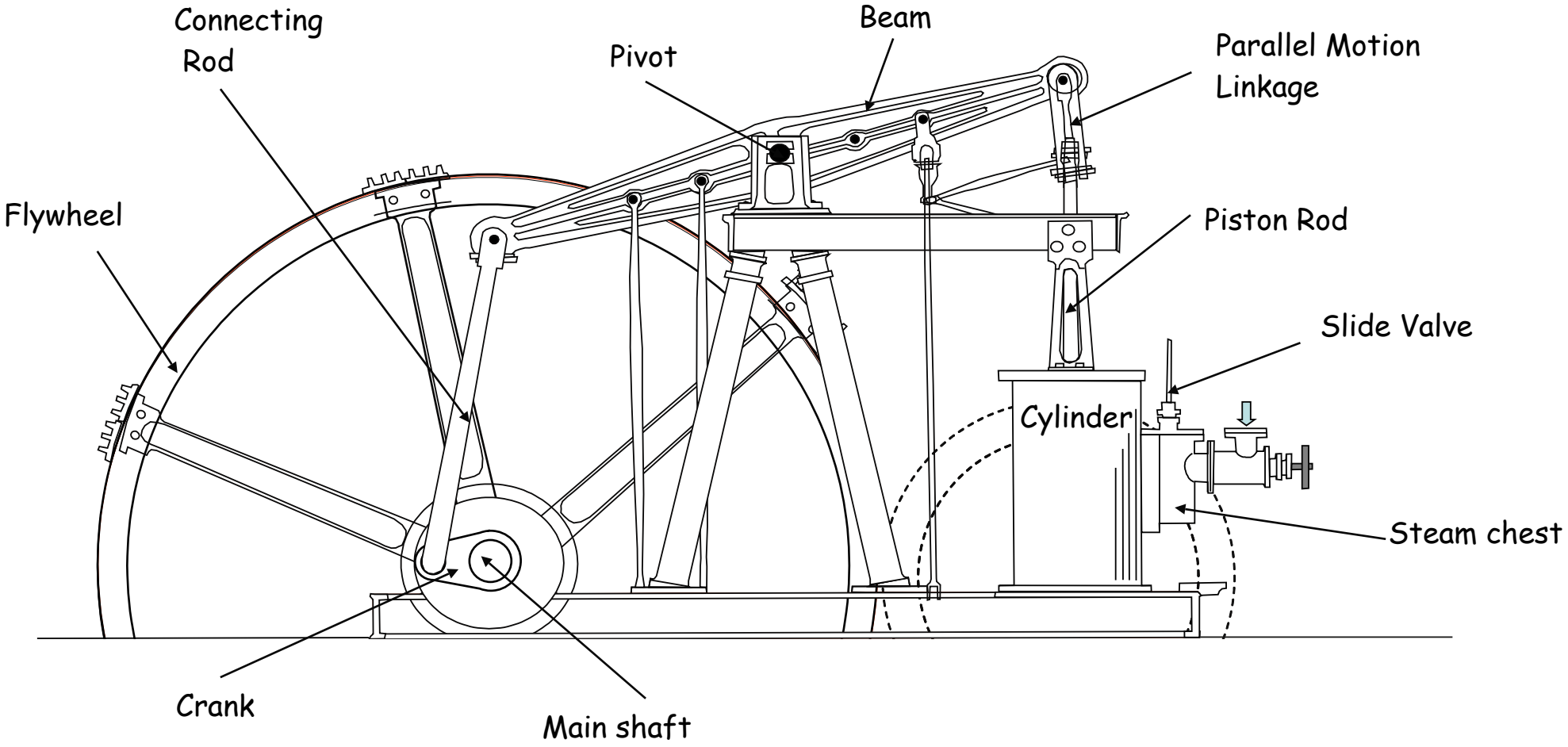
## School Project Sheet

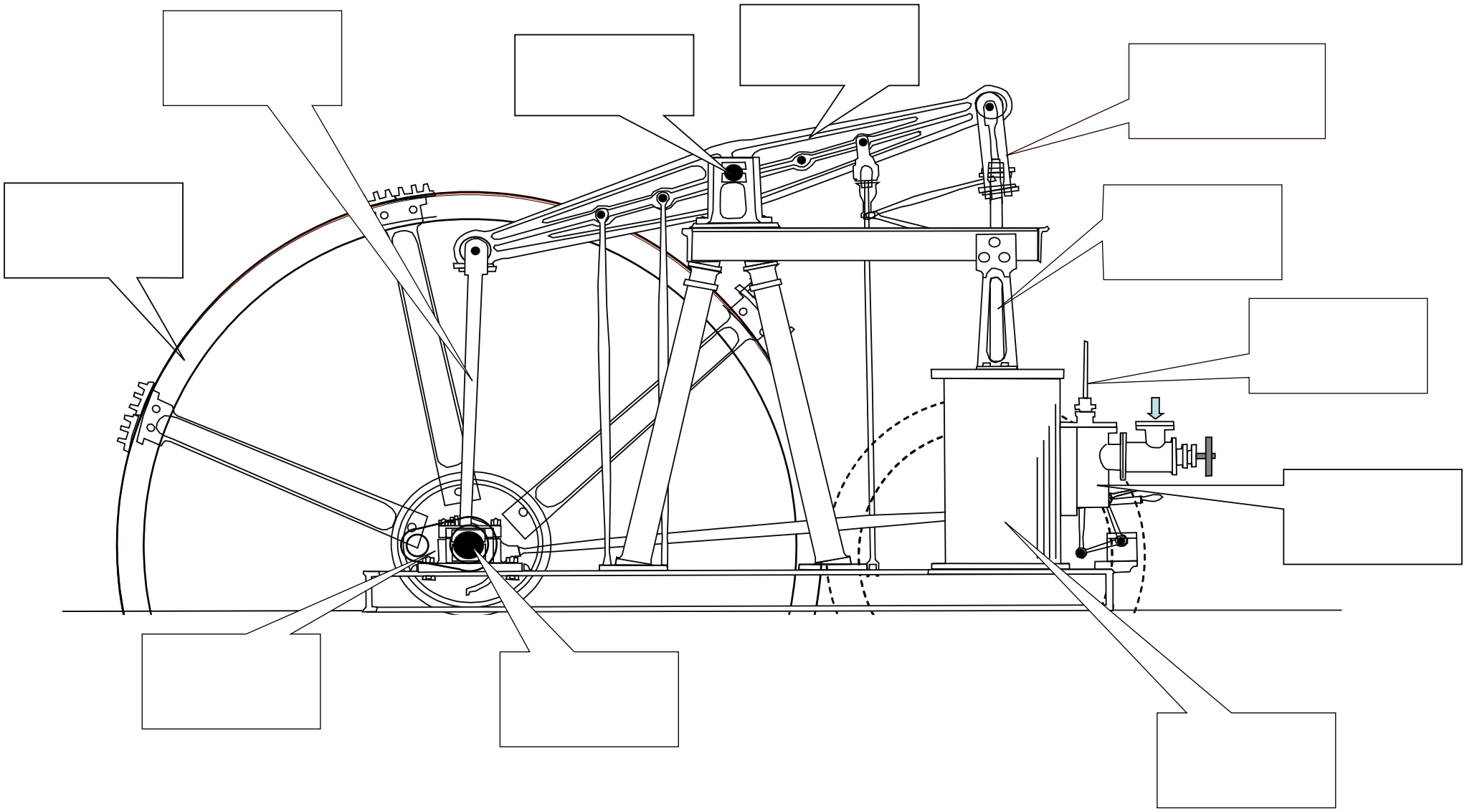
# Combe Mill Beam Engine Powering a Sawmill

Issued ~ 22 September 2013

Educational visits to Combe Mill are organised jointly by the Combe Mill Society and the Blenheim Palace Education Department.
Contact details can be found at the end of this document.



