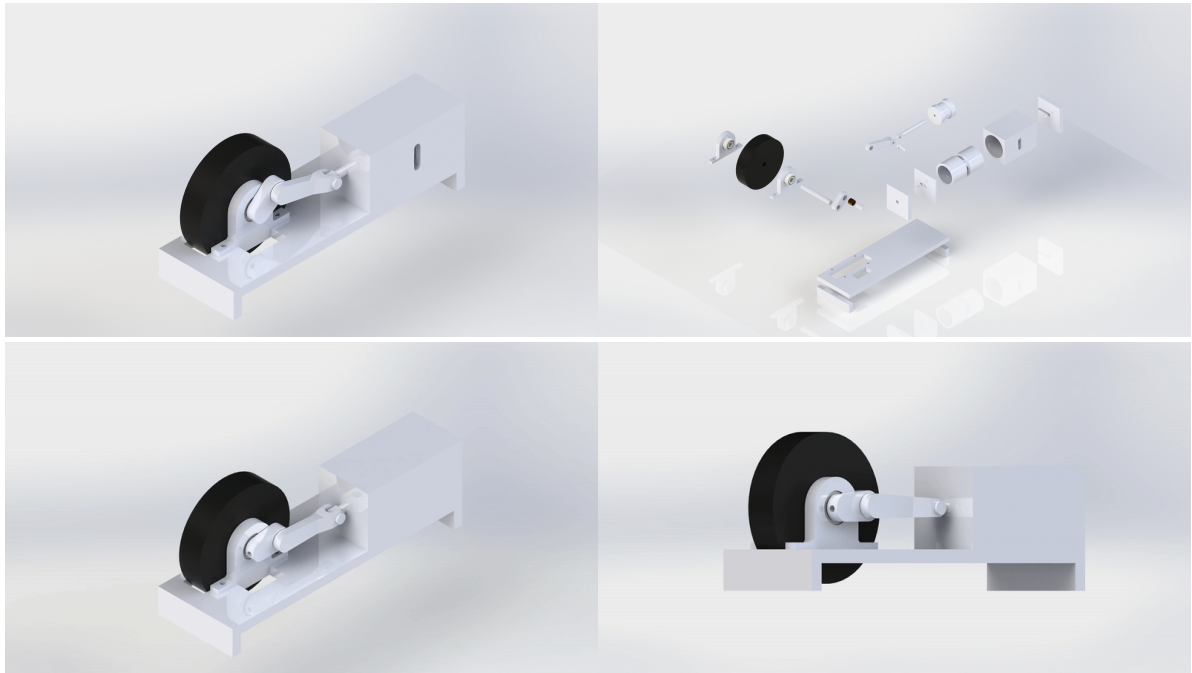


# Greensteam Design Report: Double-acting Uniflow Engine

Tae Rugh, Summer 2020



This is a single-cylinder double-acting uniflow engine with bash valve actuation. The cylinder has steam inlets on both sides, so that while one side is in power stroke, the other is in return stroke. The bash mechanism means that this engine does not need to draw from the shaft's rotation for valve timing, which significantly reduces the complexity and number of moving parts. The drawback is that control of inlet cutoff is severely limited by geometry such that the inlet must be open before top dead center for the same amount of time as it remains open after top dead center. A single uniflow exhaust port is located in the center of the cylinder block and used for both sides.

## Part Breakdown



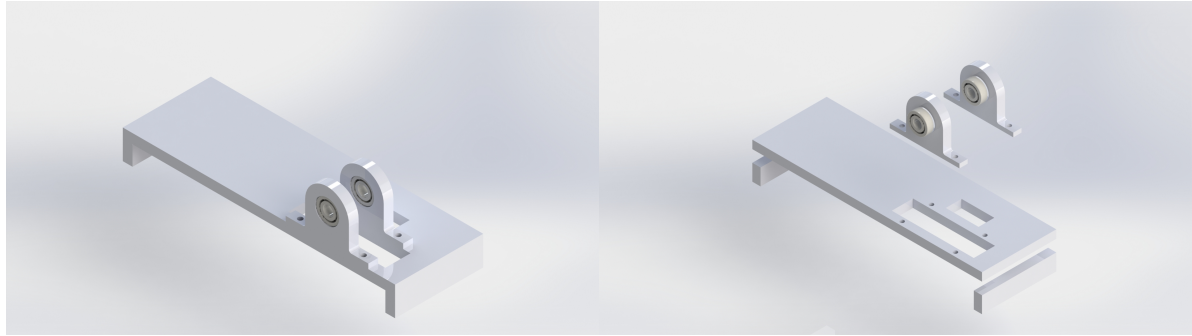
The driveshaft consists of an overhung crank, flywheel, and shaft. The crank is overhung in order to reduce complexities in manufacturing. A bronze bushing is pressed into the crank and holds the crank pin, which is pressed into the piston's connecting rod. The crank is secured to the shaft by a cotter pin. The flywheel is set to the shaft by two set screws, angled at 45°.



The cylinder block includes the piston chamber, uniflow exhaust ports, and bash valves. An inner cylinder sleeve is used to maximize the area for exhaust to escape while maintaining guiding rails to keep the piston aligned. The groove on the inner cylinder allows exhaust exiting through any of the slots to continue to flow out through the exhaust port in the cylinder block. The bash pin sits on the cylinder head and is pushed down by a spring until the piston head forces it open.



Since this engine is double-acting, the piston assembly requires a joint before connecting to the crank. The piston rod, attached to the piston head, moves in a strictly linear reciprocating pattern and is joined via a pin to the connecting rod which is free to rotate in addition to the linear movement. The connecting rod is joined on the other end to the crank pin to transform the reciprocating motion of the piston into rotation.



The base consists of a baseplate, 2 bearing supports, and 2 bar legs. The base plate has 2 cuts in it for the crank and flywheel to pass through. The bearing supports keep the crankshaft aligned and are placed on either side of the flywheel.

## Files

- Master CAD
- Renders