June 5, 1945. H. A. HARRIS 2,377,417

PISTON ROD FOR POWER HAMMERS

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Fig. 1.

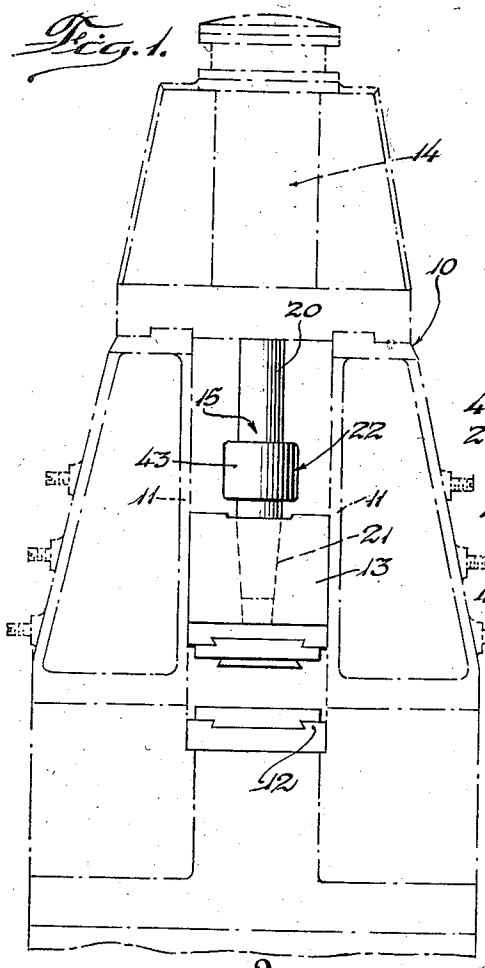


Fig. 2.

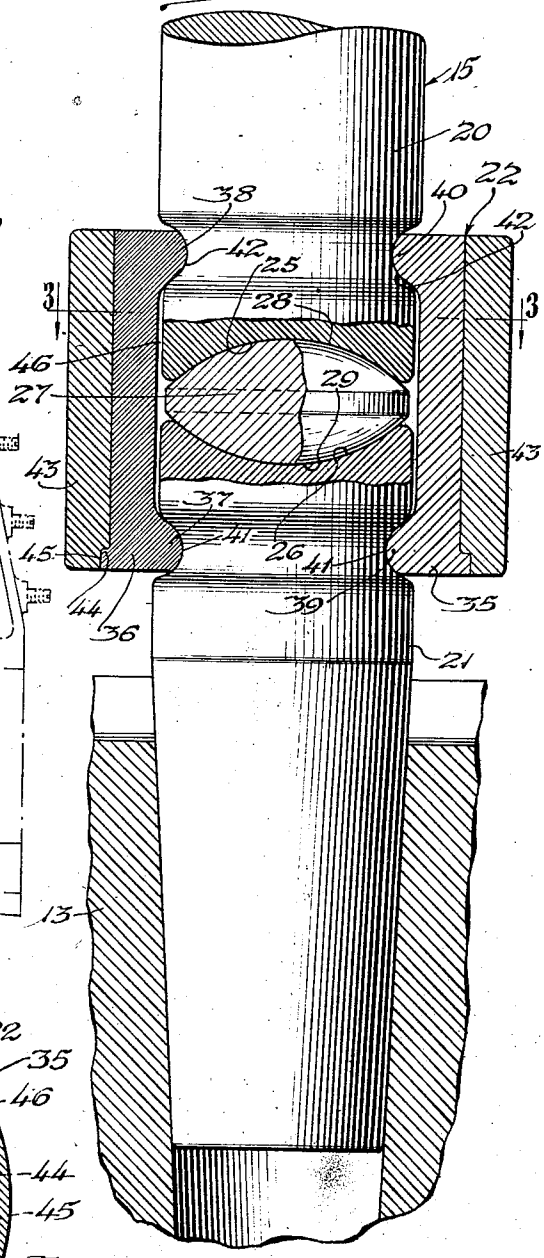
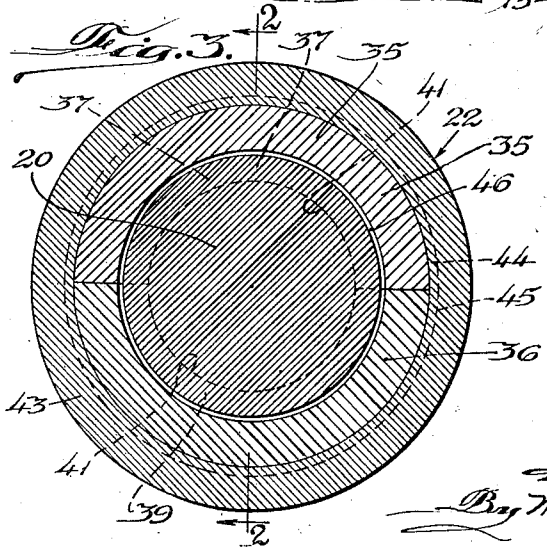