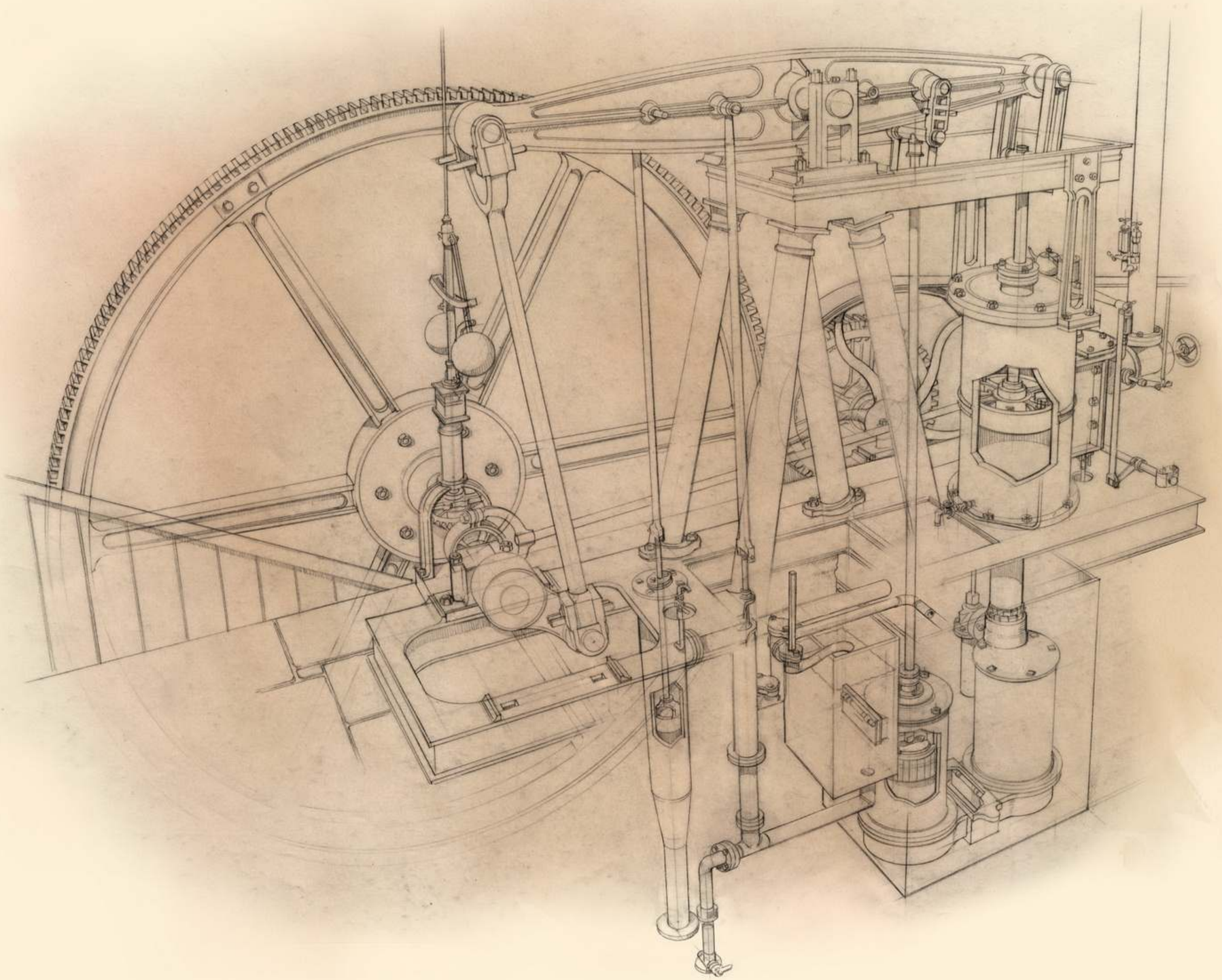

Picture of Beam Engine – name the key parts



Picture of Beam Engine – name the key parts

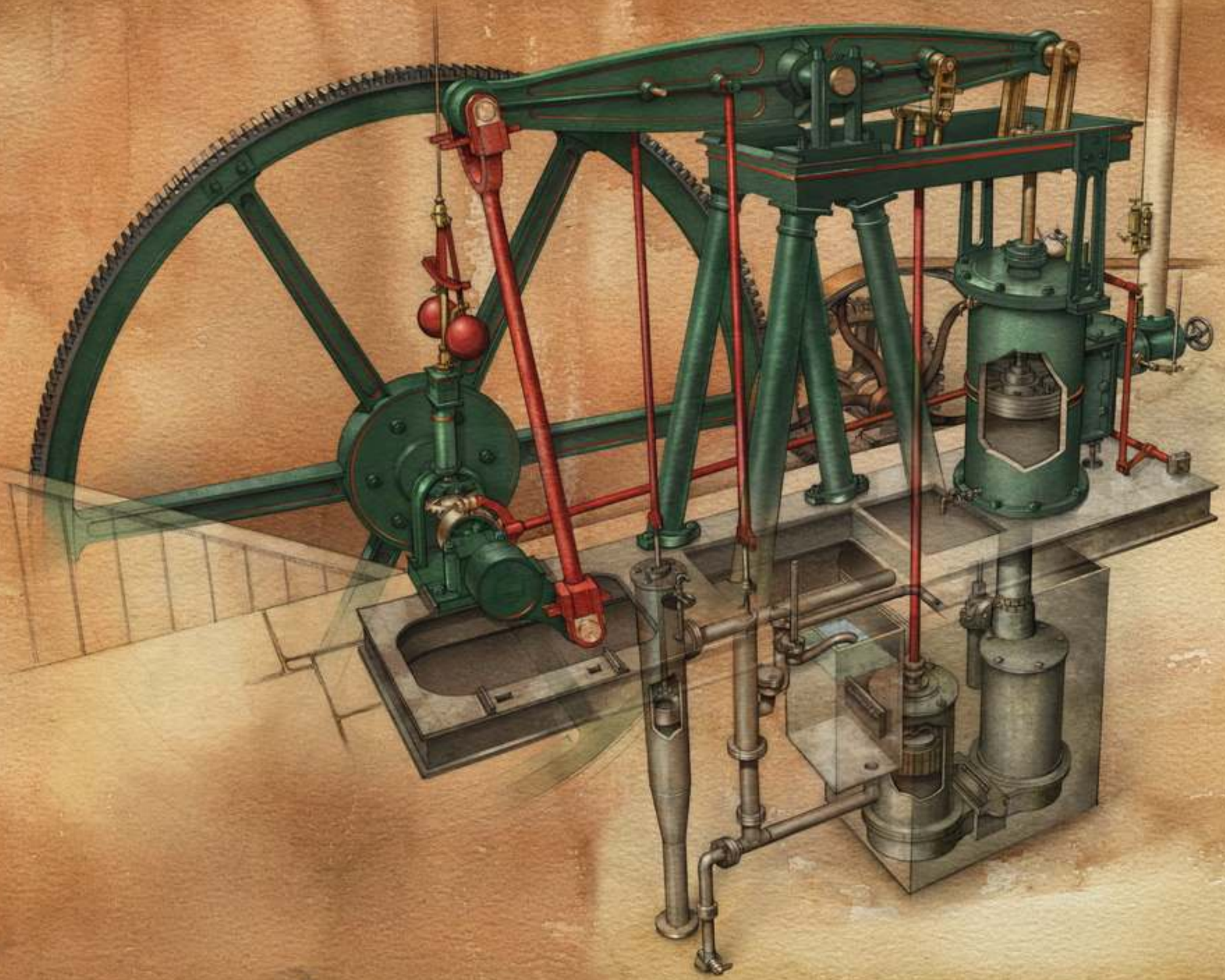
*Combe Mill Beam Engine*





