Apr. 17, 1923.

1,452,202

W. E. JORY

INTERNAL COMBUSTION ENGINE

Filed June 6, 1922

4 Sheets-Sheet 1

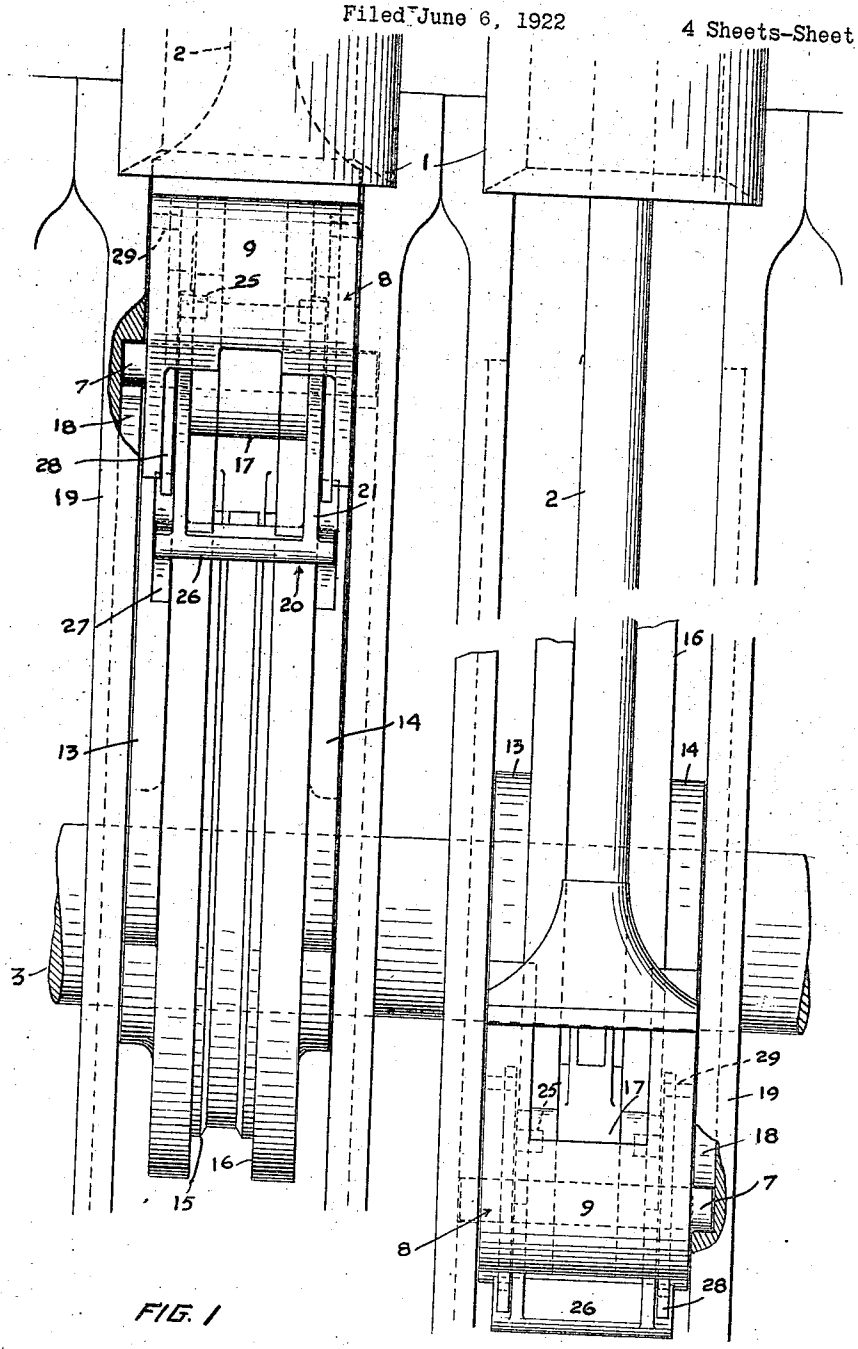


FIG. 1

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1,452,202

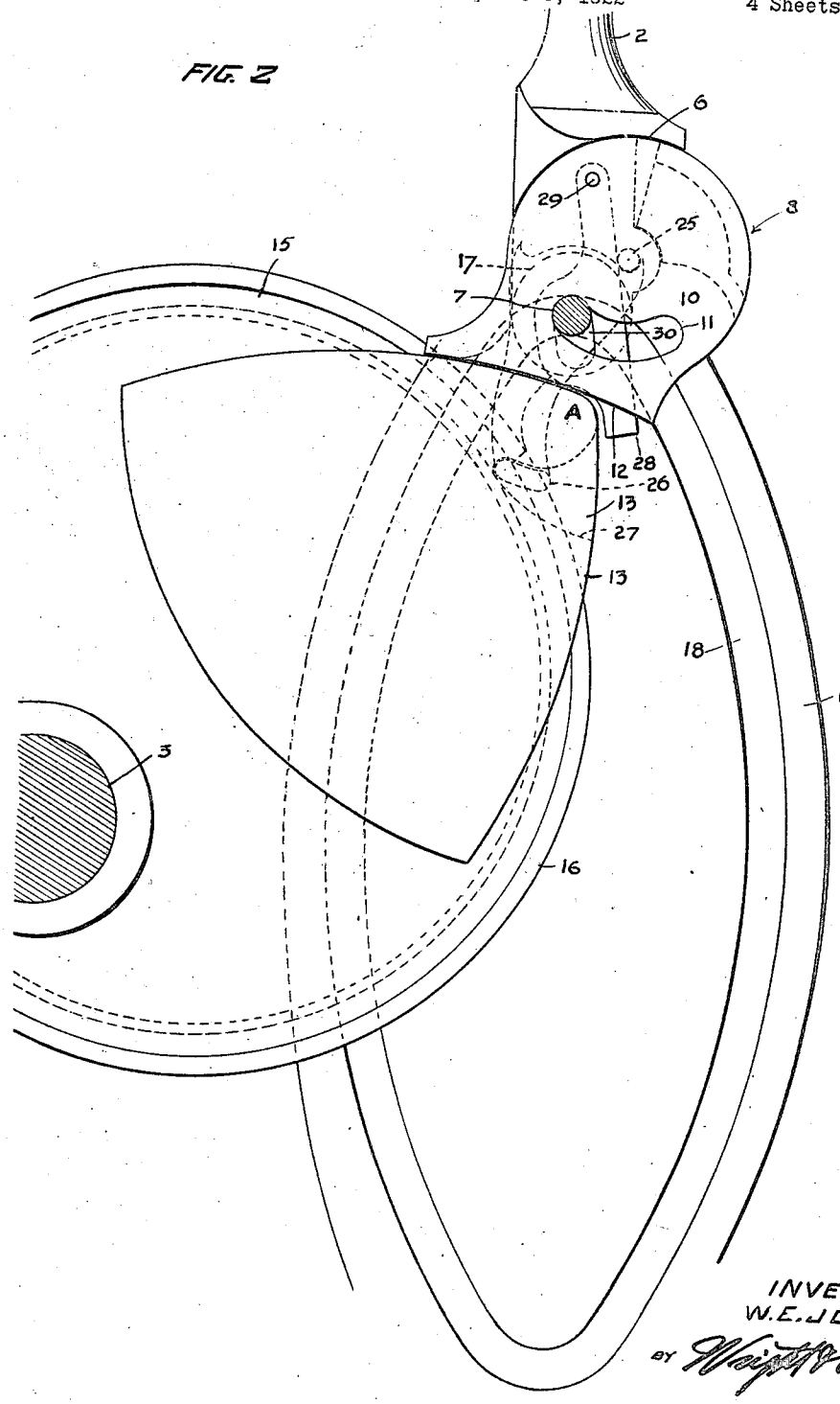
W. E. JORY

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4 Sheets-Sheet 2

