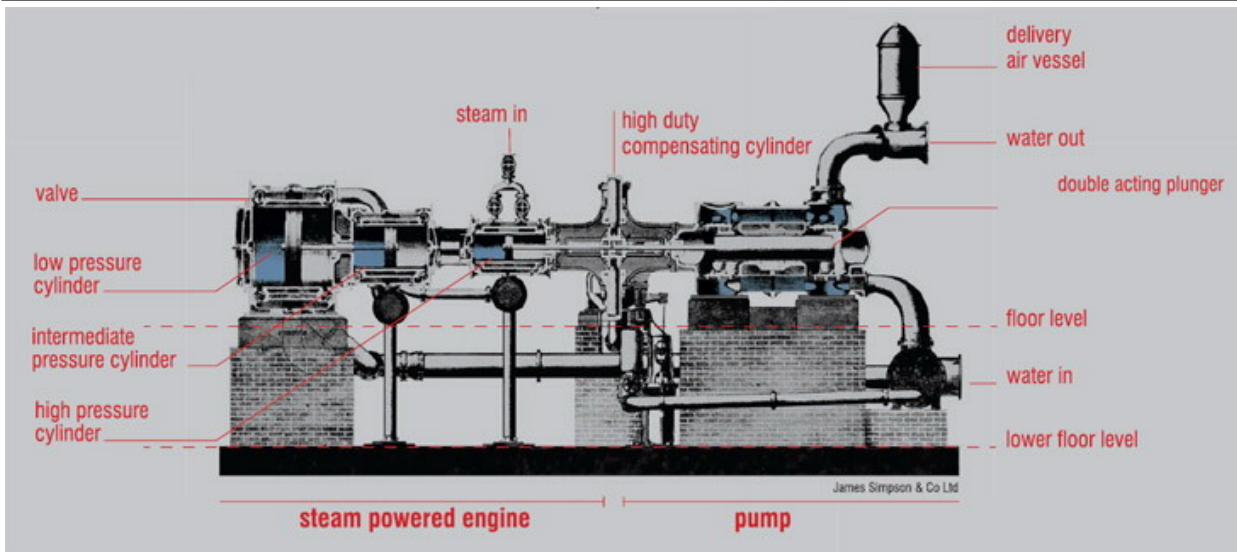


Steam-driven pumping engine, 1905



Description

This is a technical drawing of a Worthington Horizontal Duplex Triple Expansion High Duty Pumping Engine. The diagram shows how steam is taken into the actual engine (at left) and transferred through cylinders to move the fresh water through the pump (at right). Labels have been included to identify features, and the drawing measures 22 cm x 16 cm.

Educational value

- Worthington pumping engines were an important part of the machinery used in the Coolgardie Water Supply Scheme. They were installed in the eight pumping stations constructed as part of the project designed to pipe water about 560 km from a dam near Perth in Western Australia east to WA's arid gold fields. Before the Scheme began operating, lack of fresh water had hindered development of the gold mines and people had died of thirst and disease spread by the insanitary conditions.
- Twenty pumps were required to lift and propel the water along its journey from the better-watered coastal area to the inland gold fields. While the first four of the eight pumping stations each had three Worthington pumping engines, the remaining four stations only needed two each because they were situated in flatter country.
- The latest developments in steam-engine technology at the time were used in the Coolgardie Scheme. The three cylinders on each side of the triple-expansion pumping engine split the steam's expansion into stages to increase efficiency. With less expansion in each cylinder, less heat or energy was lost. There was also a separate cooling or condensing chamber to keep the cylinders hot. Pipes under floor level directed exhausted steam through tubes into a cylindrical shell (bottom right). Water drawn into the pumps passed through the cooling chamber over the tubes, cooling and condensing the steam so that it returned to liquid form.
- This Worthington engine featured a 'High Duty Attachment', an innovation patented by the firm. It was designed to increase engine efficiency by storing the excess power applied to the pistons at the beginning of the stroke or movement,



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when the steam was at its hottest, and transmitting the stored power to the end of the stroke when, because of expansion, the steam pressure was lower. This attachment was sometimes known as a liquid flywheel because it stored the energy by compressing liquid.

- As illustrated by the diagram, a steam-powered pump works by the movement of steam through the engine's cylinders. The steam is applied alternately to either side of a piston, forcing the piston to move backwards and forwards within the cylinder and driving the water plunger in the pump on the right backwards and forwards too. On its backward stroke, the plunger draws in water from a delivery pipe. On its forward stroke, the plunger pumps water into the discharge pipe.
- An ambitious engineering feat, constructing the world's then longest freshwater pipeline in the early 1900s, the Scheme was officially opened in January 1903. It is still in operation today, drawing water from the original dam and using more than half of the original pipes, although electricity has replaced steam to power the pumps.

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