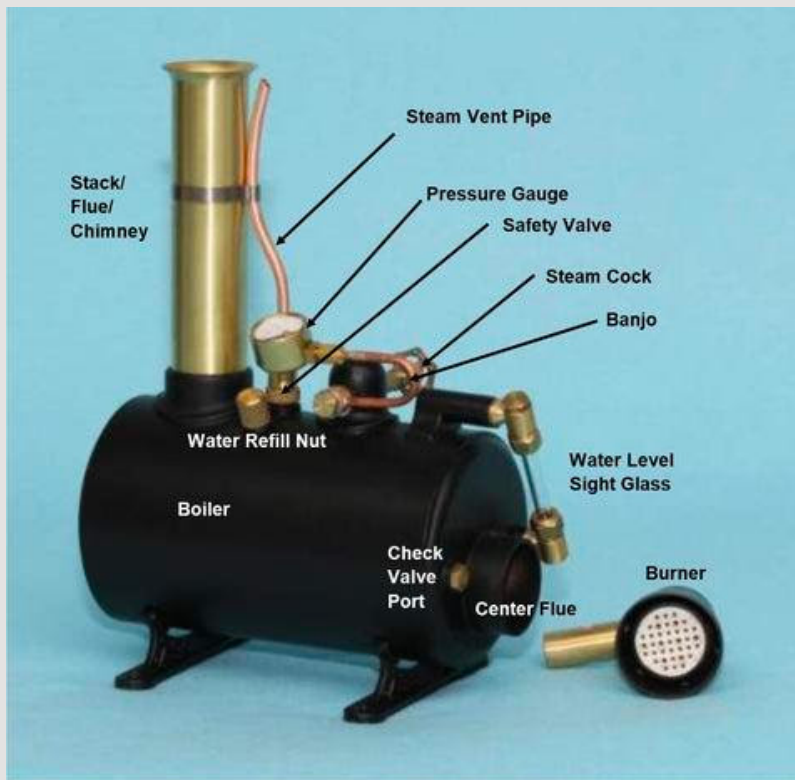


Figure 4

shows a 3 inch horizontal boiler

REFILLABLE GAS TANKS

As with other items making up an MSM Steam Plant, the refillable gas tanks are made in horizontal and vertical versions & sizes. The pictures on this page are of a 2" large horizontal tank and a 1 ½" medium vertical tank. At this time the management of the use of the tank is too complex to set out here.

Just envisage that you will be able to fill the tank with enough butane gas to run the engine "on the pond" for about 15 to 20 minutes on a refill, and at the same time you will need to refill the boiler, drain and refill the displacement lubricator (p6 and drain the oil trap (p10)

The refillable gas tanks are sized to match the boiler, which in turn are sized to match the engine being used. The boat size ultimately determines what combination is required to properly power the chosen boat.

In the Steam Plant pictures on this page the engine is our Clyde twin cylinder oscillating engine which is matched to our 3" boiler for fitting into a wide range of popular boats. The refillable gas tank is a 1 ½ " as pictured above Not every model boat can be steam powered by MSM products.



Figure 5

Shows a 1 ½ inch medium vertical tank

Some suggestions for "sizing" are set out in our Advanced User Library(more information in Further reading p11.).

In general terms, we can power boats from 2 meters down to 650 mm long and a minimum of 180 mm wide



Figure 6

shows a 2 inch large horizontal tank

DISPLACEMENT LUBRICATORS

Proper lubrication is crucial for the smooth operation of any steam engine, and that's where displacement lubricators come in. These devices allow steam, on its way to the engine, to carry a special Steam Oil into the engine to lubricate the internal moving parts.

As you'll see in this guide, We have a variety of options available, including one version with a user-adjustable injection rate and two pre-set options.



Figure 7



Figure 9



Figure 8

Figure 7. allows the user to control the rate of steam oil being collected by the steam.

Figure 8. picture has a steam valve included and the assembly is attached to the engine.

Figure 9. is designed to be placed in the steam line between the boiler and the engine.

ENGINES

There are two different designs of engines in the MSM range. All engines are “double acting” in that steam is admitted to the bottom and then the top of the cylinder each 360-degree rotation of the drive shaft (called a crankshaft). This is accomplished using a slide valve driven from the crankshaft timed to allow high-pressure steam to enter one end of the cylinder while simultaneously opening up the other end of the cylinder to allow the low-pressure “used” steam to be exhausted out to the oil trap.



Slide Valve Engines

Oscillating Engines



SLIDE VALVE ENGINES



A slide valve engine controls the entry of steam to the engine cylinders. The basic variants are single and twin cylinder, vertical and horizontal, non-reversing and reversing models.

All MSM slide valve engines have many identical parts i.e., the same piston is used for all variants. We call them “The big 4”, based on the four options of vertical and horizontal and single and twin cylinders. All four can have a classic design of Stephenson’s reversing gear named after a steam engine pioneer who designed the original version. For Radio Control (RC) required on boats reversing is only suitable for the twin cylinder models.

Figure 10

Shows a picture of our Mildura, a twin cylinder, vertical slide valve engine with the RC gear for reversing and an adjustable displacement lubricator fitted.

The single cylinder versions can stop with the piston exactly positioned at the top or bottom of their motion and require a slight push on the flywheel to open the steam ports.