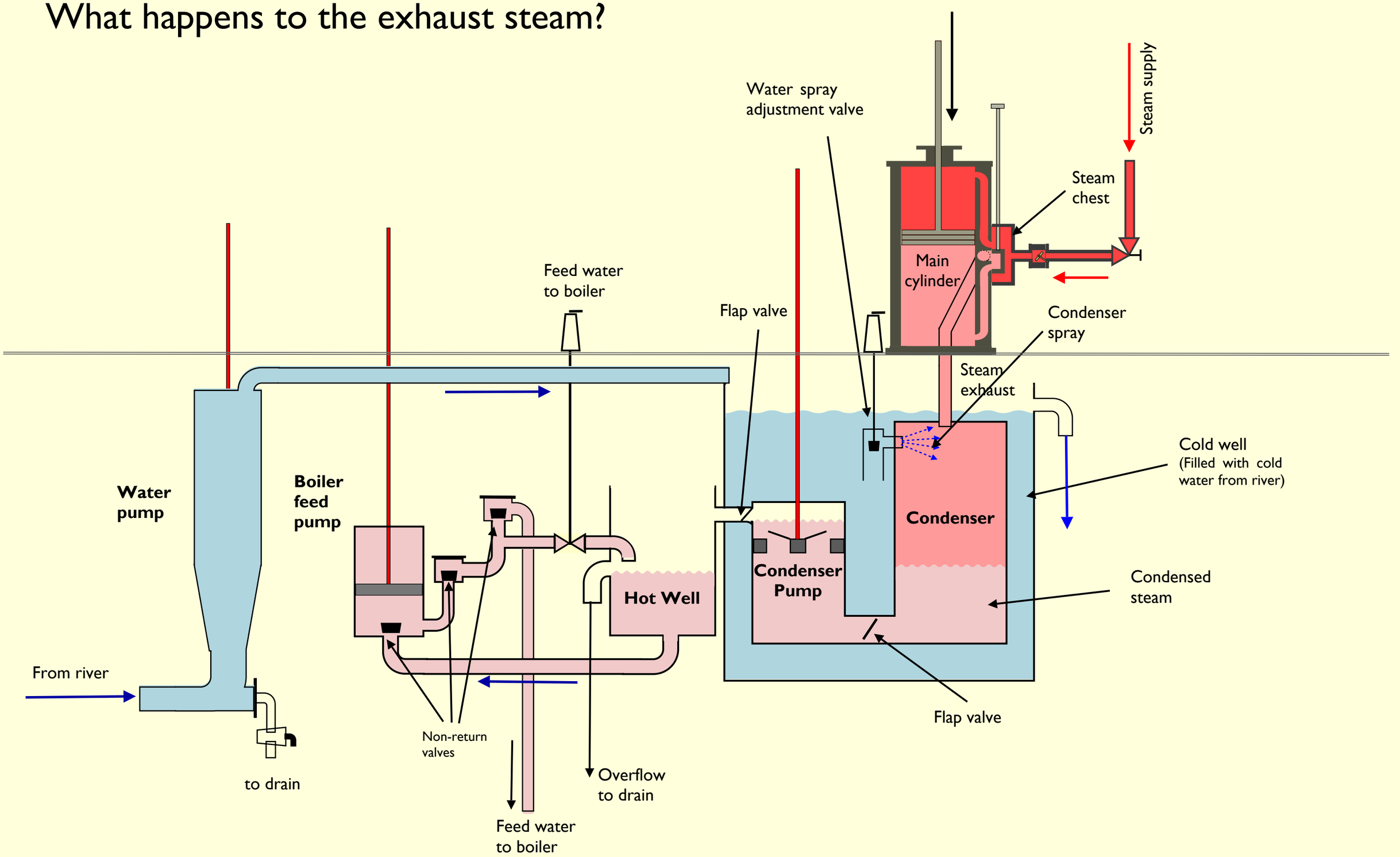
# *Combe Mill Beam Engine*



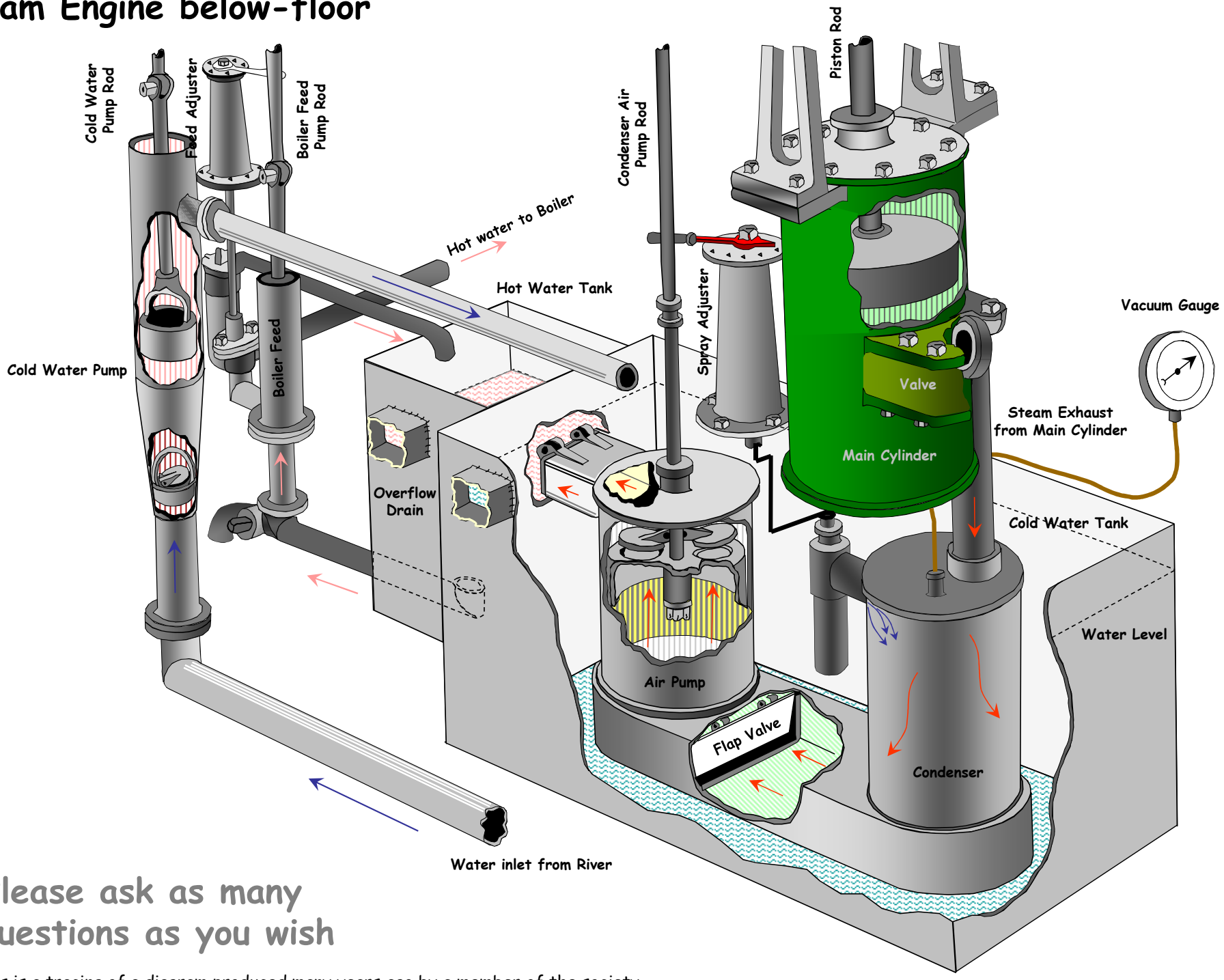


# Beam Engine below floor

What happens to the exhaust steam?