FIG. 2



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1,452,202

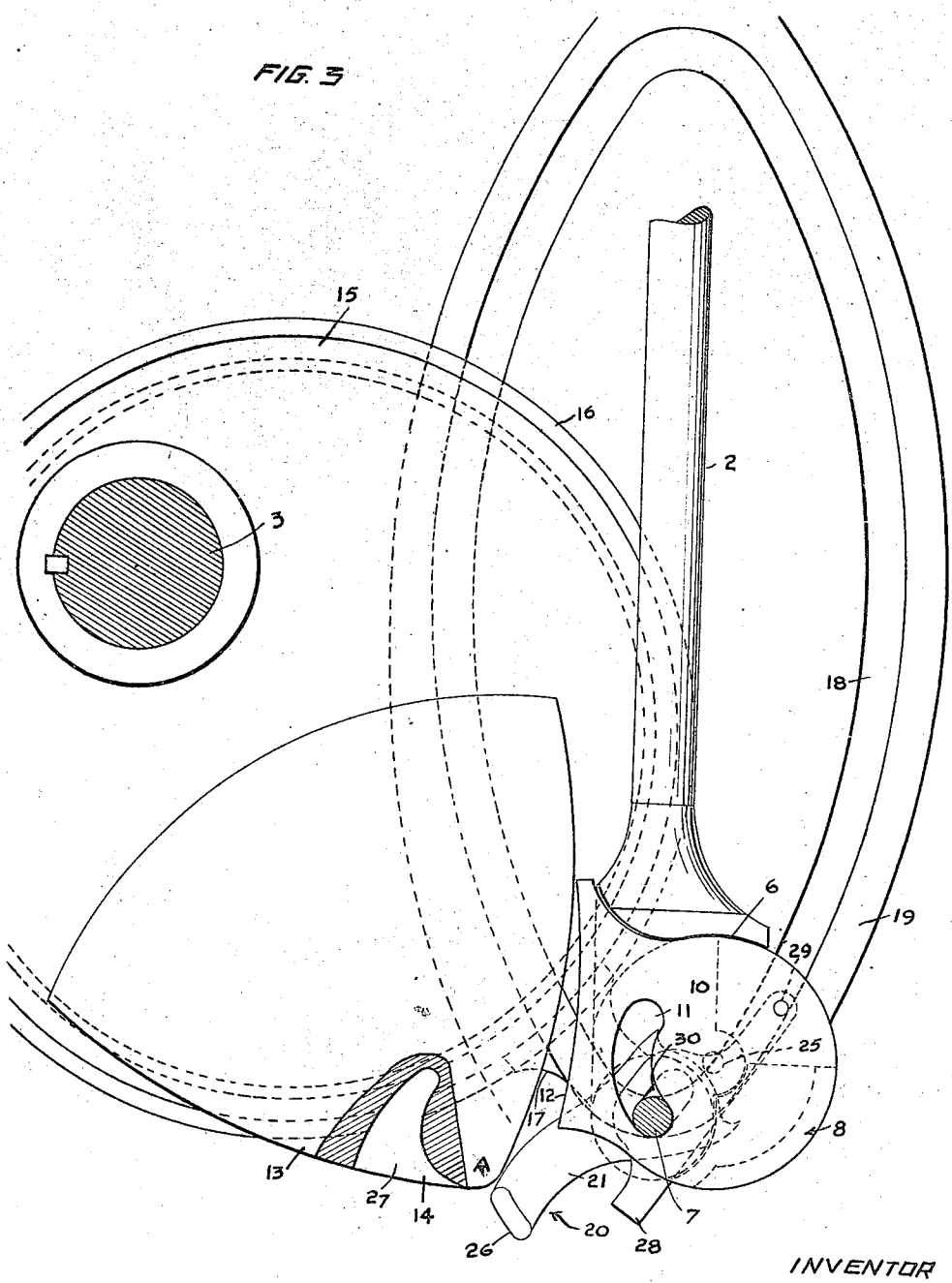
W. E. JORY

INTERNAL COMBUSTION ENGINE

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4 Sheets-Sheet 3

FIG. 3



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1,452,202

