lindsay's TECHNICAL ARCHIVE

Simple Single-Acting Steam Engine

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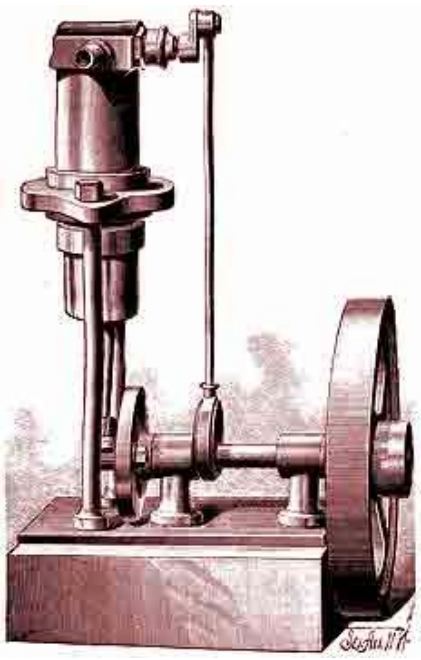
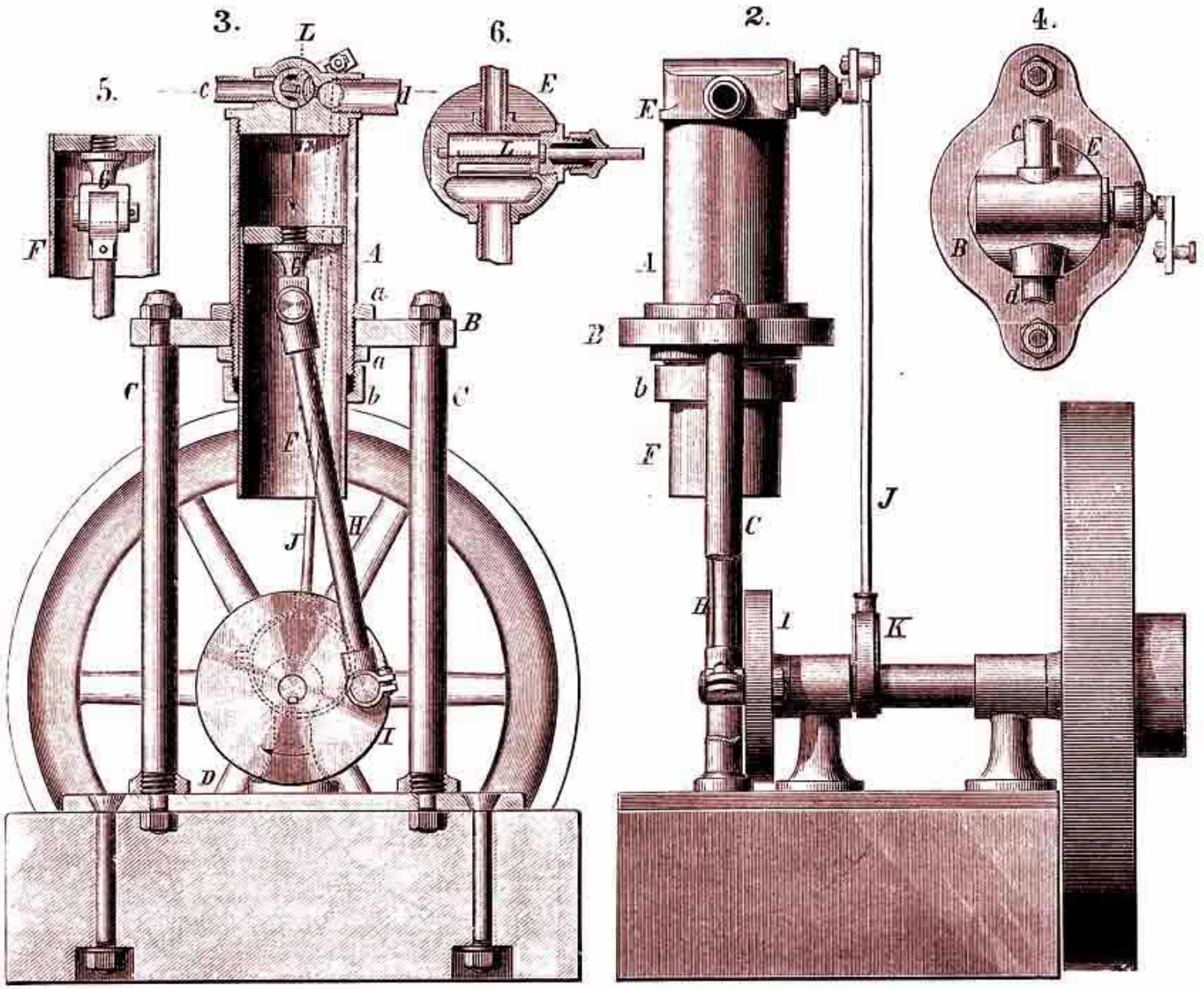


The great bugbear staring the amateur mechanic in the face when he contemplates making a small steam engine is the matter of boring the cylinder. To bore an iron cylinder on a foot lathe is difficult even when the lathe is provided with automatic feed gear, and it is almost impossible with the ordinary light lathe possessed by most amateurs. To bore a brass cylinder is easier, but even this is difficult, and the cylinder, when done, is unsatisfactory on account of the difficulty of adapting a durable piston to it.