# Beam Engine below-floor

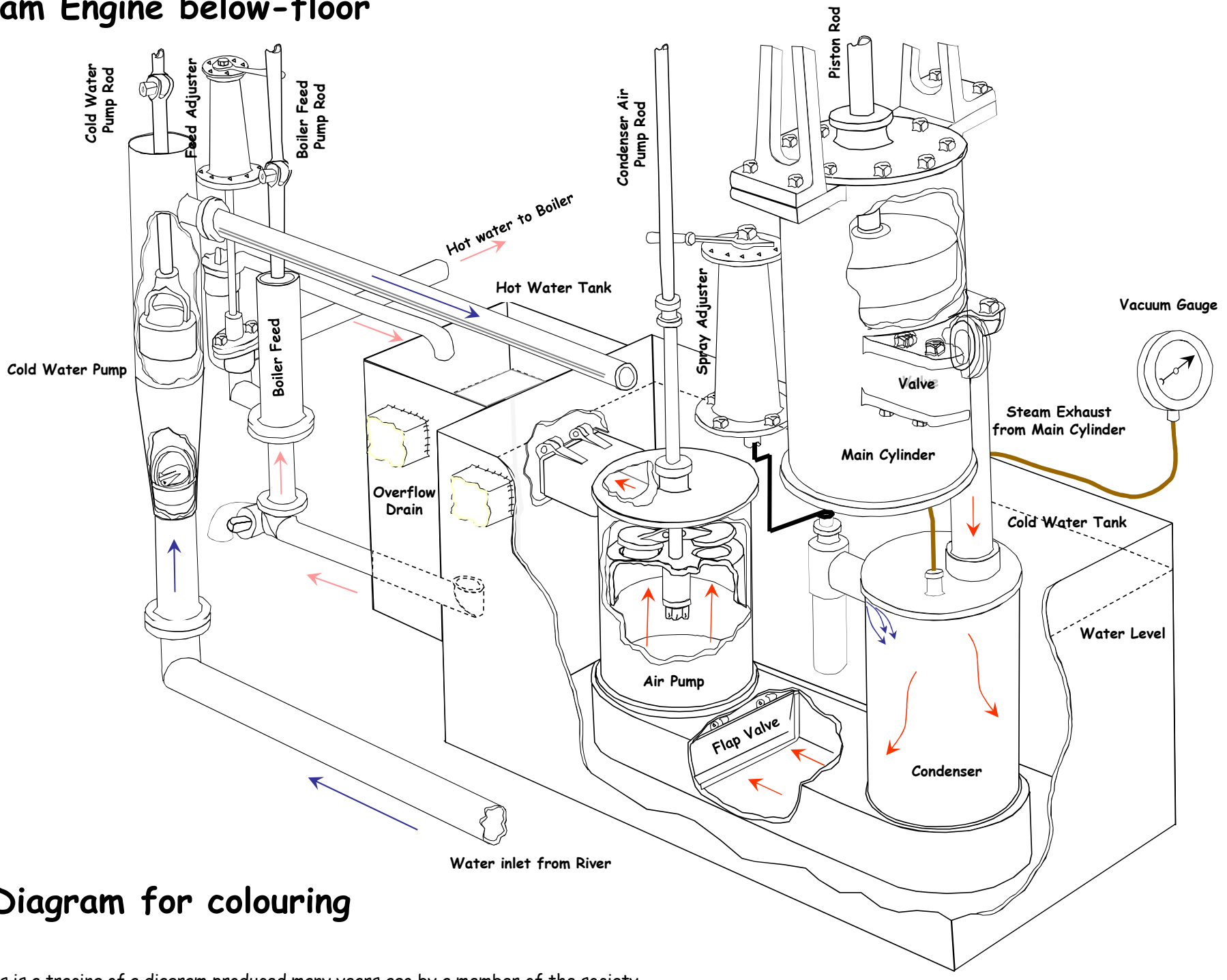



## Please ask as many questions as you wish

This is a tracing of a diagram produced many years ago by a member of the society.
(Possibly by Dennis Parks)

