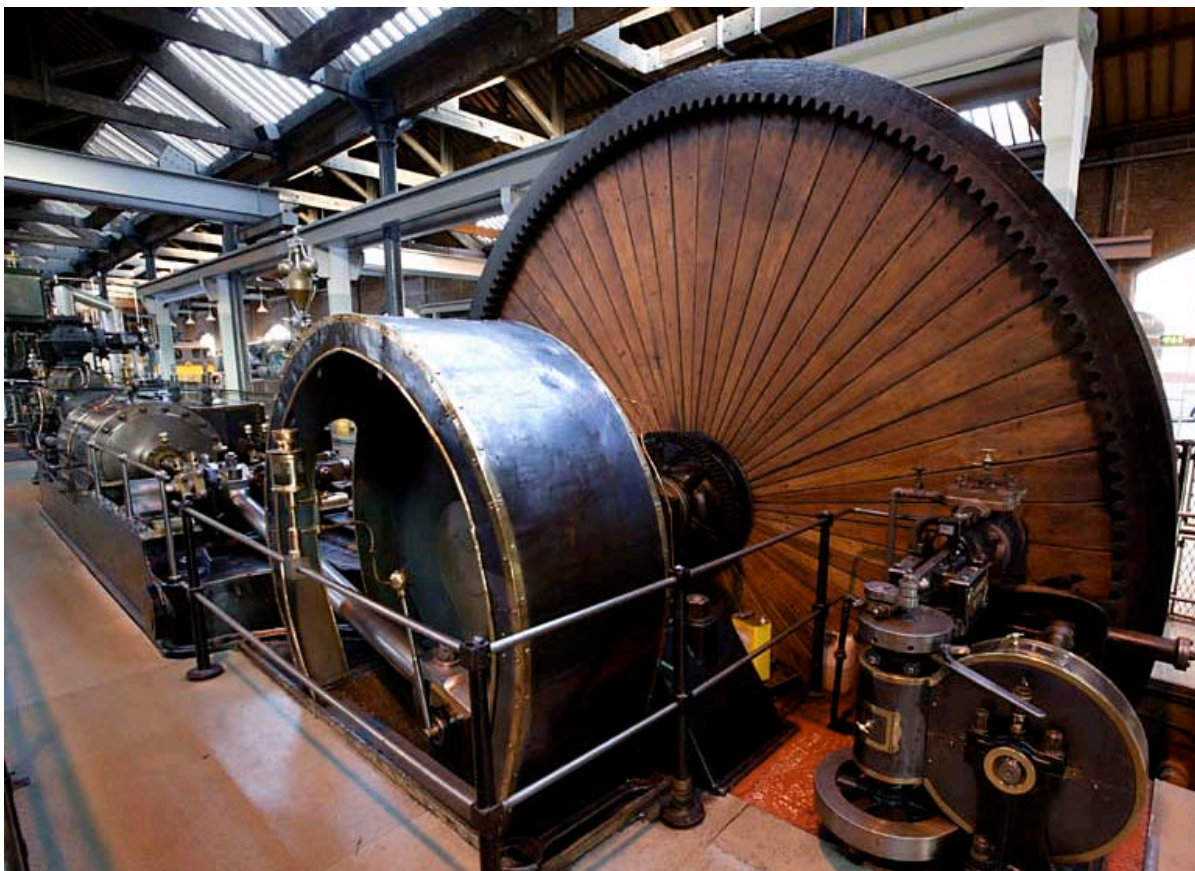


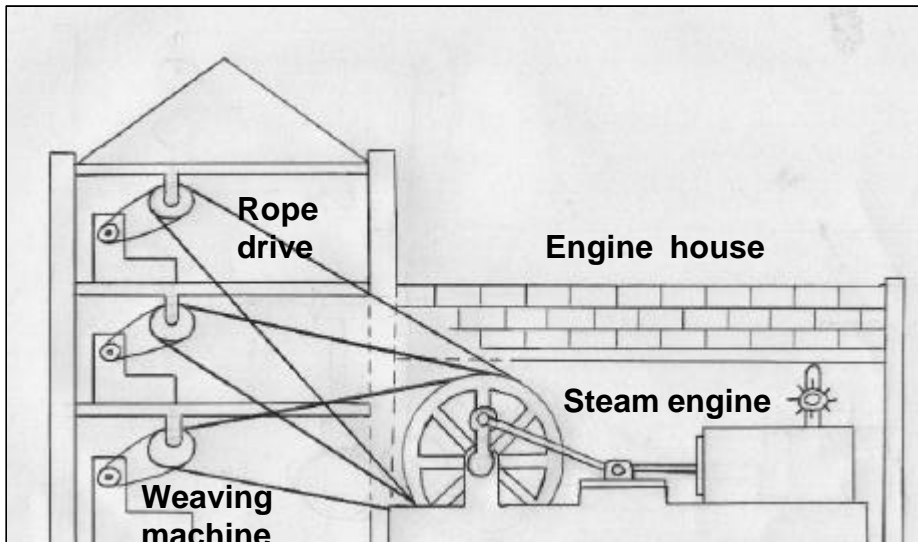
## Firgrove Mill Engine

This steam engine was built by J. & W. McNaught of Rochdale in 1907. It was operated by R. Barnes & Co. at Firgrove Mill, Rochdale, which was a flannelette sheet factory. It replaced a much earlier beam engine and remained in use until 1970. The engine was presented to the Museum by Courtaulds Ltd in 1972. It is a tandem compound engine with a high-pressure cylinder and a low-pressure cylinder, positioned one behind the other in tandem. This distinguishes it from cross-compound engines, such as the Elm Street mill engine, where the high- and low-pressure cylinders are positioned side by side.



Compound steam engines were developed in order to achieve improved efficiency. The basic idea of the compound engine was to use steam more efficiently by allowing it to expand in two or more stages. Firstly, the steam worked the piston in the high-pressure cylinder and was then exhausted to the low-pressure cylinder to work that piston. The low-pressure cylinder has the larger diameter of the two in order to compensate for the drop in steam pressure. Both pistons are connected to one continuous piston rod and to the crankshaft via the cross-head and connecting rod. This converts the back-and-forth motion of the piston into the rotary motion of the flywheel. Each cylinder has inlet and outlet valves to control when the steam enters and leaves it, so that the piston inside is driven backwards and forwards in a reciprocal motion.

