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H. A. BECKSTROM

2,229,545

ENGINE

Filed Jan. 30, 1939

2 Sheets-Sheet 1

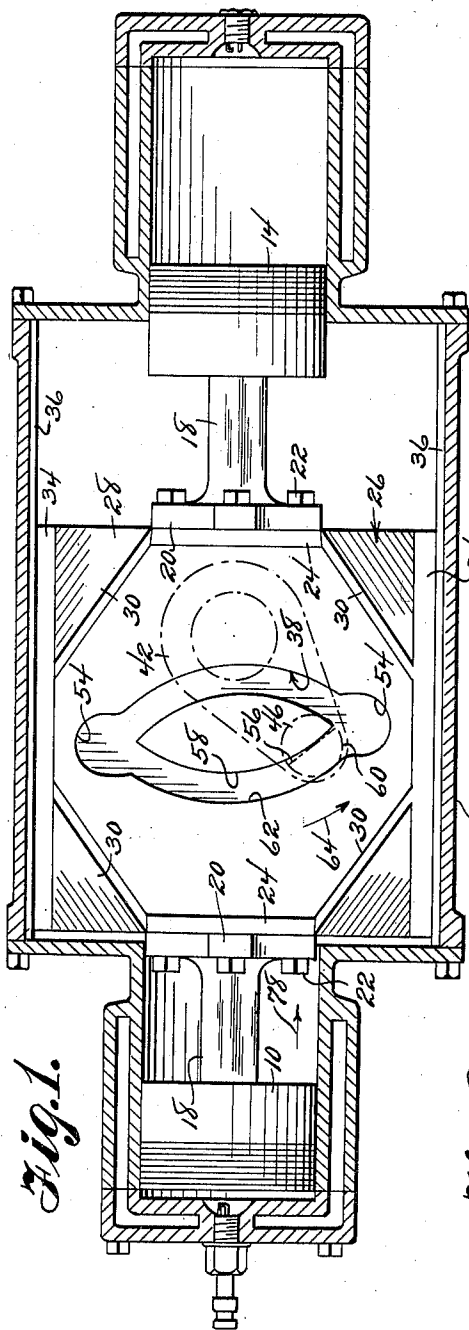


Fig. 1.

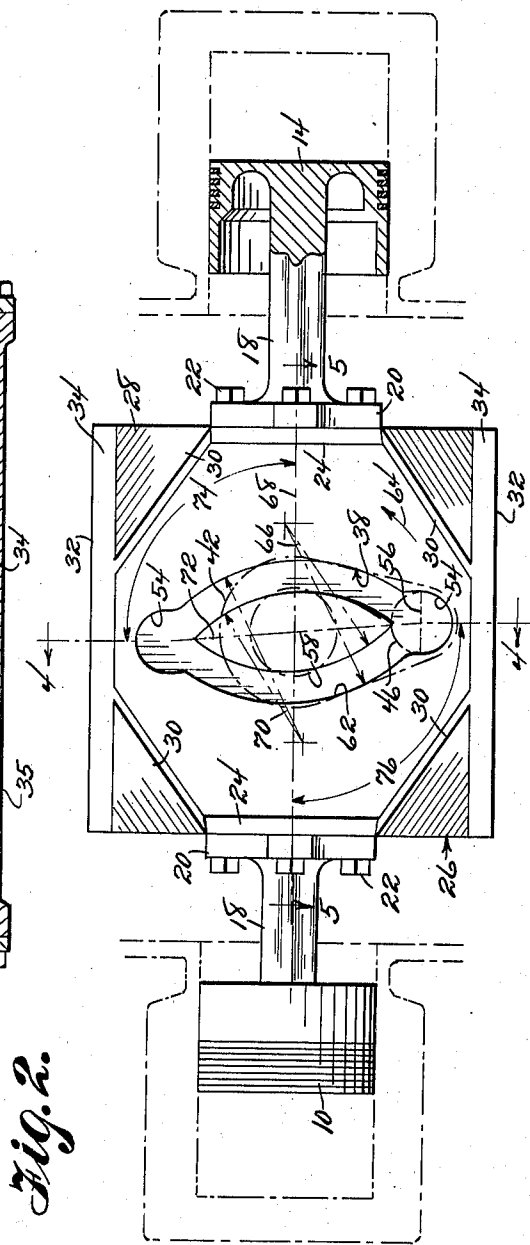


Fig. 2.