Fig. 3.



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Fig. 4.

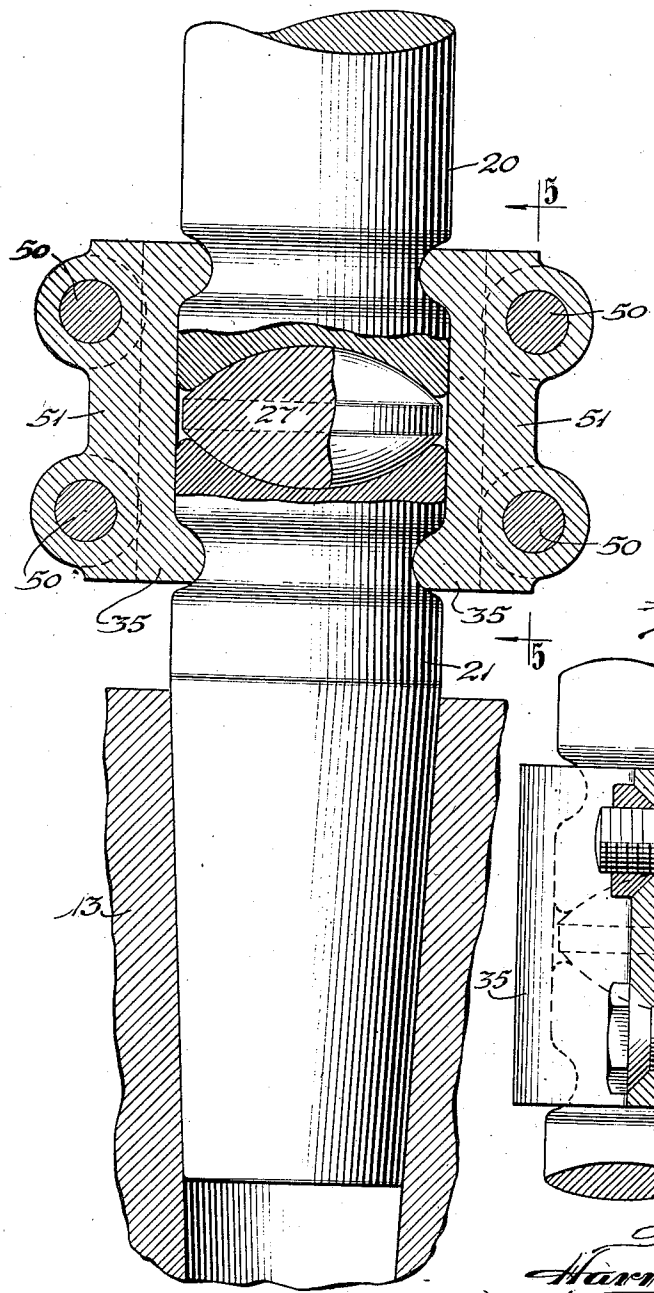
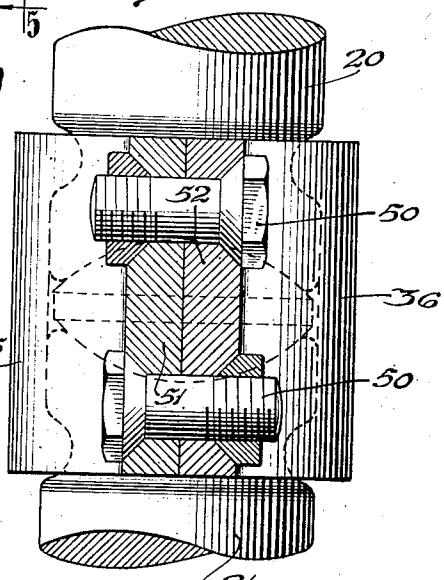


Fig. 5.