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INTERNAL COMBUSTION ENGINE

Filed June 6, 1922

4 Sheets-Sheet 4

FIG. 4

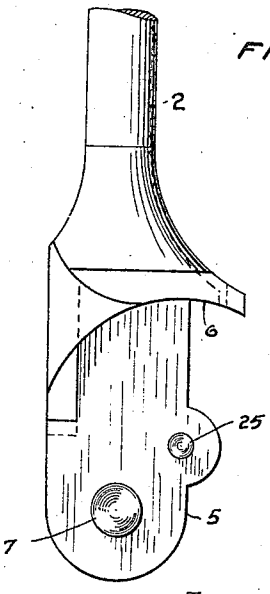


FIG. 5

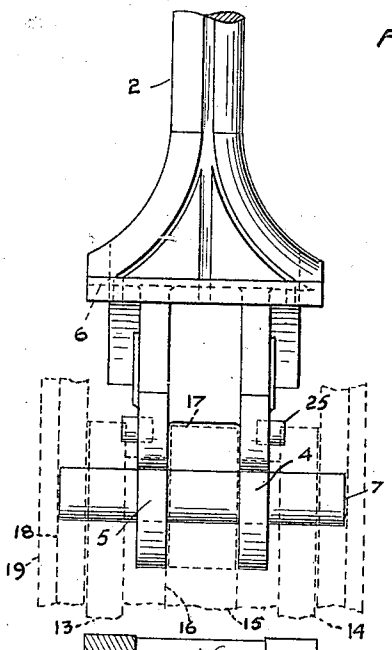


FIG. 6

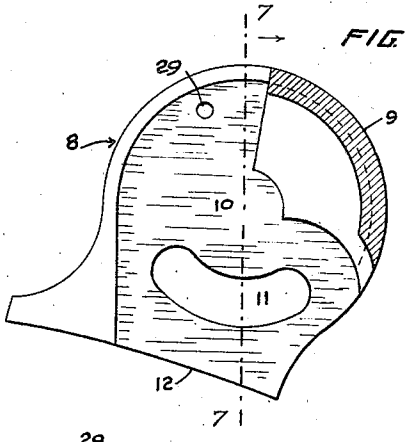


FIG. 7

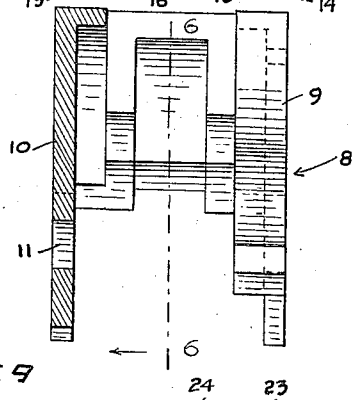


FIG. 9

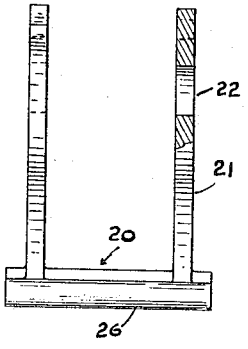


FIG. 8

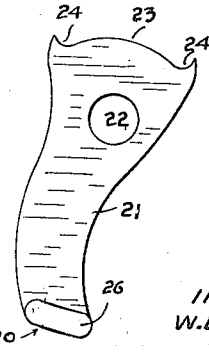


FIG. 10

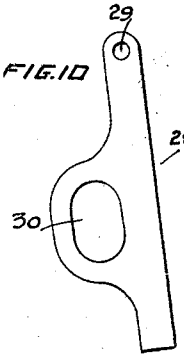
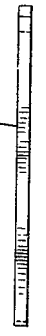


FIG. 11



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Patented Apr. 17, 1923. 1,452,202

UNITED STATES PATENT OFFICE.

WILLIAM E. JORY, OF MARTINEZ, CALIFORNIA.

