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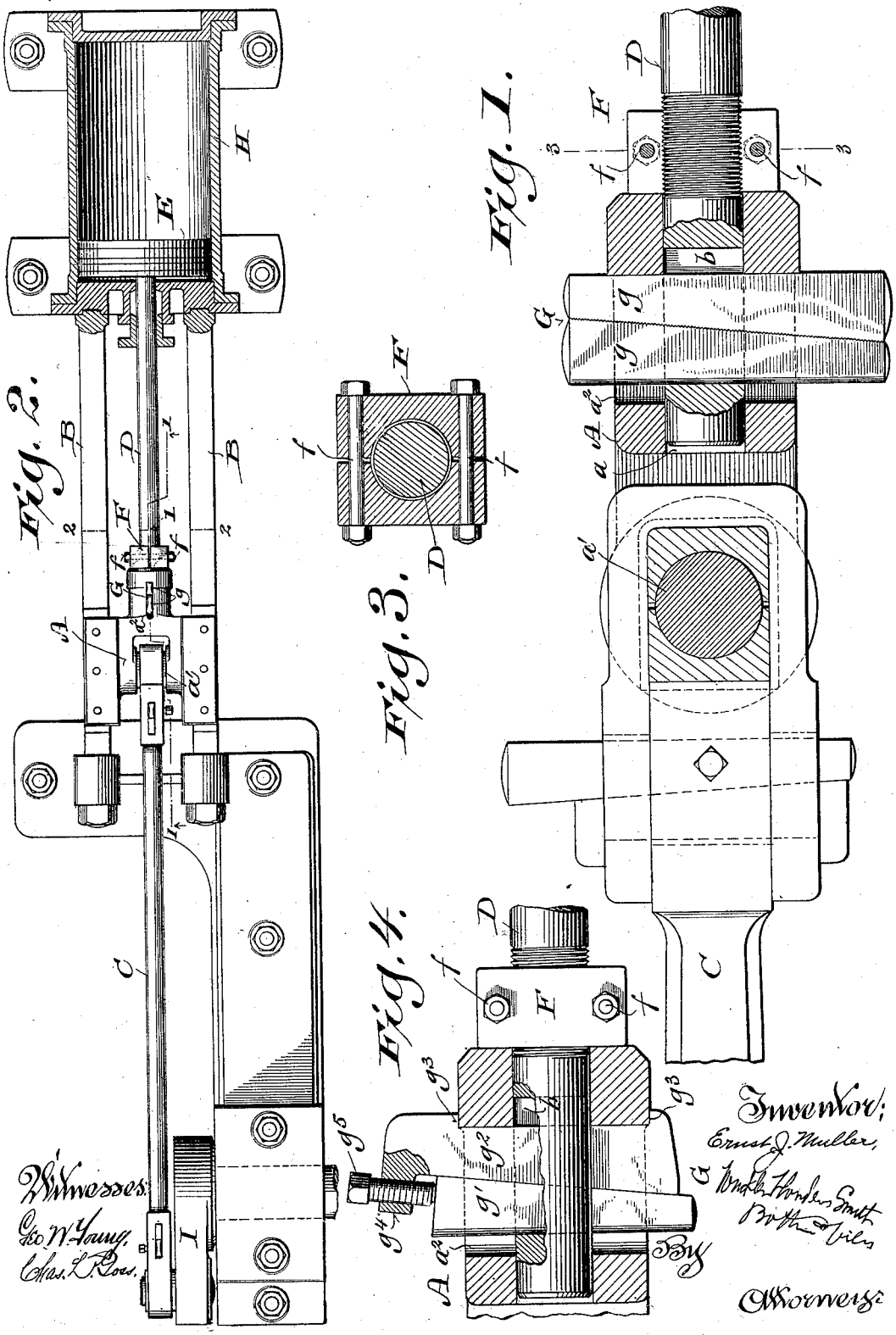
E. J. MULLER.

PISTON ROD AND CROSS HEAD CONNECTION.

(Application filed June 10, 1896.)

(No Model.)



UNITED STATES PATENT OFFICE.

ERNST J. MULLER, OF BUTTE, MONTANA.

PISTON-ROD AND CROSS-HEAD CONNECTION.

SPECIFICATION forming part of Letters Patent No. 647,020, dated April 10, 1900.

