

(No Model.)

E. J. MULLER.

PISTON ROD AND CROSS HEAD CONNECTION.

No. 555,656.

Patented Mar. 3, 1896.

Fig. 1.

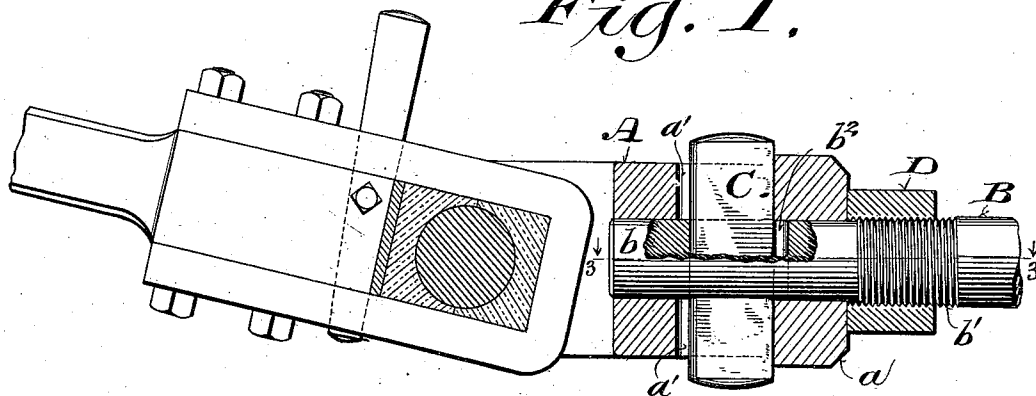


Fig. 2.

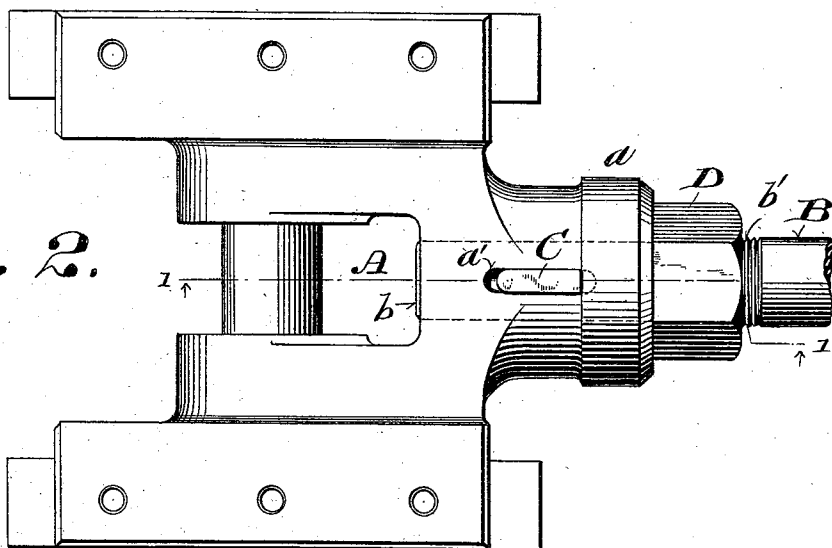
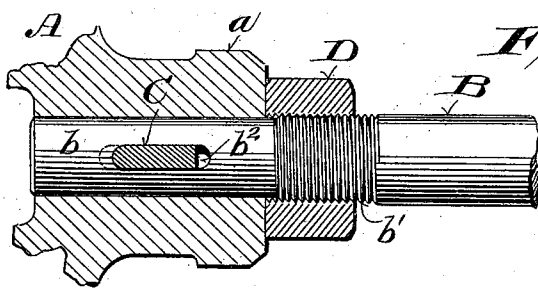


Fig. 3.



Witnesses:

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UNITED STATES PATENT OFFICE.

ERNST J. MULLER, OF BUTTE, MONTANA.

PISTON-ROD AND CROSS-HEAD CONNECTION.

SPECIFICATION forming part of Letters Patent No. 555,656, dated March 3, 1896.

Application filed August 8, 1895. Serial No. 558,576. (No model.)

To all whom it may concern:

Be it known that I, ERNST J. MULLER, of Butte, in the county of Silver Bow and State of Montana, have invented certain new and useful Improvements in Piston-Rod and Cross-Head Connections; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

The main objects of my invention are to avoid unduly straining and weakening the piston-rod in connecting it by a key with the cross-head, and to facilitate the attachment and detachment of the piston-rod to and from the cross-head.

It consists essentially of a cross-head having a plain longitudinal bore or straight hole, a piston-rod having one end fitted in said bore, and a transverse keyway through it, a key without taper fitted loosely in said keyway, and means of forcing the piston-rod and cross-head in opposite directions and holding them in engagement with opposite edges of said key.

In the accompanying drawings like letters designate the same parts in the several figures. Figure 1 is a longitudinal section of a cross-head and piston-rod attachment embodying my invention. Fig. 2 is a plan view, and Fig. 3 a longitudinal section at right angles to that shown in Fig. 1, of the device.

