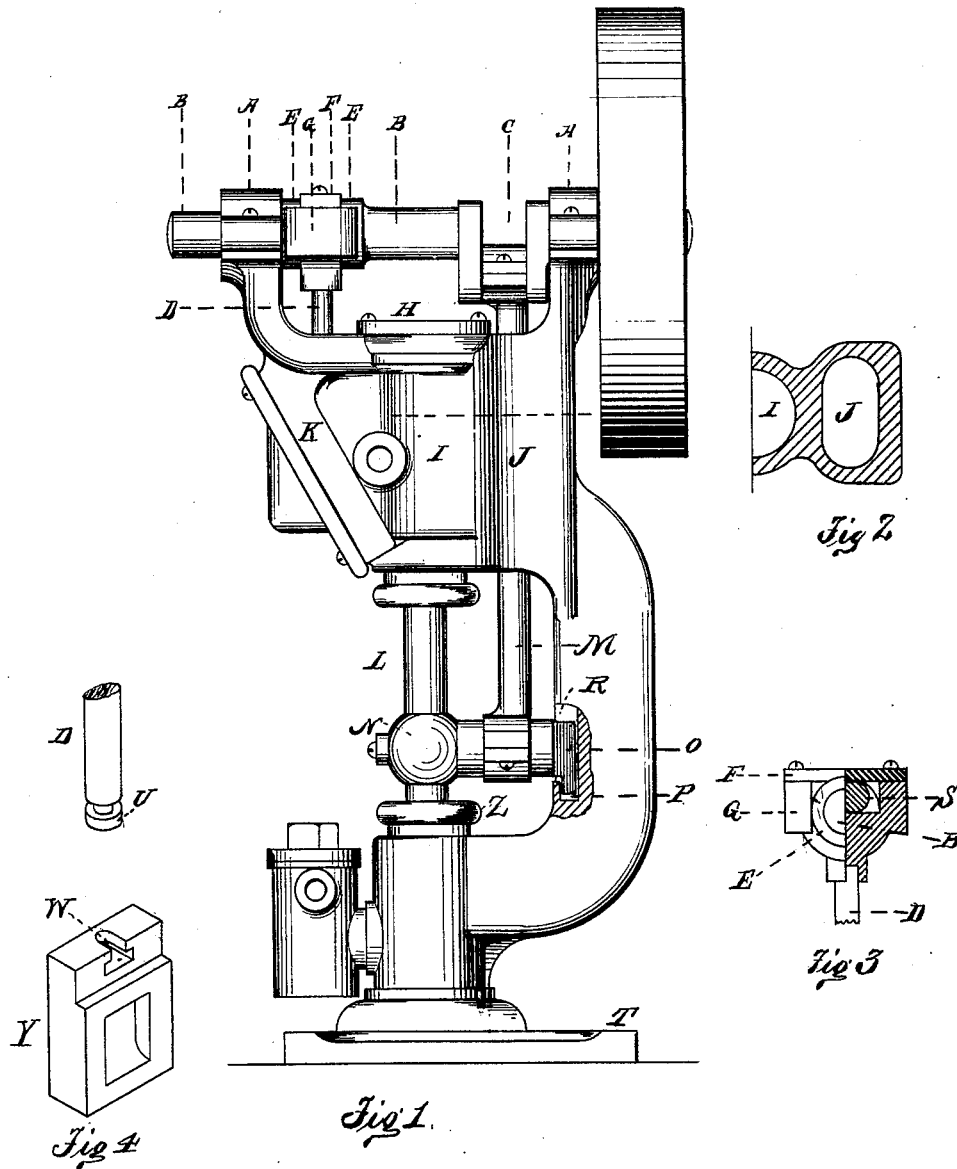


E. COPE & J. R. MAXWELL.
Steam-Engine.

No. 218,666.

Patented Aug. 19, 1879.



WITNESSES:
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UNITED STATES PATENT OFFICE.

EZRA COPE, OF HAMILTON, AND JAMES R. MAXWELL, OF CINCINNATI, OHIO.

IMPROVEMENT IN STEAM-ENGINES.

Specification forming part of Letters Patent No. **218,666**, dated August 19, 1879; application filed May 19, 1879.

To all whom it may concern:

Be it known that we, EZRA COPE, of Hamilton, Butler county, Ohio, and JAMES R. MAXWELL, of Cincinnati, Hamilton county, Ohio, have invented certain new and useful Improvements in Steam-Engines, of which the following is a specification.