The engravings show a simple steam engine, which requires no difficult lathe work; in fact, the whole of the work may be done on a very ordinary foot lathe. The engine is necessarily single-acting, but it is effective nevertheless, being about 1-20 H. P., with suitable steam supply. It is of sufficient size to run a foot lathe, scroll saw, or two or three sewing machines. The cost for materials ought not to cost more than five dollars.

The cylinder and piston are made from mandrel drawn brass tubing, which may be purchased in any desired quantity in New York city. The fittings are mostly of brass, that being an easy metal to work.



The principal dimensions of the engine are as follows:

Cylinder --Internal diameter, 1-1/2 in.; thickness, 1/8 in.; length, 3-5/8 in.

Piston. --External diameter, 1-1/2 in.; thickness, 3/32 in.; length, 3-3/4 in.

Length of stroke, 2 in.

Crank pin --Diameter, 1/4 in.; length of bearing surface, 1/2 in.

Connecting rod. --Diameter, 5/16 in.; length between centers, 5-1/2 in.

Shaft. --Diameter, 5/8 in.; diameter of hearings, 1/2 in.; length, 6 in.; distance from bed to center of shaft, 1-1/2 in.

Flywheel. --Diameter, 8 in.; weight, 10 lb.

Valve --Diameter of chamber, 9/16 in.; length, 1-1/4 in.; width of valve face working over supply port, 3/32 in.; width of space under valve, 3/8 in.; length of the same, 1 in.; distance from center of valve spindle to center of eccentric rod pin, 3/4 in.

Ports, supply. --Width, 1/16 in.; length, 1 in. Exhaust. --Width, 1/8 in.; length, 1 in.; space between ports; 5/16 in.

Pipes. --Steam supply, 1/4 in; exhaust, 3/8 in.

Eccentric. --Stroke, 3/4 in.; diameter, 1-5/16 in.; length of eccentric rod between centers, 8 -3/8 in.

Cut-off, 5/8.

Thickness of base plate, 1/4 in.

Wooden base, 6-1/4 in. x 8 in.; 2-3/8 in. thick.

Thickness of plate supporting cylinder, 3/8 in.

Total height of engine, 13-1/4 in.

Distance from base plate to under side of cylinder head, 9-1/4 in.

Diameter of vertical posts, 9/16 in.; distance apart, 3-1/2 in.; length between shoulders, 6-1/4 in.

Base plate fastened to base with 1/4 in. bolts.

The connecting rod, eccentric rod, crank pin, and shaft, are of steel. The eccentric-strap and flywheel are cast iron, and the other portions of the engine are of brass. The screw threads are all chased, and the flange, a, and head of the piston, F, in addition to being screwed, are further secured by soft solder.

Fig. 1 shows the engine in perspective. Fig 2 is a side elevation, with parts broken away. Fig. 3 is a vertical transverse section. Fig. 4 is a partial plan view. Fig. 5 is a detail view of the upper end of the connectin rod and its connections; and Fig. 6 is a horizontal section taken through the middle of the valve chamber.

The cylinder, A, is threaded externally for 1 inch from its lower end, and the collar, a, 34 inch thick, is screwed on and soldered. The face of the collar is afterward turned true. The same thread answers for the nut which clamps the cylinder in the plate, B, and for the gland, b, of the stuffing box, which screws over the beveled end of the cylinder, and contains fibrous packing filled with asbestos or graphite. The posts, C, are shouldered at the ends and secured in their places by nuts. Their bearing surface on the plate, D, is increased by the addition of a collar screwed on. The posts are made from drawn rods of brass, and need no turning except at the ends.

The cylinder head, E, which is a casting containing the valve chamber, is screwed in. The piston, F, fits the cylinder closely, but not necessarily steam tight. The head is screwed in and soldered, and the yoke, G, which receives the connecting rod pin, is screwed into the head. The connecting rod, H, is of steel, with brass ends. The lower end, which receives. the crank pin, is split, and. provided with a tangent screw for taking up wear. The crank pin is secured in the crank disk, I, by a nut on the back. The eccentric rod, J, is of steel, screwed at its lower end into an eccentric strap of cast or wrought iron, which surrounds the eccentric, K. -

The valve, L, is slotted in the back to receive the valve spindle, by which it is oscillated. The ports are formed by drilling from the outside, and afterward forming the slot with a graver or small sharp chisel. The supply port, for convenience, may be somewhat enlarged below. The holes for the exhaust port will be drilled through the hole into which the exhaust pipe is screwed. The chamber communicating with the exhaust is cored out in the casting.

The easiest way to make the valve to cut it out of a solid cylinder turned to fit the valve chamber.

An engine of this kind will work well.under a steam pressure of 50 lb., and it may be run at the rate of 200 to 250 revolutions per minute.

It is desirable to construct a flat pasteboard model to verify measurements and to get the. proper adjustment of the valve before beginning the engine. -------- * M.

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