Application filed June 10, 1896. Serial No. 594,981. (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 straining and weakening a piston-rod in connecting it with a cross-head, to facilitate the attachment and detachment of the piston-rod to and from the cross-head, and at the same time to provide for and facilitate the adjustment of the piston-rod and cross-head connection, whereby wear on the crank-pin brasses and the consequent lengthening or shortening of the connecting-rod may be compensated for and the clearance of the piston in the cylinder reduced to and maintained at a minimum.

It consists, essentially, of a cross-head having a plain bore, a piston-rod having one end fitted in said bore and a transverse keyway through it, a key adjustable in width having its opposite working edges parallel with each other, and means of forcing the piston-rod and cross-head in opposite directions and holding them in engagement with opposite edges of said key, besides certain novel details hereinafter particularly described, and pointed out in the claims.

In the accompanying drawings like letters designate the same parts in the several figures.

Figure 1 is a vertical longitudinal section on the line 1 1, Fig. 2, of a cross-head and piston-rod connection embodying my improvements. Fig. 2 is a plan view, on a reduced scale, of the connection as applied to an engine, pump, or compressor. Fig. 3 is a cross-section, on an enlarged scale, on the line 3 3, Fig. 1, of the clamping-nut employed on the piston-rod; and Fig. 4 is a view similar to Fig. 1 of a modified form of the device.

My improvements relate to a connection of the kind and for the general purpose of that shown in United States Patent No. 555,656, granted to me March 3, 1896; and they are designed, in addition to the attainment of the objects and advantages set forth in my said patent, to facilitate the adjustment of the connection, to compensate for irregularities in the shrinkage of castings, inaccuracies of workmanship, and the lengthening or shortening of the connecting-rod occasioned by taking up wear on the crank-pin brasses without refitting the key or providing keys of different widths. This is of special importance in the manufacture and operation of compressors, particularly those designed to produce high pressures, in which it is essential that the clearance-space be reduced to and maintained at a minimum.

Referring to the drawings, A designates a cross-head of an engine, pump, or compressor adapted to slide in the usual way upon guide-rods B B, parallel with the piston-rod. The cross-head is formed with a straight longitudinal bore *a* and is provided with a cross-pin *a'*, to which one end of the connecting-rod C is pivoted.

D is the piston-rod, secured at one end in the usual or any suitable manner to the piston E and fitted at the other end in the bore *a* of the cross-head. A transverse keyway *b* is formed through this end of the rod, which is provided adjacent thereto with a screw-thread and a clamping-nut F. The cross-head A is also formed with a keyway a^2, corresponding with the keyway *b* in the piston-rod.

G is an adjustable key composed of two tapering parts *g g*, the outer edges of which are parallel when their inclined edges are placed together, as shown in Fig. 1. The inclined edges of the parts *g g* are formed with corresponding teeth which hold one part from slipping upon the other. These teeth may be made of a certain width and the parts of the key of a certain taper, so that moving one part of the key upon the other the distance of one or more teeth will increase or diminish the width of the key a determinate amount. For instance, if each part of the key is tapered one-eighth of an inch to the inch, and it is provided with eight teeth to the inch, moving one part upon the other the distance of one tooth will increase or diminish the width of

the key one sixty-fourth of an inch. By providing the parts of the key with teeth they can be made more tapering and shorter than they could be if their contiguous edges were made straight or smooth, and at the same time the slipping of one upon the other will be avoided and the requisite range of adjustment afforded. The teeth also prevent one part of the key from being driven with a hammer upon the other for the purpose of adjustment and the taking up of play between the cross-head and piston-rod.

To change the width of the key it is necessary to unscrew the clamping-nut F and slack up on the key until the teeth of one part will pass by those on the other part. Substantially the same result may be accomplished, as shown in Fig. 4, in which the key is represented as composed of a plain tapering part g' and a correspondingly-tapering part g^2, which is formed with shoulders g^3 to hold it in place by engagement with the cross-head. The part g^2 is formed at its smaller end with an ear g^4 overhanging the larger end of the part g', and in this ear is threaded an adjusting-screw g^5, by means of which the part g' is moved lengthwise and held in place upon the part g^2. For the purpose of adjusting this form of key it is necessary simply to slack up on the key or cross-head and piston-rod by loosening or unscrewing the clamping-nut F slightly. I do not wish to be understood, however, as limiting myself to the construction of the adjustable key shown in Figs. 1 and 4, since it may be made of two plain tapering parts similar to those shown in Fig. 1, but without the teeth, or in the form of a gib and cotter, as shown in Fig. 4, but without the adjusting-screw. It will be understood that the keyways a^2 and b in the cross-head and piston-rod are to be made of sufficient length and that a sufficient portion of the piston-rod will be threaded for the clamping-nut to admit of the required range of adjustment.