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PISTON ROD FOR POWER HAMMERS

Harry A. Harris, Chicago, Ill.

Application July 3, 1943, Serial No. 493,357

4 Claims. (Cl. 287—108)

My invention relates to piston rods for power hammers, particularly steam drop hammers.

Piston rods for steam drop hammers are currently cylindrical one piece masses of steel—preferably chrome-nickel-molybdenum steel for heavy work—sometimes ten or more feet in length. Breakage is a continuing source of work interruption and expense. Usually breaks occur within or a few inches above the junction between the rod and the ram or head of the hammer. They are thought generally to be caused by "fatigue" of the metal which results from vibration occasioned by the imperceptible "whipping" of the rod brought about by the rapid movements and impacts of the head, unsymmetrical distribution of metal within die cavities, non-uniformity of applied work-pressure and guide friction. Breaks not only result in production stoppage, but also in considerable extra work and expense for replacement and in loss of material.

The principal object of my invention is to provide an improved power hammer piston rod.

Another object is to provide a rod wherein the vibration tendency is reduced with the result that fatigue is retarded and longer life insured.

A further object is to provide a rod such that only the part most susceptible to breakage needs be replaced if breakage does occur.

Other objects and advantages will hereinafter appear.

In general, my invention contemplates a composite rod of four parts, two axially aligned sections between which is interposed a compression piece, the confronting faces of the rod sections and compression piece fitting together on spheroidal surfaces, and a coupling that unites the sections and compression piece into a unitary and seemingly rigid structure.

In the accompanying drawings wherein two typical embodiments of my invention are illustrated:

Fig. 1 is a side elevation, largely diagrammatic, of a power hammer equipped with a piston rod constructed according to my invention;

Fig. 2 is an enlarged side elevation and partial section of the preferred rod assembly;

Fig. 3 is a section on the line 3—3 of Fig. 2;

Fig. 4 is a side elevation and partial section of a modified construction; and

Fig. 5 is a section on the line 5—5 of Fig. 4.

In general, a power press includes a frame 10 having hammer head guides 11 and a fixed die support 12; a movable hammer head 13 carrying a die complementary to the die supported by the frame; a cylinder-piston assembly 14, most frequently steam operated, for actuating the hammer head, sometimes merely by lifting it to permit it to drop by gravity on its work stroke and sometimes to actuate the head on both the retracting and work strokes; and a piston rod 15 interconnecting the piston and the hammer head. The present invention concerns itself only with the piston rod.

Referring now particularly to Figs. 2 and 3, the preferred rod construction includes two cylindrical axially aligned sections 20 and 21 which are joined end to end by a coupling 22. The upper end of rod-section 20 is connected to the hammer's piston in any appropriate manner. The lower end of rod-section 21 is connected to the hammer head 13 in any approved manner, a taper press fit is indicated because that is a widely used method. These rod-sections may be formed from metal suitable for the service expected of the hammer; chrome-nickel-molybdenum steel is currently very extensively used. If desired and feasible under special conditions, the lower rod-section may be made integral with the hammer head or ram. Usually the lower section should not project very far above the top of the head so that the coupling to be hereinafter described is located as near as possible to the top of the ram.

The confronting ends of rod-sections 20 and 21 are fashioned with cavities to provide spheroidal contact surfaces 25 and 26, respectively. A compression piece 27 is interposed between the confronting ends of sections 20 and 21. This compression piece is preferably made from the same material as the rod-sections, although under some conditions and for some services a different material may prove superior. Preferably it is formed in ellipsoidal shape to provide convexly spheroidal surfaces 28 and 29 which are complementary to and accurately fit the surfaces 25 and 26, respectively, of the rod-section cavities. In order to eliminate sharp edges, the rod-section cavities may be somewhat smaller across than the diameter of the sections, and the spheroidal surfaces of the compression piece need not meet in a plane, but the piece may be circumferentially somewhat flattened, as shown clearly in Fig. 2.