August 2007

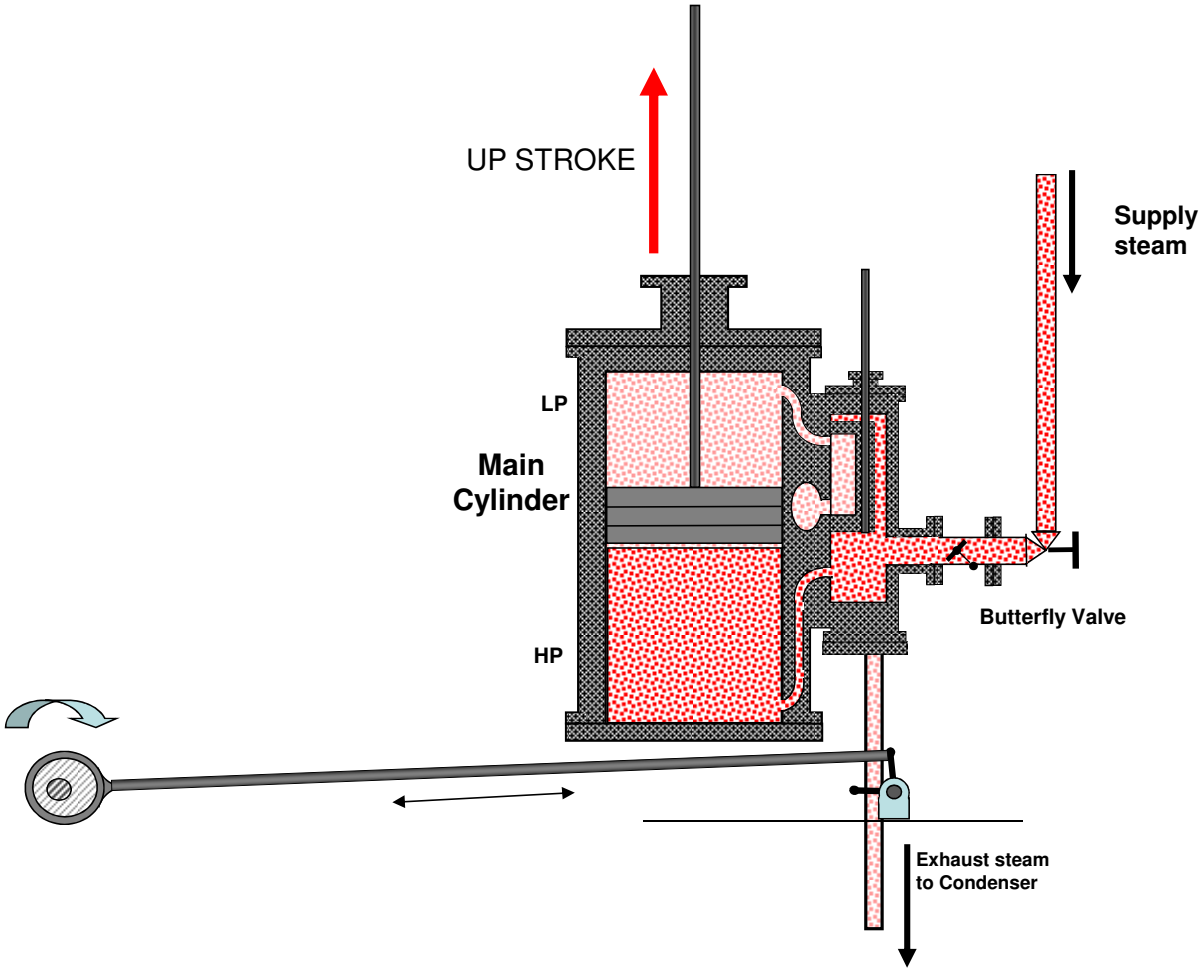
# Beam Engine below-floor



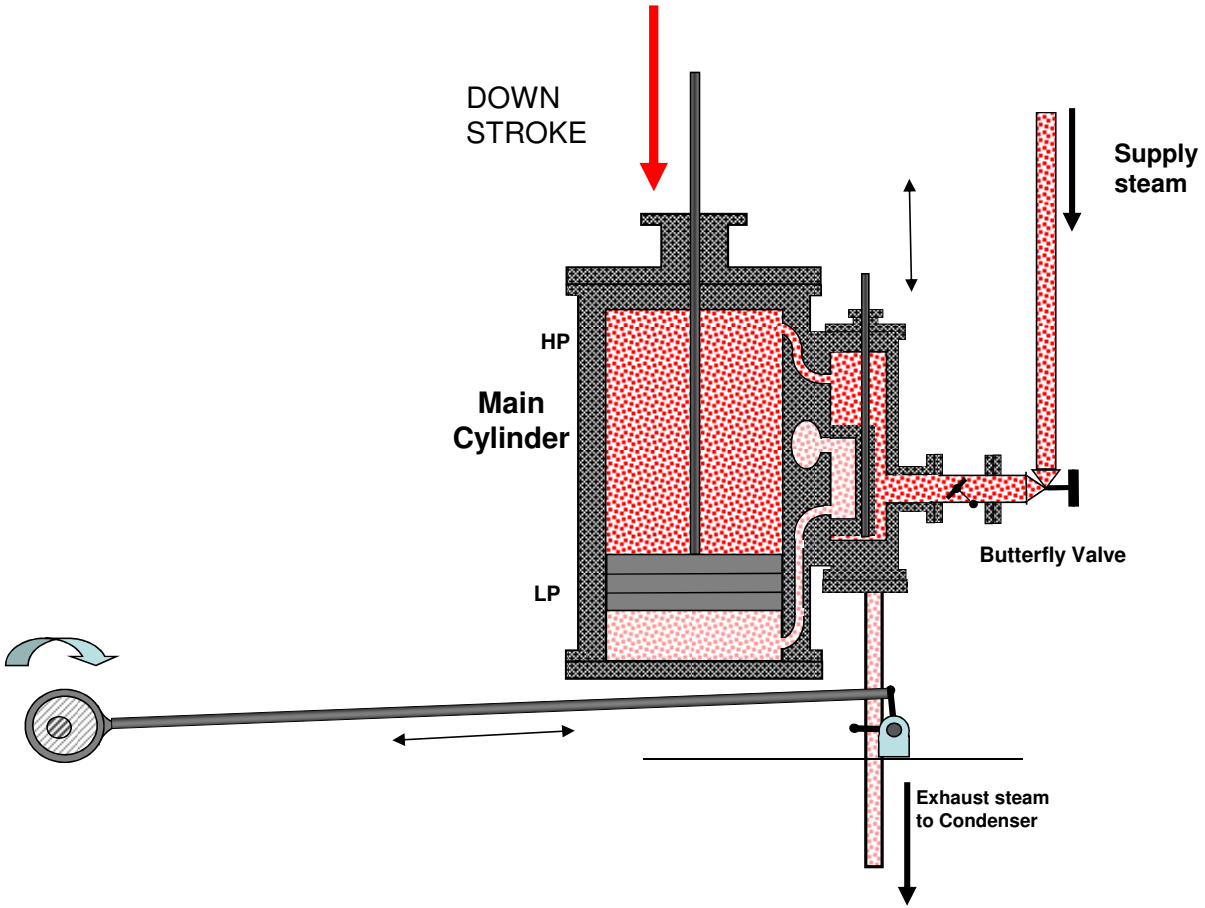

# Diagram for colouring

This is a tracing of a diagram produced many years ago by a member of the society.
(Possibly by Dennis Parks)