I have shown the end of the piston-rod which is fitted in the cross-head unreduced and the screw-thread for the clamping-nut F cut into the adjacent portion of the rod, which is of the same diameter. This construction necessitates the use of a clamping-nut made of two parts which are held together and tightened upon the rod by means of clamping screws or bolts f f, as shown in Fig. 3. By reducing the end of the piston-rod which is inserted in the cross-head and forming the thread on the unreduced portion next to it an ordinary integral nut may be employed, as shown in my former patent. In certain respects, however, the sectional clamping-nut is preferred, as it admits of the employment of a piston-rod of uniform gage or diameter from end to end, and when it is adjusted it may be secured in place on the piston-rod by means of the clamping screws or bolts f.

When the engine, pump, or compressor is built or erected, the piston-rod and cross-head guides may be marked, as shown at 1 2 2 in Fig. 2, to indicate the position of the piston E in the cylinder H with reference to either cylinder-head, preferably that through which the piston-rod passes. These index-marks are preferably arranged as shown, so that when the crank I is on its dead-center farthest from the cylinder and the piston E is in as close proximity as practicable with the cylinder-head through which the piston-rod passes the mark "1" on the piston-rod will be exactly in line with the marks "2 2" on the cross-head guides. By this means it can be readily seen and determined at any time how much the piston is out of adjustment and the exact amount the width of the key G must be increased or diminished to equalize the clearance between the piston and both ends of the cylinder.

While the construction of the key as hereinbefore described, provides for the ready adjustment of the piston-rod and cross-head connection for producing and maintaining proper and equal clearance between the piston and both ends of the cylinder, the key as a whole is without taper and is clamped in place when adjusted between one end of the keyway b in the piston-rod and the opposite end of the keyway a^2 in or an opposing face of the cross-head by means of the nut F. Injurious strain on the piston-rod by driving a tapering key tightly into place, as well as the inconvenience and annoyance of turning the piston in the cylinder in coupling the piston-rod with the cross-head when a screw-threaded connection is employed, is thus avoided.

I claim—

1. The combination with a cross-head having a straight bore, of a piston-rod fitted in said bore and having a keyway through it, an adjustable key composed of tapering parts and having its working edges or faces parallel with each other, and means applied to said piston-rod for 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 with a cross-head having a straight bore, of a piston-rod fitted in said bore and having a keyway through it, an adjustable key composed of tapering parts having their outer edges parallel with each other, and a nut threaded on the piston-rod and adapted to clamp said key between opposing faces of said piston-rod and cross-head, substantially as and for the purposes set forth.

3. The combination with a cross-head having a straight bore, of a piston-rod fitted in said bore and having a keyway through it, an adjustable key composed of tapering parts having their outer edges parallel with each other, and means for holding them from slipping lengthwise one upon the other, and means applied to said piston-rod for 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.

4. The combination with a cross-head having a straight bore, of a piston-rod fitted in said bore and having a keyway through it, an adjustable key composed of tapering parts having their outer edges parallel with each other and their inner edges formed with interlocking teeth, upon rigid portions of the two tapering parts and means applied to said piston-rod for clamping the key between one end of the keyway therein and an opposing face of the cross-head, substantially as and for the purposes set forth.

5. The combination with a cross-head having a straight bore, of a piston-rod fitted in said bore and having a keyway through it, and a threaded portion between its ends adjacent to the keyway therein the piston-rod being substantially of uniform size on both sides of the threaded portion, an adjustable key composed of tapering parts having their outer edges or working faces parallel with each other, and a nut fitted on the threaded portion of the piston-rod next to the cross-head and composed of two parts held together by clamping screws or bolts, 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:
WM. H. COLE,
B. C. W. EVANS.