The coupling 22, which joins the two rod-sections and compression piece into a unitary structure, is shown as a collar formed of two semi-cylindrical parts 35 and 36. However, if desired, it may be formed in three or more pieces. Each of the parts of the collar is formed with inwardly

projecting semi-annular bosses or lugs 37—38 and 39—40, respectively, which fit into complementary annular channels or grooves 41 and 42 formed in the rod-sections 21 and 20, respectively. The coupling collar sections may be clamped and tightly held together by a cylindrical outer ring or sleeve 43 which may be shrunk thereabout. The correct seating of the ring or sleeve about the coupling collar may be facilitated by providing the coupling with a shoulder 44 and the sleeve with a complementary offset 45. Thus, when the two rod-sections, the compression piece, the coupling collar and the retaining sleeve are assembled, they form a unitary composite piston rod. A tighter clamping action and otherwise better fit between the coupling collar and sleeve may usually be attained by tapering slightly the contiguous surfaces thereof. Preferably the central region of the bore through the assembled coupling collar sections is slightly larger than the diameter of the rod-sections so as to provide a small clearance 46 therebetween.

The modification shown in Figs. 4 and 5 differs from the preferred embodiment heretofore described merely in the construction of the retaining sleeve. Here the sleeve, instead of being in one piece which is, for example, shrunk tightly into position, is formed in two semi-cylindrical parts clamped and tightly held in position by bolts 50 passing through appropriate holes in radially projecting longitudinal flanges 51 and 52 formed upon the collar-sections 35 and 36, respectively.

The division of the rod into two axially aligned sections renders it unnecessary to scrap an entire rod when a break occurs. Experience has demonstrated that breaks usually appear in the part of the rod which fits within the hammer head, or a short distance above the head. With my new rod, when a break occurs, the broken section may be removed and replaced by a new section. And breakage is less apt to occur. The spheroidal surfaces between the two rod-sections and interposed compression piece result in something comparable to a ball and socket joint, even though the coupling seems to unite the parts into a rigid unit. Thus, the joint seems to compensate for inequalities in the distribution of weight and the pressures at the hammer head, and in guide friction, and for this and perhaps other reasons which are not yet fully understood, the imperceptible but none the less fatigue production vibrations are effectively lessened, if they are not eliminated.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. A power hammer piston rod comprising two axially aligned but separated sections of cylindrical metal rod and a metallic compression piece interposed between the confronting ends of said sections, the confronting end faces of the rod sections and the compression piece being formed with complementary spheroidal interfitting surfaces, a multi-piece coupling fitting about and uniting the rod sections and compression piece, each rod section and the coupling having complementary projections and depressions for preventing axial relative movement therebetween, and means for clamping the parts of the coupling together and about the rod sections and compression piece.

2. A power hammer piston rod comprising two axially disposed sections of cylindrical metal rod, the confronting end faces of the two sections being provided with spheroidal cavities, a metallic compression piece interposed between the two rod sections and having spheroidal faces complementary to and fitting the cavities of the two sections, a multi-piece coupling for uniting the two rod sections and compression piece, each section and the coupling having complementary projections and depressions for preventing axial relative movement therebetween, and means for clamping the parts of the coupling together and about the rod sections and compression piece.

3. A power hammer piston rod comprising two axially aligned sections of cylindrical metal rod, the confronting end faces of the two sections being provided with spheroidal cavities, a spheroidal metallic compression piece separating the two rod sections and fitting the confronting cavities thereof, a multi-piece coupling fitting about and uniting the rod sections and compression piece, each section and the coupling having annular complementary projections and depressions for preventing axial relative movement therebetween, and a retaining ring shrunk upon the coupling to retain the parts thereof together.

4. A power hammer piston rod comprising two axially aligned sections of cylindrical metal rod, the confronting end faces of the two sections being provided with spheroidal cavities, a metallic spheroidal compression piece separating the two rod sections and fitting the confronting cavities thereof, a multi-piece coupling fitting about and uniting the rod sections and compression piece, each section and the coupling having annular complementary projections and depressions for preventing axial relative movement therebetween, a retaining ring formed of complementary parts fitting around the coupling sections, and means for clamping the ring parts together.

HARRY A. HARRIS.