INTERNAL-COMBUSTION ENGINE.

Application filed June 6, 1922. Serial No. 566,207.

To all whom it may concern:

Be it known that I, WILLIAM E. JORY, a citizen of the United States, residing at Martinez, in the county of Contra Costa and State of California, have invented new and useful Improvements in Internal-Combustion Engines, of which the following is a specification.

This invention relates to improvements in internal combustion engines and more particularly to novel means for connecting the piston rods with the drive shaft, which will serve as a substitute for the ordinary crank shaft arrangement and will provide for a smooth, more effective and continuous application of power to the drive shaft during each movement of the shaft through 360° of arc, whereby vibration is lessened and a gain in efficiency is obtained.

An object of the invention is to provide simply constructed and inexpensive means of connection between the piston rods and drive shaft, which means will eliminate vibration and intermittent power application such as usually attends the use of the ordinary crank shaft arrangement, prevents loss of power and causes each piston or cylinder to move the shaft under a continuous power thrust through 90° of arc.

The invention possesses other advantages and features some of which, with the foregoing will be set forth at length in the following description where I shall outline in full that form of the invention which I have selected for illustration in the drawing accompanying and forming a part of the present specification. In said drawings I have shown one form of the construction of my invention, but it is to be understood that I do not limit myself to such form since the invention as expressed in the claims may be embodied in a plurality of forms.

Referring to the drawings:

Figure 1 represents a fragmentary side elevation of the mechanism of my invention showing it as when applied to an internal combustion engine, part of which is shown.

Figure 2 represents an enlarged side elevation of the mechanism of my invention as when at the beginning of a power stroke.

Figure 3 represents an enlarged side elevation of the mechanism of my invention as when at the end of a power stroke.

Figure 4 represents a side elevation of one of the piston rods showing the construction at the lower end thereof.

Figure 5 represents a view in elevation of the rod as shown in Figure 4 but taken at right angles thereto and showing parts of the mechanism of my invention as associated therewith.

Figure 6 is a sectional view taken on line 6—6 of Figure 7.

Figure 7 is a sectional view taken on line 7—7 of Figure 6. Both Figures 6 and 7 showing in detail the construction of the power thrust member of the invention.

Figure 8 is a side elevation of the cam locking member.

Figure 9 is a top plan view of the cam locking member.

Figure 10 is a side elevation of a detail of the invention.

Figure 11 is an edge view of the detail shown in Figure 10.

Referring to the embodiment of the invention shown in the accompanying drawings, 1 designates the piston of an internal combustion engine, part of which is shown in Figure 1 of the drawings, 2 the piston or connecting rod therefor and 3 the drive shaft of the engine which is connected with the piston rod by the means of my invention.

In Figure 1 two pistons and other associated parts are shown as a part of an internal combustion engine, but I wish it understood that I may carry out my invention with multiple cylinder engines regardless of the number of cylinders employed, although I prefer to employ a four cylinder engine so that each cylinder may be made to apply a continuous 90° power movement to the shaft.

My invention takes into account a special construction at the lower end of the piston rod and as shown in the drawings, the rod is enlarged at its lower end and formed with spaced downwardly projecting portions 4 and 5, at the upper end of which and on opposite sides thereof, there is provided an arcuate shoulder 6. Extending transversely through the members 4 and 5, near the lower ends of said members, is a pin 7 upon which pin is mounted a specially constructed thrust member 8. The thrust member 8 comprises an arcuate body portion 9 which is adapted to bear upon the arcuate shoulder 6. Extending from the

arcuate body portion 9 are spaced parallel side portions 10 having alined corresponding arcuate slots 11 in which end portions of the pin 7 are received whereby said member 8 is movable upon the pin and with relation to the portions 4 and 5 of the piston rod. The lower or free ends 12 of said members 10 are slightly curved and adapted to engage upon cam members 13 and 14 fixed to the respective sides of an eccentric disc 15, which latter is keyed to the shaft 3. Surrounding the disc 15 is an eccentric ring 16 having an integral or fixed extension 17 through which the pin 7 extends. The extension 17 engages between and with the portions 4 and 5 as particularly shown in Figure 5.