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Fig. 3.

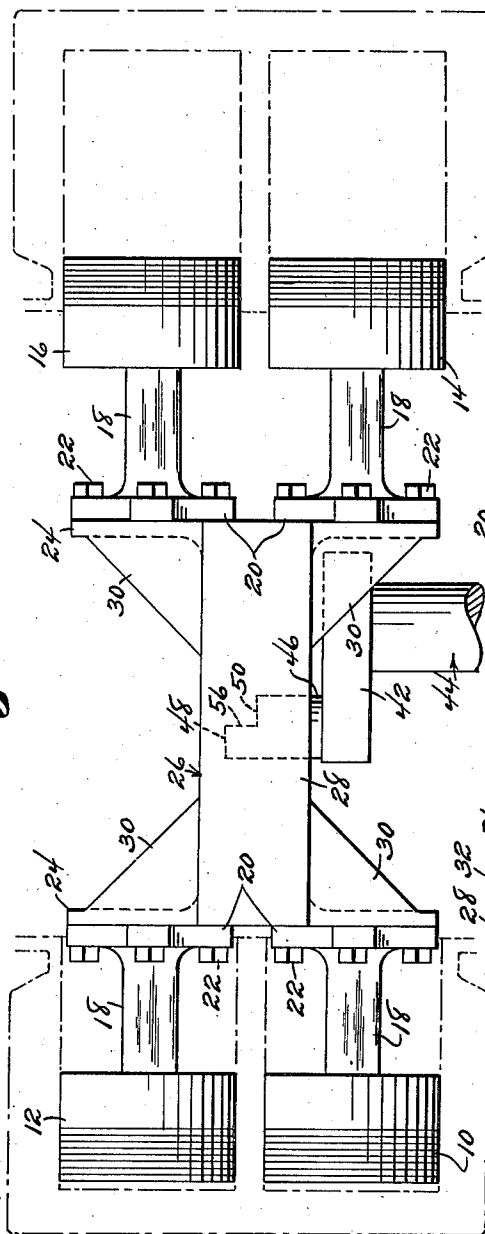


Fig. 5.

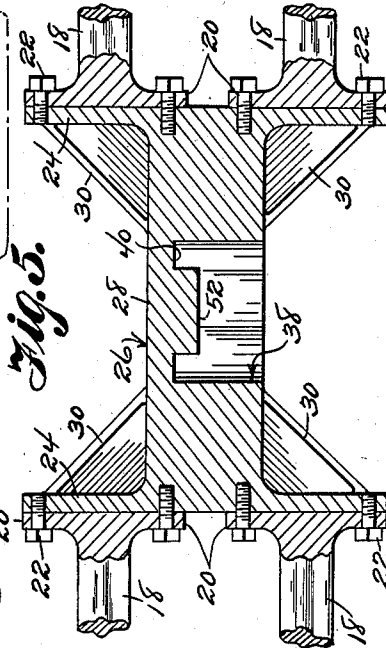
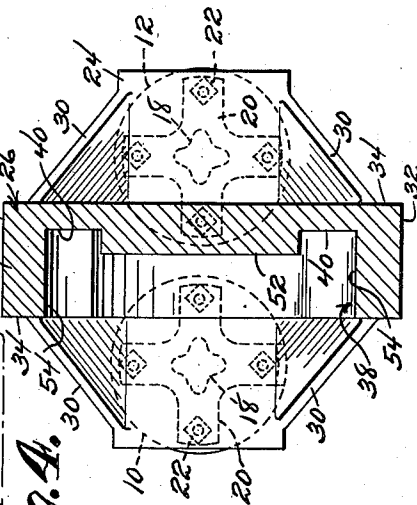


Fig. 4.