Our invention relates to back-acting engines—that is, engines having their cranks and cross-heads located at opposite ends of the cylinders. Such engines can be built very compactly; but, as heretofore constructed, it has been found necessary to have the crank outside the main bearings, resulting in a cross-head journal so far from the central line of the engine that vicious strains were exerted upon the piston-rod. These strains are so undesirable that a second connecting-rod has been added in many cases to neutralize them. In engines of this class a complex back-acting valve-operating device has been required, owing to the lack of room for an eccentric-rod between the shaft and front end of the steam-chest.

The attachment of the valve to the stem has also proven a source of trouble. In most every form of attachment there is something upon the end of the valve-stem which must be removed before the valve can be taken out, and in many cases the stem itself must be taken out before the valve can leave the chest.

When it is remembered that nuts, collars, &c., often get rusted so tightly upon the valve-stem that they must be cut for removal, it will be apparent that any improvement is well worth consideration.

The object of our invention is to so construct a back-acting engine that the crank may be inside or between the main bearings, and the connecting-rod be between the piston-rod and the cross-head guide, to allow the connecting-rod to journal upon the cross-head close to the piston-rod; to so arrange the parts that the piston-rod may form the real guide, by being exempted from excessive side strain; to devise a form of parallel motion for the valve-stem, which will allow us to dispense with a back-acting valve motion; to devise a valve attachment which will allow the valve to be removed without disturbing the stem or the stem attachments, and also allow the stem to be removed without the necessity of removing attachments within the

steam-chest, which might corrode and cause trouble.

Our invention consists in casting a tube alongside the cylinder, a prolongation of one side of the tube supporting a main bearing, while a prolongation of the other end of the tube supports or forms the guide; of a parallel-motion device, consisting of a slotted yoke driven by a crank or eccentric, provided with side flanges, guided by concentrics formed on the crank or eccentric; and of a slide-valve having a mortise in its face, in combination with a valve-stem having its end formed to fit the valve-mortise.

In the accompanying drawings, Figure 1 is a side elevation of our improved engine; Fig. 2, a horizontal section of the tube and part of the cylinder; Fig. 3, an elevation and half-section of the valve-driving device; and Fig. 4, a perspective view of the valve and the end of the valve-stem.

In Fig. 1, I is the cylinder, with the main bearings A cast above it. These bearings might be attached to the cylinder-head H and removable with it; but such a construction permits all adjustment of length to be destroyed by unskillful packing of the cylinder-head joint. Alongside the cylinder is cast the tube J, sufficiently large to allow the connecting-rod M to vibrate properly. The outer side of the tube is prolonged to support the main bearing, and the lower end is prolonged to form the guide. The piston-rod is prolonged beyond the cross-head, and slides in the guide Z. To prevent twisting, the cross-head is guided by the cross-head guide R, formed in the reach which connects the guide Z with the cylinder.

It will be seen that the connecting-rod takes hold of the cross-head close to the piston-rod, and that the office of the guide R is simply to prevent twist. The lower piston-rod guide, Z, may, if desired, be caused to form a pump, as is shown in the drawings. The engine may thus operate its own feed-pump, or it may be proportioned as a donkey pumping-engine.

The steam-chest is at K, and the valve-stem D, projecting from its top, is driven by an eccentric turned in the main shaft. There being no room for an eccentric-rod, we arrange a slotted yoke upon the eccentric, as shown in Fig. 3.

This yoke is furnished with side flanges, G, which bear upon concentrics E upon the main shaft. These concentrics properly guide the yoke in its motion. If desired, the concentrics E may have blocks upon them, in which they may revolve, and thus present flat wearing-surfaces to the yoke-flanges.

The slide valve Y is provided with a T-shaped mortise in its face, as shown at W, Fig. 4. This mortise fits over a button turned on the end of the valve-stem, as shown, and permits the valve to be lifted from the steam-chest without removing the stem. After the valve is out the stem may be withdrawn without the necessity of unscrewing anything within the steam-chest.

The drawings show this engine as vertical and standing upon the base T. It may, of course, be inclined or horizontal, in which case the proper base is located upon one side of the cylinder or reach, and the base T dispensed with.

We claim as our invention—

1. In a back-acting engine, the combination, with the steam-cylinder, of the side tube, J, having its upper end formed into a main shaft-bearing outside the crank, and having a lower portion prolonged to support a lower piston-rod guide, substantially as set forth.

2. In a back-acting engine, the combination, with the cylinder, of the side tube, J, having its upper end formed into or supporting a main shaft-bearing outside the crank, and having a lower portion prolonged to form a cross-head guide, R, substantially as set forth.

3. The eccentric S and concentrics E, combined with a slotted yoke having side flanges, G, guided by said concentrics, substantially as set forth.

EZRA COPE.

J. R. MAXWELL.

Witnesses:

THOS. McFEELY,

J. W. SEE.