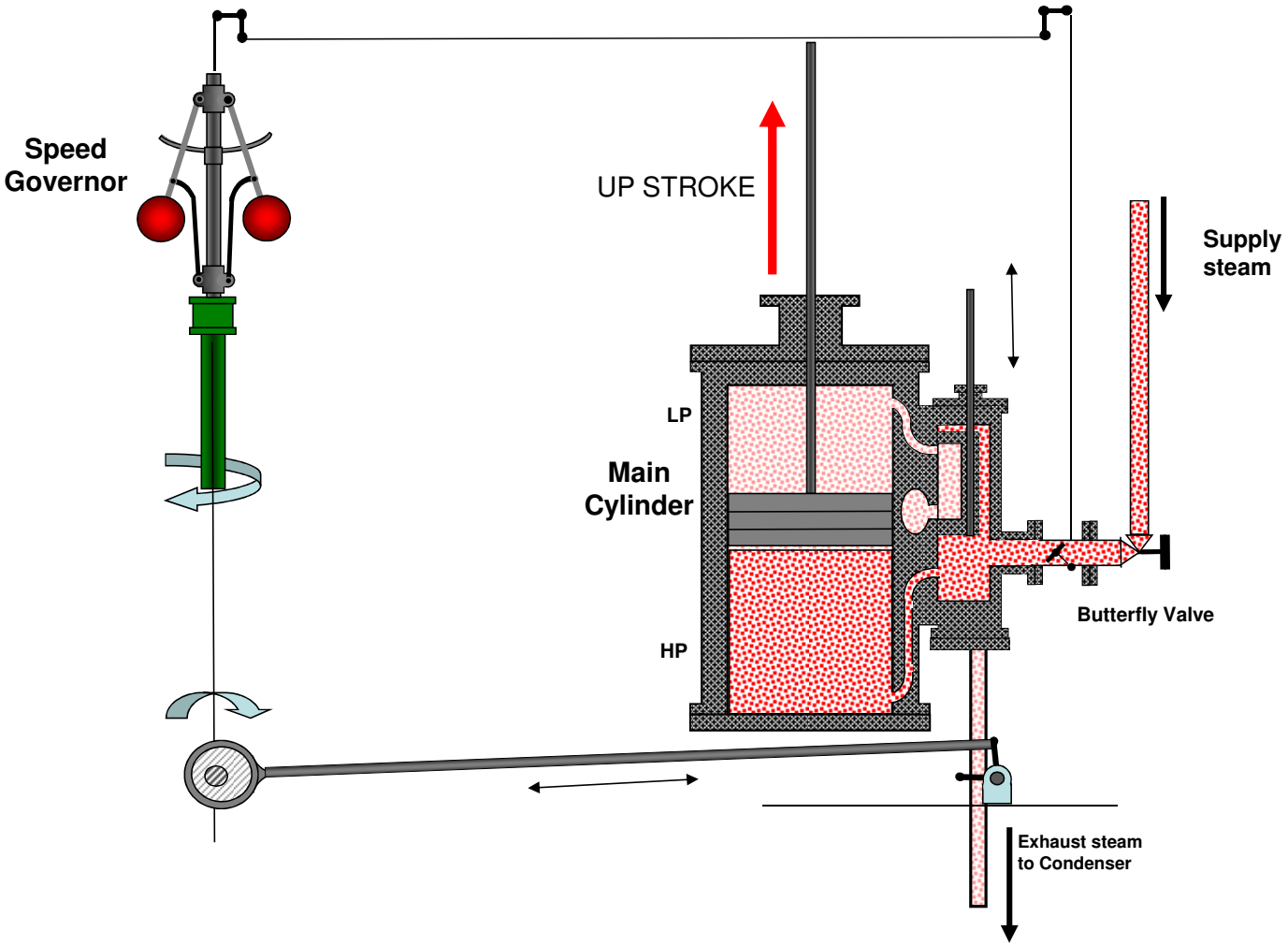
December 2007



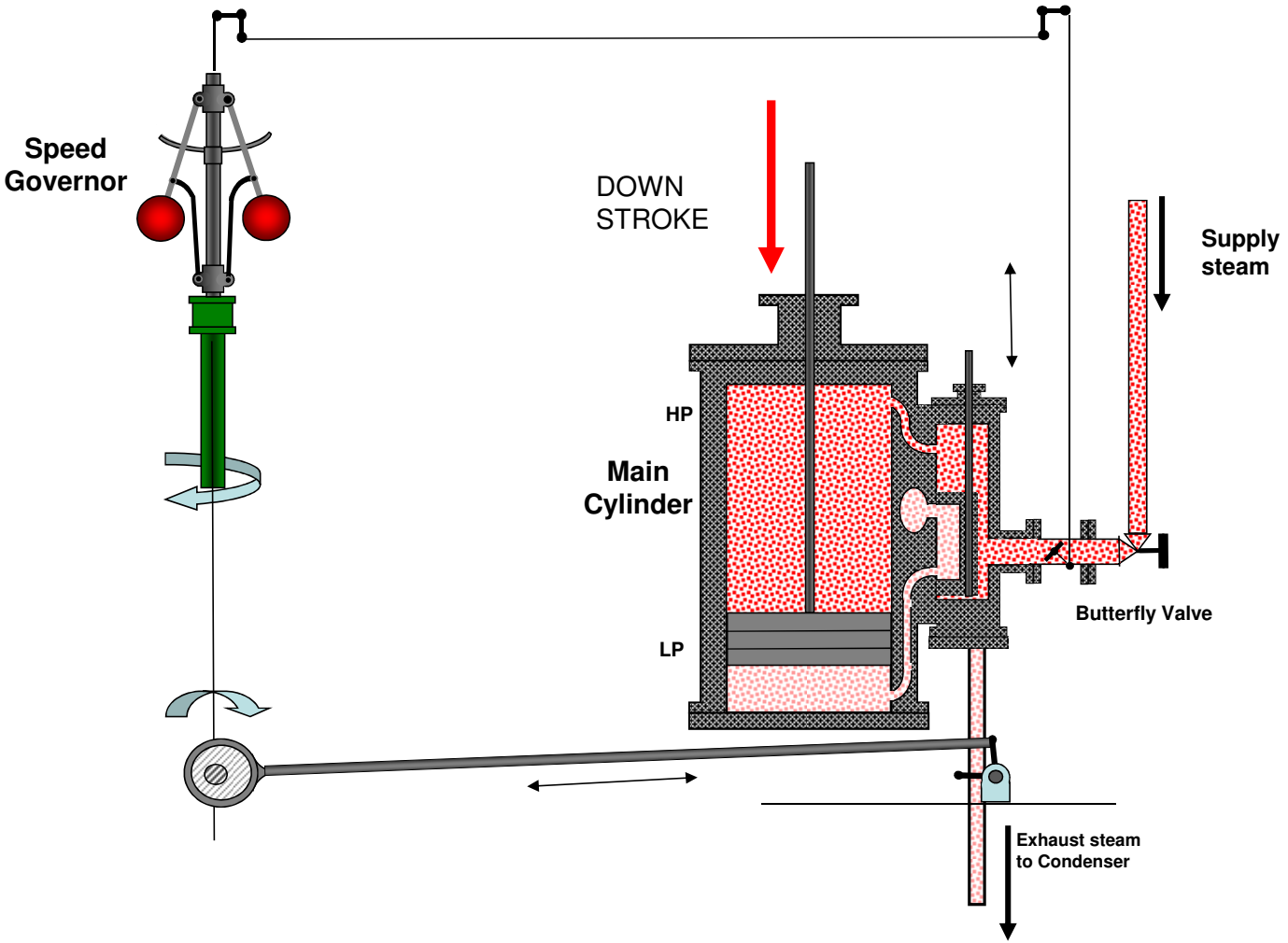

# Beam Engine steam chest




## Beam Engine steam chest




**Beam Engine steam chest**




**Beam Engine steam chest**

Speed Governor

Governor weights rise when speed increases and cause linkage to close the steam butterfly valve

Supply steam

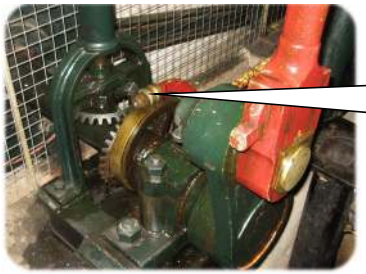