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UNITED STATES PATENT OFFICE

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ENGINE

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Application January 30, 1939, Serial No. 253,687

3 Claims. (Cl. 74—50)

My invention relates to engines, particularly of the internal combustion type, and has among its objects and advantages the provision of novel means for converting reciprocatory motion of the pistons into rotary motion of the crank shaft.

An object of my invention is to provide an engine including reciprocatory pistons and a crankshaft wherein novel means are provided for operatively connecting the pistons with the crankshaft for rotating the latter.

A further object is to provide an engine including opposed pistons fixedly related to a cross head guided in a reciprocatory path wherein novel means are employed for operatively connecting the cross head with the crankshaft. The crankshaft is connected with the cross head in such manner that the power of a particular piston delivers a powerful leverage on the crank pin through the medium of the cross head. At the same time, the construction is such that the stroke or movement of the cross head and pistons is less in a large degree than the diameter of the circle described by the crank pin of the crankshaft.

In the accompanying drawings:

Figure 1 is a view of the cross head showing the manner in which the pistons are connected therewith with the crankshaft positioned to receive the power to be applied by one piston;

Figure 2 is a similar view illustrating the crankshaft rotated forty-five degrees;

Figure 3 is a view similar to Figure 1 illustrating the piston and cross head assembly rotated ninety degrees about its longitudinal axis;

Figure 4 is a sectional view along the line 4—4 of Figure 2; and

Figure 5 is a sectional view along the line 5—5 of Figure 2.

In the embodiment selected to illustrate my invention, I make use of pistons 10, 12, 14 and 16 each of which is provided with a piston rod 18. Each piston rod 18 is branched at 20 and bored for the reception of bolts 22 threaded into the flange 24 of the cross head 26. According to Figure 3, pistons 10 and 12 are axially aligned with the pistons 14 and 16, while all the pistons lie in a common plane. Cross head 26 includes a body 28 which may be cast integrally with the flanges 24. Body 28 is in the nature of a relatively thick plate of rectangular configuration arranged at right angles to the plane defining the alignment of the cylinders 10 to 16, inclusive. Flanges 24 are interconnected with the body 28 through the medium of reinforcing webs 30.

Webs 30 terminate short of the two edges 32 of the body 28 to provide ribs 34 which are slidably guided in grooves 36 in the crankcase 35.

One face of the body 28 is provided with a generally elliptically shaped recess 38, the bottom of which is fashioned to provide a similarly shaped groove or race 40. The arm 42 of the crankshaft 44 is provided with a pin 46 which extends into the recess 38 and is provided with a semi-circular extension 48 arranged to ride in the groove 40, as illustrated in Figure 1. Pin 46 includes an end 50 which lies adjacent the bottom face 52 of the recess 38. Figures 1 and 2 illustrate the groove 40 as terminating in opposed semi-circular pockets 54 the transverse axes of which intersect the major axis of the groove 40.

Extension 48 fits snugly in the groove 40 with its face 56 contacting the wall 58 of the groove and its curved face 60 contacting the wall 62. In operation, the crankshaft 44 rotates in the direction of the arrow 64 of Figures 1 and 2. Walls 58 and 62 on one side of the elliptical groove 40 are defined by the radiuses 66 having axes positioned slightly to one side of the axis line 68 of the cross head 26 and the piston assembly. The faces 58 and 62 on the other side of the groove are defined by the radiuses 70 having axes located on the opposite side of the axis line 68. Thus the major axis 72 of the ellipse defined by the groove 40 is arranged at slightly more than ninety degrees from the axis line 68 as at 74 and 76.