Each cylinder has inlet and outlet valves to control when the steam enters and leaves it, so that the piston inside is driven backwards and forwards in a reciprocal motion. The smaller high-pressure cylinder has the American Corliss valves, which were popular from 1880 to 1910. The larger low-pressure cylinder has double slide valves to balance the steam flow between the two cylinders. To control the speed of the engine, a centrifugal governor alters the length of time that the inlet valves are open. If the flywheel rotates too fast, the spheres of the governor are thrown outwards. This reduces the time that the valves are open, thus slowing the engine down.



The flywheel of the Firgrove Mill engine is grooved around its circumference to accommodate 10 driving ropes. These ropes transmitted power to the machinery throughout the mill. This was achieved by having a rotating drive shaft on each floor of the mill. Each machine was connected to the shaft

by a drive belt. The drive shaft on each floor of the mill was connected to the flywheel of a large mill engine on the ground floor either by drive ropes, as in this case, or directly through toothed gears.

#### *Technical Data*

Engine type	Tandem compound condensing engine
Manufacturer	J. & W. McNaught, Rochdale, Lancs.
Date of manufacture	1907
Operator	R. Barnes & Co., Firgrove Mill, Rochdale
Rating	500 horsepower
Speed	80 rpm
Cylinder	15-inch (380-mm) and 31-inch (790-mm) bores; 48-inch (1220-mm) stroke
Steam pressure	180 p.s.i.
Valve type	First stage – Corliss valve Second stage – slide valve
Flywheel	15-foot (4.57-metre) diameter, driving 10 ropes.

#### *For more information:*

<i>Read</i>	Hayes, G. <i>Stationary Steam Engines</i> . Princes Risborough, UK: Shire Publications, 2003.
<i>Visit</i>	Trencherfield Mill, Wigan Pier, Wigan. Queen Street Mill, Burnley.