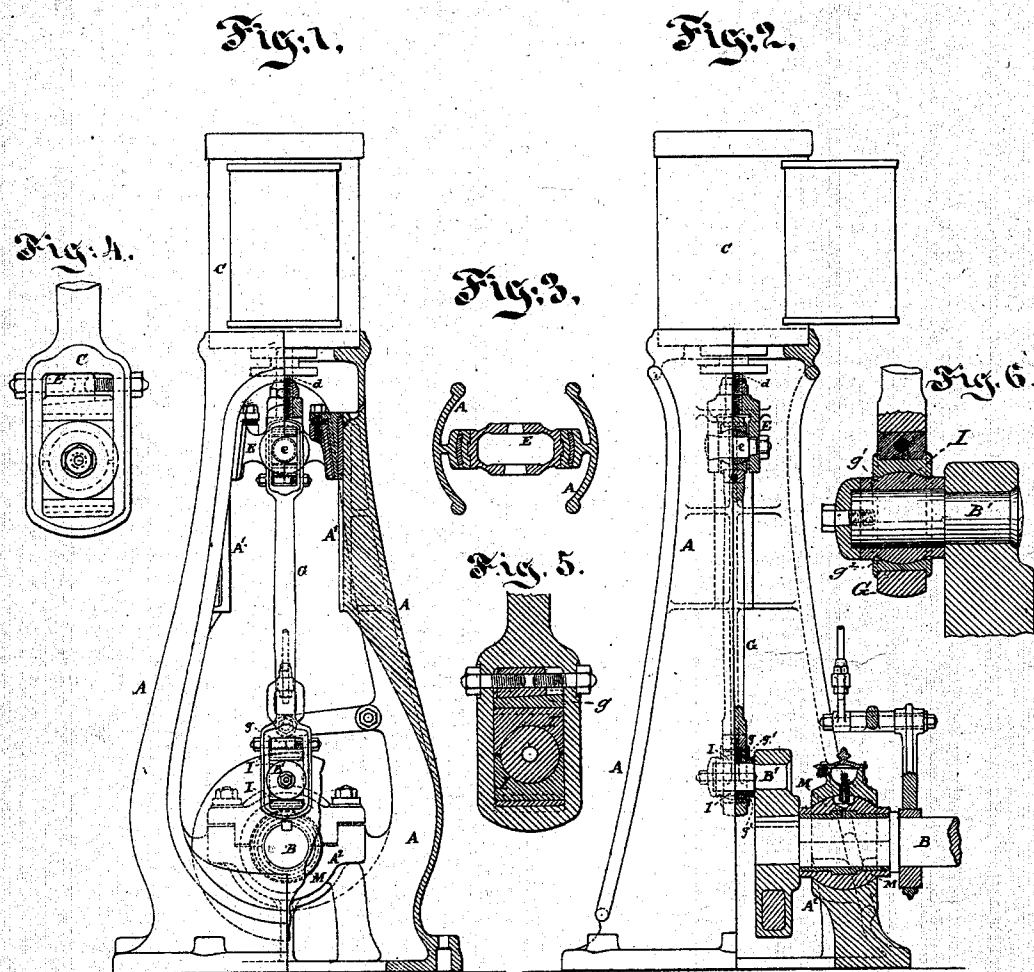


G. H. BABCOCK & S. WILCOX.
Steam-Engines.

No. 139,448.

Patented June 3, 1873.



Witnesses:

Arnold Hornum.
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Inventors:

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UNITED STATES PATENT OFFICE.

GEORGE H. BABCOCK, OF PLAINFIELD, NEW JERSEY, AND STEPHEN WILCOX, OF BROOKLYN, NEW YORK.

IMPROVEMENT IN STEAM-ENGINES.

Specification forming part of Letters Patent No. **139,448**, dated June 3, 1873; application filed November 7, 1872.

To all whom it may concern:

Be it known that we, GEORGE H. BABCOCK, of Plainfield, Union County, New Jersey, and STEPHEN WILCOX, of Brooklyn, Kings County, New York, have invented certain Improvements relating to Steam and Gas Engines, of which the following is a specification:

We will describe the invention as applied to an upright steam-engine, having the cylinder above the crank. We provide more efficiently and conveniently than usual for the successful operation of the parts when considerably out of line. The following is a description of what we consider the best means of carrying out our invention.

The accompanying drawings form a part of this specification:

Figure 1 is a front elevation, partly in section; Fig. 2 is a corresponding side elevation, also partly in section; and Fig. 3 is a horizontal section in the plane of the cross-head. This figure shows only the parts which lie in the plane of section. Figs. 4, 5, and 6 represent certain parts on a large scale. Fig. 4 is a side elevation of the lower stub end; Fig. 5 is a vertical section of the same; and Fig. 6 is a vertical section of the same at right angles to the last.

Similar letters of reference indicate like parts in all the figures.