The ends of the pin 7 extend beyond the side portions 10 of the thrust member 8 and engage in guide grooves 18 provided in opposed upright guide members 19 which are fixed in any suitable manner to the crank shaft and other stationary parts of the engine. The grooves 18 in said members 19 are elliptical in form and when the piston rod descends on its power stroke and rises upon its return stroke, it will move downwardly, outwardly and inwardly and upwardly, outwardly and inwardly, describing an elliptical path.

Means is provided for locking the cam members in such manner that the disc 15, ring 16 and cam members will move as one upon a power stroke of the piston rod. Mounted upon the thrust member 8 is a U-shaped locking member 20. The arm portions 21 of the locking member 20 are slightly curved and adjacent their free ends provided with openings 22 through which the pin 7 extends. The arms 21 are mounted so as to lie between the outer sides of the members 4 and 5 and the inner face of the sides 10 of the thrust member. The end edges of the arms 21 are rounded as at 23 and said rounded portions terminate in spaced shoulders 24. The rounded portions are adapted to engage cylindrical pins or projections 25 which are rigidly carried on the inner faces of the sides 10, see Figures 2 and 5. The bight portions 26 of the U-shaped locking member 20 extends beyond the arms 21 and their projecting portions are adapted to engage in notches or recesses 27 provided in the opposed faces of those portions of the cams 13 and 14 which project beyond the peripheries of the eccentric member. The notches or recesses 27 are peculiarly shaped so as to function as will be later more particularly pointed out.

As a means for setting the thrust member and locking member for operation upon return of the mechanism to position such that the power stroke may be commenced, I provide trip members 28 constructed as shown in Figures 10 and 11. These members, in the form of flat elongated plates, are pivoted at certain ends as at 29 to the inner faces of the sides 10 and lie between said sides and outer sides of the arms 21 of the member 20. Intermediate of their ends the members 28 are enlarged and provided with longitudinal slots 30, said slots receiving the pin 7. The lower or free ends of the members 28 are adapted to extend beyond the edges 12 of the sides 10 so as to engage the cams 13 and 14 as will be later more fully described.

At the beginning of a power stroke the piston rod 2, as shown in Figure 2, the thrust member 8, pin 7 and associated parts are disposed at the upper ends of the guides 19 with the pins 7 engaged in the grooves 18. The cams 13 and 14 are of a substantially triangular shape save that the working surfaces of the cam have a slight camber. The thrust member 8 will engage the upper side of the cam adjacent one corner thereof and said engaged surface of the cam and the edges 12 of the thrust member are in a plane substantially at right angles to the direction of movement of the thrust member on its power stroke. The locking member 20 is engaged in the recess 27 so that the cams and the eccentric disc are locked for movement with the eccentric ring. It will thus be seen that when the piston 2 descends in its power stroke, the pin 7 will move downwardly and outwardly and then inwardly in one side of the elliptical grooves 18 and that during such movement the member 8 will rock or shift in such manner that it will apply power to the cams during the movement of the member 8 from the upper ends of the guides to the lower ends thereof. This rocking of the member 8 is permitted by the arcuate slots 11 through which the pin 7 extends. When the member 8 moves through 90°, the portion 26 of the locking member disengages from the notches 27 due to the rocking or turning movement of the thrust member 8. At the beginning of the power stroke, the pins or projections 25 are engaged with one of the shoulders 24 on the arms 21 of the member 20 and as said member 8 rocks or turns said pins or projections in moving over the rounded portions 23 will move the member 20 clear of the notches 27 and into position shown in Figure 3. At this time the edges 12 of the member will have moved away from the corner A of the cam so as to engage or lie opposite the mid portion of the normally upper side of the cam. When the member 20 disengages the cams, the eccentric ring is free from fixed connection in its return stroke, the ring will move relative to the disc, which latter continues in its rotation, and the parts will be returned to normal position. When the member 8 has been moved through 90° of arc, the corresponding member of the

next cylinder working under power stroke, will begin its movement through 90° arc. Just before the cams move into normal position near the completion of the return stroke of the piston, the projecting ends of the members 28 will engage near the corner A of the cams in such manner as to effect a leverage upon the member 8 and locking member 20, whereby said locking member 20 will slip into the locking notches of recesses 27 and the member 8 will move again into engagement with the upper edge of the cam as shown in Figure 2.