Main Cylinder

Steam chest containing the slide valve

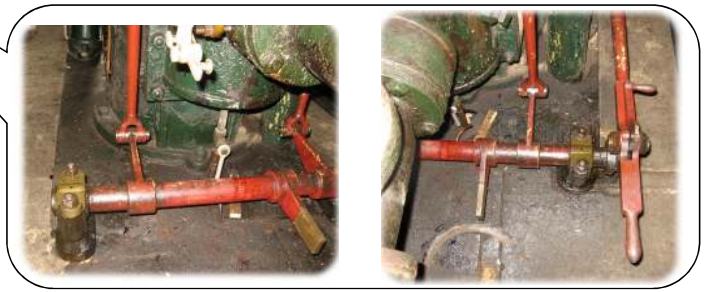
Driven by Crank Shaft

Butterfly Valve

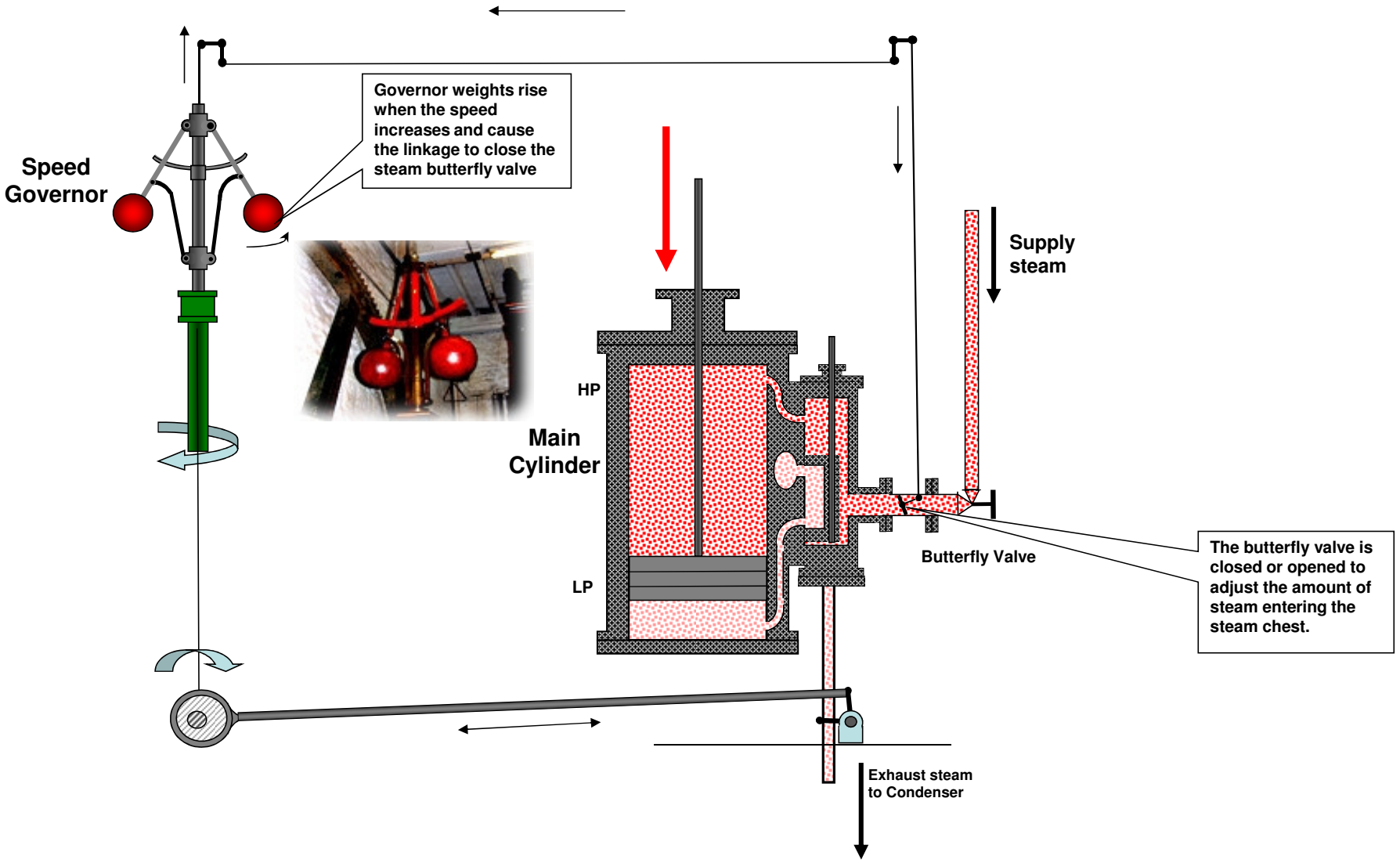
Exhaust steam to Condenser



The eccentric cam causes the rod to move from side to side.
This movement is converted to vertical movement by a crank to raise and lower the steam chest slide valve.