A is the rigid frame-work; B, the main shaft; and B' the crank-pin. C is the cylinder; *d*, the piston-rod; E, the cross-head, and G the connecting-rod. Directing attention to the crank-pin B' and the adjacent part of the connecting-rod G, it will be observed that the stub end, the enlarged part of the connecting-rod, is provided with a tapering cross-key, *g*, with adjusting means adapted to compress together and hold firmly a pair of cheeks having their inner faces bored cylindrically, as indicated by *g*¹ *g*². These nicely-finished, hollow, cylindrical faces, properly lubricated, press against correspondingly cylindrical surfaces, which form the outer faces of the boxes or brasses I I, which fit around the crank-pin B'. These brasses, when fitted upon the crank-pin, present a true cylindrical form, at

right angles to the axis of the crank-pin B', and the length of the cylinder being just sufficient to fit nicely within the stub end, or the plane-enclosing surfaces formed in the connecting-rod. The construction of the brasses I I and of the adjacent parts affords broad bearings, easily lubricated and kept in order, to allow the connecting-rod to adjust itself or vibrate thereon if the main shaft gets out of line, while the forms are easily produced with ordinary tools, and the brasses and cheeks may be easily taken out and exchanged or adjusted. The other end of the connecting-rod, though of less importance, because the motion there is less, is similarly constructed. It follows that the crank-pin may change its position in various directions without causing any oblique strain or tendency to heat in the bearings. We have provided, in connection with the above, means for allowing the entire cross-head, with the connected piston-rod and piston to turn round a little within its slides, in case the main shaft should get out of line laterally, so as to cause the crank to traverse in a plane oblique to its proper position. It will be understood that the brasses with cylindrical surfaces are not a full equivalent to spherical brasses. They are equivalent in allowing freely and properly for motion in one plane, but not like spherical brasses for a motion in every direction. We provide means whereby the cross-head E, and consequently the connecting-rod and its bearings, at both ends, may adapt themselves to any change in the plane of the crank. This is secured by making the slide bearings at the ends of the cross-head cylindrical, and correspondingly finishing the slides A' by simply boring them with a cutter set at a corresponding radius. To effect this latter, the boring-bar is mounted with its axis in the line to be subsequently occupied by the piston-rod; and after the slides are bored the cross-head is put in position with its outer faces made to form portions of a corresponding upright cylinder; and on setting its faces out properly to their bearings the cross-head is efficiently guided and supported against the severe oblique strains of

the connecting-rod, while it is free to turn itself in the horizontal plane to any extent desired in order to correspond in position with the plane of the crank. The above peculiarities of the bearings of the cylindrically-constructed boxes at both ends of the connecting-rod and the freely-rotating or self-adjusting piston and cross-head form, in combination, a device which our experiments indicate constitutes a perfect and enduring arrangement, adapted to allow for all possible distortion in the position of these parts alone. We provide also, in connection therewith, for properly supporting the main-shaft bearings, so that they may also work perfectly when greatly out of line. We make the eccentric in the ordinary manner and inclose it with an eccentric strap fixed to the rod as usual, but we give a spherical form to the entire bearing surface of the eccentric and concave the interior of the strap to match. We consider this construction of the eccentric and strap simply analogous to the long-known spherical crank-pin and concave boxes. The main-shaft bearings require more description. We construct each bearing with brasses having a cylindrical interior fitted to the ordinary cylindrical surface of the shaft-bearing, and with a partially spherical exterior. These boxes require to be spherical. Cylindrical bearings, like those described for the connecting-rod, would not serve here, because there is no corresponding condition in any other parts to that provided by the turning of the piston and cross-head. The main-shaft bearings are liable to get out of line with each other, either in the horizontal or in the vertical plane, or in various oblique positions between. Our brasses for the main shaft are marked M. Portions of their exteriors are perfectly spherical, and they are made to form a zone of a width greater than the correspondingly-bored seat therefor in the pedestals A².

It will not be usually necessary to pro-

vide for more than a very slight wobbling motion of the boxes, and we can provide very perfectly for more than will be ever required. The several parts may be varied considerably, and in other respects than the features here specifically referred to may be constructed and arranged in any ordinary or suitable manner. A very successful substitute for the turning of the whole cross-head would be to swivel the jaw carrying the bearing or pin *e* alone, constructing it separately from the cross-head E and properly mounting it therein. It is evidently sufficient if the bearing *e* is capable of turning a little, whether the entire cross-head turns or not; but we prefer the exact construction represented.

We claim as our invention—

1. The boxes or brasses I I, forming a cylinder at right angles to the crank-pin, fitted upon the same and inclosed within cheeks *g*¹ *g*² formed and adjusted in the connecting-rod G, as and for the purposes specified.

2. The combination of the universal-joint bearing on the main shaft B, with the universal-joint bearing on the crank, and with the turnable cross-head bearing *e*, so as to form a complete engine, adapted to work perfectly when out of line in any and all directions, as specified.

3. The combination of a spherical eccentric with the universal-joint bearing on the main shaft B and the universal-joint bearing on the crank-pin, substantially as and for the purposes specified.

In testimony whereof we have hereunto set our hands this 28th day of August, 1872, in the presence of two subscribing witnesses.

GEO. H. BABCOCK.
STEPHEN WILCOX.

Witnesses:

A. HÖRMANN,
WM. C. DEY.