Heretofore it has been customary to secure piston-rods which are formed with tapering ends and keyways for the purpose in tapering bores of the cross-heads by means of tapering keys, which are driven into place by a hammer. By this means of attachment the piston-rod is frequently strained between the ends of the keyway nearly if not quite to the point of rupture by driving the key into place, the force employed in the operation being indeterminate and usually excessive, varying of course according to the weight of the hammer and the strength and judgment of the operator.

To avoid the objection to the above-explained method of attachment, piston-rods have been threaded and screwed into the cross-heads; but as the pistons are usually

secured to their opposite ends and placed in their cylinders before the piston-rods and cross-heads are connected this method of attachment is objectionable, because it involves turning the pistons in their cylinders, which in the case of a large and heavy engine or pump is a laborious and inconvenient operation. I avoid these objections by my improved means of attachment.

Referring to the drawings, A designates a cross-head having a hub *a* with a straight longitudinal bore and an intersecting transverse slot or keyway *a'* without taper.

B designates a part of a piston or pump rod, having a reduced end *b* fitted into the bore of the cross-head, a screw-thread *b'* on the adjacent unreduced portion, and a straight transverse slot or keyway *b²* through the reduced end.

C is a straight key loosely fitted in the keyways *a'* and *b²* of the cross-head and piston-rod respectively.

D is a nut tapped to fit the screw-thread *b'* on the unreduced portion of the piston-rod and adapted to be turned thereon against the end of the hub *a*, and to force and hold opposite ends of said keyways in engagement with opposite edges of the key C. It is obvious that by this means the piston-rod and cross-head can be readily connected and disconnected without turning the piston-rod, and that the key can be secured in place with much less liability of straining and weakening the piston-rod than by driving a tapering key into place, the force applied through a wrench for turning the nut D being susceptible of much more accurate determination and regulation than the force applied by the blows of a hammer for driving a tapering key into place.

My improved connection also facilitates the fitting of the piston-rod, and enables me to readily compensate for variation in the distance between the centers of the crank-pin and cross-head pin, due to taking up wear of the crank-pin brasses, an operation that tends to lengthen or shorten the connecting-rod, and thereby reduce the clearance of the piston in one end of the cylinder and increase it in the other.

In building engines according to the usual practice all parts are made and finished ex-

actly to given dimensions before they are assembled, with the exception of the length of the piston-rod, the measurement for which in each case is accurately made after the parts have been assembled. In this way the unavoidable variation in the distance between the center of crank-pin and cylinder, due to unequal shrinkage of castings and inaccuracies in workmanship, is taken into account and provided for in fitting the piston-rod in the cross-head and cutting the keyway, operations requiring a high grade of skill and workmanship. With my construction the fitting required to compensate for the variations above noted is confined to the key, and no more skill is required in fitting the piston-rod to the cross-head and cutting the keyway therein than in the construction of other parts of the engine. The keyway being made of sufficient length, the measurement for the key is taken, when the parts have been assembled as above explained, from the outer end of the keyway to the opposing face of the cross-head. If a mistake is made in this measurement or in fitting the key, it is a simple and easy matter to make another. In fitting the piston-rod and making the connection between it and the cross-head according to methods usually followed allowance is frequently made for the lengthening or shortening of the connecting-rod by making the clearance of the piston at one end of the cylinder greater than at the other. This is obviously objectionable and tends to unnecessarily increase the clearance-space. By my improved connection the clearance of the piston at both ends of the cylinder may be made exactly the same at the outset, and thus the clearance-space can be reduced to a minimum. As the connecting-rod is lengthened or shortened by taking up wear on the brasses, thus

disturbing the adjustment of the piston, a new key can be easily substituted that will compensate for the variation and maintain the proper adjustment of the piston.

I claim—

1. The combination of a cross-head having a longitudinal bore or hole, a piston-rod having one end fitted into said bore and formed with a transverse keyway, a key without taper loosely fitting said keyway, and means applied to said piston-rod of clamping the key between one end of the keyway in said rod and an opposing face of the cross-head, substantially as and for the purposes set forth.

2. The combination of a cross-head having a straight longitudinal bore or hole, a piston-rod having a reduced end fitted therein and formed with a transverse keyway, a key without taper loosely fitting said keyway and a nut threaded on the unreduced portion of the piston-rod and adapted to be screwed thereon against the cross-head, substantially as and for the purposes set forth.

3. The combination of a cross-head having a straight cylindrical bore and an intersecting keyway, a piston-rod having a reduced end fitted in said bore and formed with a transverse keyway, a straight key without taper loosely fitting the keyway in said piston-rod, and a nut threaded on the unreduced portion of said piston-rod and adapted to be screwed thereon against the cross-head, substantially as and for the purposes set forth.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

ERNST J. MULLER.

Witnesses:

WILLIAM TODD,
B. C. W. EVANS.