I claim:

1. In an internal combustion engine, a piston rod, an engine shaft, an eccentric disc fixed to the shaft, an eccentric ring loosely surrounding the disc, a pin carried by the piston rod, a connection between said pin and the ring, a thrust member mounted so as to rock on said pin, a cam member fixed on the disc and with which said thrust member is adapted to engage, a guide having an elliptical guide groove in which the pin extends, and means for preventing relative movement of the ring and disc throughout the down stroke of the piston rod and permitting relative movement thereof upon the up stroke of said rod.

2. In an internal combustion engine, a piston rod, an engine shaft, an eccentric disc fixed to the shaft, an eccentric ring loosely surrounding the disc, a pin carried by the piston rod, a connection between said pin and the ring, a thrust member mounted so as to rock on said pin, a cam member fixed on the disc and with which said thrust member is adapted to engage, a guide having an elliptical guide groove in which the pin extends, means for preventing relative movement of the ring and disc throughout the down stroke of the piston rod and permitting relative movement thereon upon the up stroke of said rod and means which when the rod returns to normal position will automatically lock said ring and disc against relative movement and dispose the thrust member in cam engaging position.

3. In an internal combustion engine a piston rod, a drive shaft, an eccentric disc fixed on the drive shaft, an eccentric ring loosely mounted on the disc, a connection between the ring and piston rod, a thrust member pivoted on the piston rod, a cam fixed on the disc and with which said thrust member engages upon the down stroke of the rod but is operatively disassociated therefrom upon upstroke of the rod and a locking member on the rod having locking engagement with the cams so as to provide relative movement of the disc and ring during the down stroke of the piston rod and automatically disengaging the cam to permit relative movement of said parts upon the up stroke of the piston rod, and a guide with which the piston rod is connected, arranged to move the rod in an eccentric path.

4. In an internal combustion engine a piston rod, a drive shaft, an eccentric disc fixed on the drive shaft, an eccentric ring loosely mounted on the disc, a connection between the ring and piston rod, a thrust member pivoted on the piston rod, a cam fixed on the disc and with which said thrust member engages upon the down stroke of the rod but is operatively disassociated therefrom upon the upstroke of the rod and a locking member on the rod having locking engagement with the cams so as to provide relative movement of the disc and ring during the down stroke of the piston rod and automatically disengaging the cam to permit relative movement of said parts upon the up stroke of the piston rod, a guide with which the piston rod is connected, arranged to move the rod in an eccentric path and a trip member operatively associated with the piston rod, thrust and locking member so as to automatically move said thrust and locking member into proper position at the end of the return stroke of the piston rod.

5. In an internal combustion engine a piston rod, a pin carried by and projecting on opposite sides of the piston rod, a drive shaft, an eccentric disc fixed to the drive shaft, an eccentric ring loosely mounted upon the disc, an apertured extension fixed to the ring and through which said pin extends, a thrust member having arcuate slots therein through which the pin extends, said thrust member and piston rod having arcuate opposed shoulders engaging one another, a cam member fixed to the disc and with which said thrust member is adapted to engage throughout the down thrust of the piston rod, said cam member having a notch therein, a locking member pivoted on the pin and arranged to engage in said notch throughout the down stroke of the piston rod and to move clear of the notch on the upstroke of the piston rod a fixed guide member having an elliptical guide groove therein in which the pin engages and means which when the piston rod completes its return stroke will automatically set the thrust member into engagement with the cam and move the locking member so as to extend into said notch.

WILLIAM E. JORY.