Figure 1 illustrates the position of the crankshaft 44 when the piston 10 is in the firing position, at which time the arm 42 is positioned preferably at an angle of about forty-five degrees from the axis line 68. As the piston 10 is driven in the direction of the arrow 78 the crankshaft will be rotated in the direction of the arrow 64. With the crankshaft positioned according to Figure 1 in the firing position of the piston 10, the arm 42 is so positioned as to derive full leverage from the piston, thus employing or utilizing all power from the explosion to turn the crankshaft. Figure 2 illustrates the crankshaft rotated forty-five degrees beyond the position of Figure 1, at which time the curved face of the extension 48 lies inside the curvature of one of the pockets 54. Further rotation of the crankshaft brings the extension 48 into the other side of the groove 40 after which it moves therein to the position where one of the pistons on the other end of the cross head delivers power to the extension 48 at the moment the crankshaft has rotated 180° from the position of Figure 1.

The engine may embody the four-cycle principle as well as conventional valves and ignition system. Obviously, more or less cylinders may be employed than herein described without departing from the spirit of the invention. My invention eliminates individual connecting rods for the pistons. While I have described the firing position of the crankshaft as being forty-five degrees past center, it will be understood that this angularity may be varied. In any event, the firing position is such as to derive a powerful leverage from the explosion.

In arranging the firing position considerably beyond the axis line 68, I provide a construction which minimizes lateral thrust on the guides for the cross head. Because of the formation of the groove or race 40, the cross head moves a distance considerably less than the diameter described by the extension 48. In an arrangement such as that illustrated, the travel of the cross head and pistons is less by twenty-five per cent than the diameter of the circle.

As the extension 48 moves beyond the position of Figure 2 and enters the approached end of the groove 40, the curved face 60 of the extension will continue or have a limited thrust action on the wall 62 of that side of the groove until it reaches a position at the other end of the groove corresponding to the position of Figure 1. The pockets 54 are of such curvature as to fit closely about the face 60 of the extension and are of such depth as to permit entrance, rotation and exit in a precise manner.

Without further elaboration, the foregoing will so fully illustrate my invention that others may, by applying current knowledge, readily adapt the same for use under various conditions of service.

I claim:

1. In an engine, a guide, a reciprocatory piston, a crosshead slidably guided by said guide, a fixed connection between said piston and the crosshead, said crosshead being provided with a groove of generally elliptical configuration, with the major axis of said groove intersecting the axis of said piston, a crankshaft having a crank pin operating in said groove to rotate the crankshaft through reciprocatory motion of the crosshead, said crank pin having a relatively wide and flat face arranged to have contacting relation with the two inner walls of said groove and a curved face arranged to have contacting relation with the outer walls of said groove, the outer

walls of said groove being materially wider than the inner walls, and said curved face having contacting relation with the full width of the outer walls.

2. In an engine, a guide, a reciprocatory piston, a crosshead slidably guided by said guide, a fixed connection between said piston and the crosshead, said crosshead being provided with a groove of generally elliptical configuration, with the major axis of said groove intersecting the axis of said piston, a crankshaft having a crank pin operating in said groove to rotate the crankshaft through reciprocatory motion of the crosshead, said crank pin having a relatively wide and flat face arranged to have contacting relation with the two inner walls of said groove and a curved face arranged to have contacting relation with the outer walls of said groove, the outer walls of said groove being materially wider than the inner walls, said curved face having contacting relation with the full width of the outer walls, said groove being provided with a pocket at each end for rotatably receiving the crank pin during transfer of the latter from one side of the groove to the other, said crank pin having a reach circular in cross section adapted to rotate inside said pockets for guiding the crank pin during transfer of its relatively wide and flat face from one inner wall to the other inner wall of the groove.

3. In an engine, a guide, a reciprocatory piston, a crosshead slidably guided by said guide, a fixed connection between said piston and the crosshead, said crosshead being provided with a groove of generally elliptical configuration, with the major axis of said groove intersecting the axis of said piston, a crankshaft having a crank pin having an end extension operating in said groove to rotate the crankshaft through reciprocatory motion of the crosshead, said end extension having a first face arranged to have selective contacting engagement with the two inner walls of said groove and a curved face arranged to have selective contacting engagement with the outer walls of said groove, the outer walls of said groove being materially wider than the inner walls and said groove being provided with a pocket at each end for rotatably receiving the crank pin during transfer of said end extension from one side of the groove to the other.

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