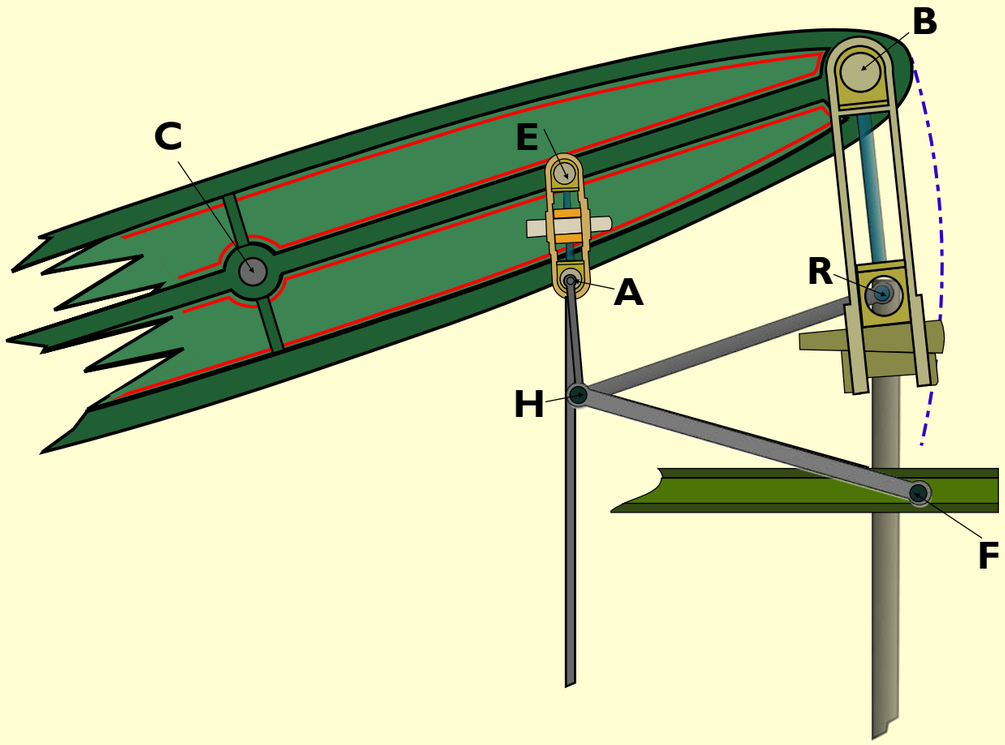


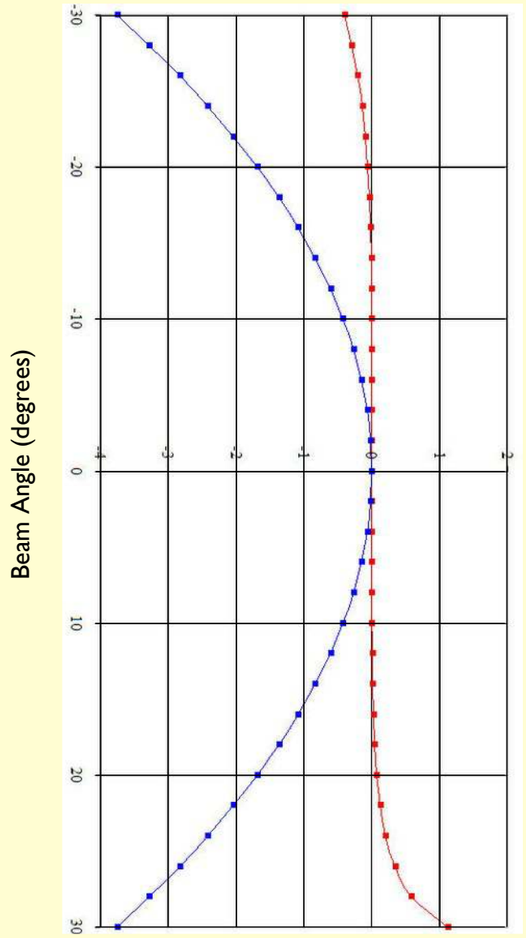
# Beam Engine steam chest

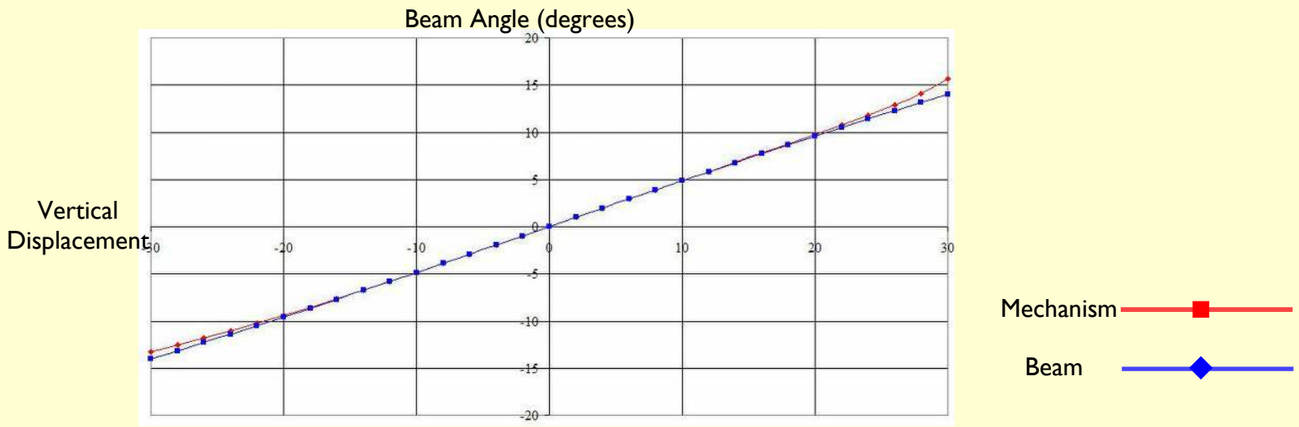



The governor working to control engine speed

# Parallel Motion Link




James Watt was very proud of his parallel motion invention.
The end of the beam [B] moves in an arc and if this was connected directly to the piston rod much damage would be caused to the engine. The parallel linkage compensates for this and the red line in the top graph shows how successful it does this when compared with the movement of the beam shown by the blue line.

# Beam Engine Film Commentary

The beam engine was installed at the Mill in the late 1850s and was possibly made by Thomas Piggott of Birmingham and ensured that the Mill could operate without having to depend on the waterwheel.

It's called a beam engine because the power is transmitted via a massive beam which rocks to and fro'.

Steam for the engine was provided by a Cornish boiler which is a very simple boiler encased in a brick housing. The steam was carried in a large pipe through a butterfly valve to the steam chest on the side of the piston. With the valve open the steam can pass through at a higher rate making the engine work faster. As the valve is closed the rate of steam reduces and slows the engine down.

This strange spinning device is for regulating the speed of the engine should there be a higher of lower load and it moves the butterfly valve to regulate the intake of steam from the boiler.

A slide valve inside the steam chest moves up and down to switch steam alternately to each side of the piston.

Steam is now provided by a modern oil-fired boiler which is situated outside the Mill.

The piston moves up and down and moves the beam which in turn is connected to a crank which makes the flywheel go round. The flywheel is connected to a series of gears and belts which drives the machinery in the workshop.