The twin cylinder versions are designed so that a steam port is always open somewhere in the cycle. Manually controlled reversing is available for all four variants if they are used in non-marine settings.



Figure 11

Shows our Pevensey single-cylinder non-reversing slide valve engine.

OSCILLATING ENGINES



The most useful of these engines achieve the same “double action” as the slide valve engine by attaching a rod (piston rod) to the crankshaft and causing the cylinder to rock (oscillate) as the crankshaft rotates against a trunk.

There are two cylinders – one on each side of a “trunk”. The trunk has four ports on each side that match the two cylinder ports to deliver and exhaust the steam. The trunk also has a flat rotating valve on the top that can be moved to regulate the delivery of high-pressure steam to the cylinders, allowing the low-pressure steam to exhaust and can change the rotation direction of the crankshaft. The valve, therefore, acts as a throttle and reversing control.

Figure 10

Shows a picture of single cylinder oscillator MSM Tyne that has to be reversed manually



Figure 11

Shows our Clyde.

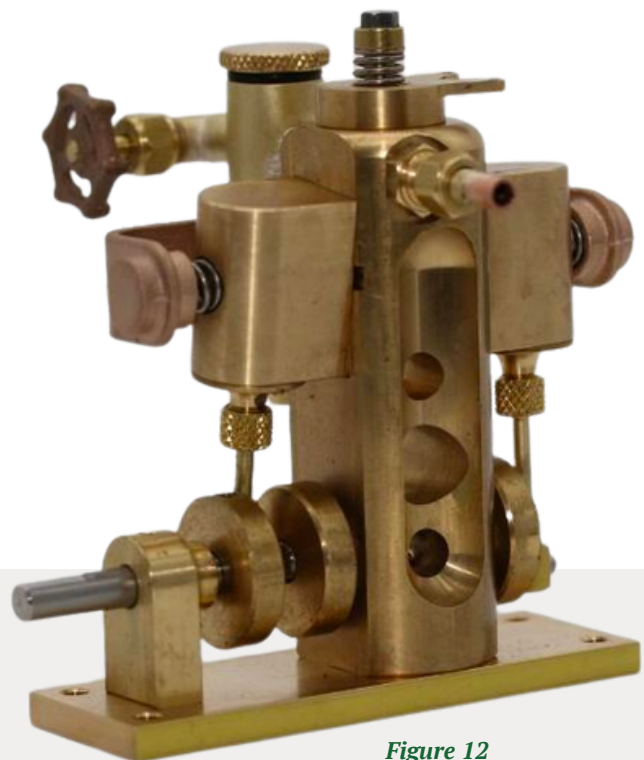


Figure 12

Shows our Avon.

OIL TRAPS



Figure 13

The oil trap does this by creating a mini cyclone of the input steam where the oil is separated from the steam and collected in the bottom of the cylinder. Removal of the oil by syringe is advised for every run of the plant.

As noted earlier the steam exhausted by the engine contains most of the oil added by the displacement lubricator. For environmental reasons this must be removed before the waste steam is allowed into the atmosphere.

As with other items the oil traps come in both horizontal and vertical shapes. The horizontal oil trap shown on the right can be made for input from one input as shown to two and three inputs



Figure 14

The horizontal oil trap shown in figure 15 can be made for input from one input as shown to two and three inputs



Figure 15



FURTHER READING

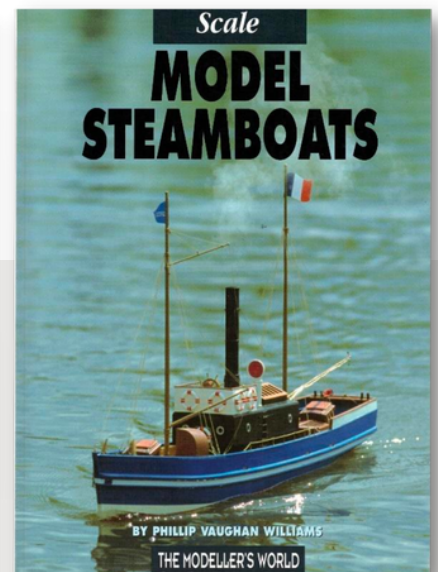
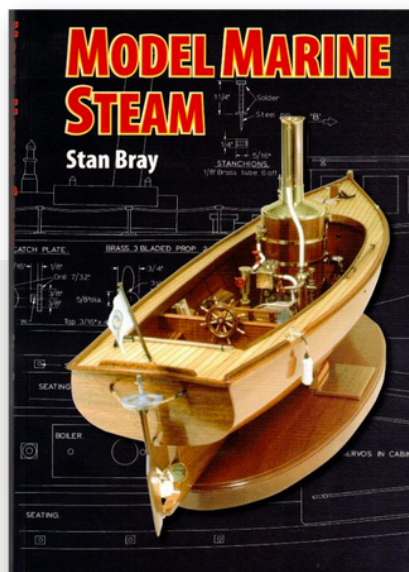
Now that you are familiar with the basics, you may like to take a look at our guide that dives a little bit deeper. If you are on your computer you can click this link (insert hyperlink when available) or if you have your mobile phone handy you can scan this QR code.



If this guide has helped you finish your build then we are very pleased, and we would love to hear all about it.

A recently released book that may be of interest is "Making Model Steam Boats by STEPHEN BODILEY"

The following two books are recommended for further reading.



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