

UNITED STATES PATENT OFFICE.

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MEANS FOR CONVERTING RECIPROCATING INTO ROTARY MOTION.

SPECIFICATION forming part of Letters Patent No. 673,208, dated April 30, 1901.

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To all whom it may concern:

Be it known that I, LOUIS KRAMER, a citizen of the United States, and a resident of Evansville, in the county of Vanderburg and State of Indiana, have invented new and Improved Means for Converting Reciprocating into Rotary Motion, of which the following is a full, clear, and exact description.

My invention relates to means for converting reciprocating into rotary motion, and has for its object to provide a device of the above-indicated class which will be simple in construction, which will take up but little room, and which will operate uniformly and without undue strain on the moving parts.

The invention will be fully described hereinafter and the features of novelty indicated in the appended claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a plan showing the application of my invention to a reciprocating-piston engine. Fig. 2 is an enlarged detail plan of the slide and rotary screw forming part of my invention in a reverse position to that shown in Fig. 1, and Fig. 3 is an end view of the slide and its guides.

A is the cylinder, in which reciprocates a piston (not shown) provided with a piston-rod B, which is connected with a cross-head C', forming part of a frame C, carrying slides C², mounted to move in guides D' of a stationary support D. The said slides C² have a swivel connection with a ring E, the axis of the swivel being indicated by the pins E'. The ring E is arranged to surround a shaft or drum F, the axis of which is parallel to the direction in which the slide C reciprocates. This shaft F is mounted to turn in bearings G, one of which or both may be provided with means for adjusting the shaft lengthwise, as a screw H. A plurality of screw-threads are formed upon the periphery of the shaft or drum F, at least two threads being provided, one of which is left handed and the other right handed.

In Fig. 2, F' is the left-hand thread, and F² is the mating right-hand thread. These two threads are continuous, running into each

other at both ends of the shaft, as clearly shown in the drawings, and they intersect at every half-turn, the intersections being alternately upon the lower face of the shaft (these being invisible in the drawings) and upon the upper surface thereof, as indicated by the reference-letter F³. Preferably there are two sets of threads such as just described, the second set having its ends diametrically opposite the ends of the threads F' F² and being of the same pitch, so that the intersections F⁶ of the left-hand thread F' and the right-hand thread F⁵ of the second set will come half-way between the intersections F³ of the first set. The threads of one set also intersect those of the other set, as indicated at F⁷. The threads form guides for slides I, projected from the ring E, the slides having two convex surfaces adapted to engage the walls of the spiral grooves or threads (see dotted lines in Fig. 2) and a round shank I', which is pivotally seated in a semicylindrical recess in the ring E and in a like recess in a plate E², which is secured to the ring by bolts J. At its ends the rotary screw or shaft F is provided with heads F⁸ F⁹, having recesses F⁰ parallel and adjacent to the end portions of the grooves—that is, those portions at which the left-hand groove of one set passes into the right-hand groove of the same set. The ring E is provided adjacent to each of the slides I with rounded projections E³, adapted to engage the walls of the recesses F⁰. The swivel-axis E' E' of the ring E is preferably at a right angle to the pivot-axis I' I' of the slides I, as shown in Fig. 3. To more readily carry the rotary screw F over the dead-centers, I may provide a fly-wheel K.

The operation is as follows: If the engine has stopped in a dead-center position, as in Fig. 2, the attendant turns the shaft F—as by means of the fly-wheel K, for instance—in the direction indicated by the arrow. At the start one of the slides I is at the junction of the threads F' F² and the other at the junction of the threads F⁴ F⁵. When the shaft begins to turn in the indicated direction, the slides I pass into the grooves F' F⁴, respectively, these being the two left-hand threads. Now as the piston in the cylinder A propels the slides C² and ring E the slides I exert a

pressure on the spiral threads and turn the shaft or screw F. With the arrangement shown the forward stroke of the piston will impart three complete revolutions to the shaft

5 F. The swivel connection at E' E' is of advantage, as it causes both slides I to bear with equal force upon the threads of the shaft, thereby equalizing strains. Theoretically, with absolutely-true threads, the swivel-joint

10 at E' E' would be superfluous; but in practice it will be almost impossible to avoid inaccuracies resulting from uneven wear, and for this reason I consider it preferable to provide the swivel-joint even where it is appar-

15 ently not required. When the ring E comes to the end of its stroke, the projection E³ comes into engagement with the recess F⁰ of the head F⁹, and as the latter is carried over the dead-center by the momentum of the shaft

20 and fly-wheel the slides I pass from contact with the left-hand threads F¹ F⁴ into the right-hand threads F² F⁵. In doing this the slides I turn about their shanks I' through an angle equal to twice the pitch-angle of the threads.

25 To render this turning movement possible, it is preferable in all cases and necessary when the pitch of the threads exceeds a certain angle to widen the grooves at their ends. The object of the projections E³ and recesses

30 F⁰ is to keep the slides I against the inner walls of the threads at the turn or junction of the right-hand and left-hand threads, thus insuring a smooth passage of the slides at said points even when the grooves are not

35 widened, and the rounded surfaces of the projections E³ and recesses F⁰ assist in turning the slides on their shanks I'. At this moment the motion of the piston is reversed and the ring E travels in the opposite direc-

40 tion, (from right to left in Fig. 2;) but as the slides I now engage the right-hand threads F² F⁵ the shaft F is rotated in the same direction as before—that is, a continuous rotation of the shaft is obtained. It will be under-

45 stood that the shaft may be rotated in one direction or the other, this depending merely upon the direction in which the shaft is started from a dead-center position. The number of revolutions per piston-stroke may

50 be varied by changing the pitch of the screw-threads.

It will be seen that the construction here-inbefore described is simple and very com-

pact and is therefore particularly applicable where a saving of space and of weight is desirable, as in marine engines. 55

I desire it to be understood that the number of slides I and spiral threads may be varied and that other modifications may be made without departing from the nature of 60 my invention as defined in the claims.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The combination of a reciprocating part, 65 a body swiveled thereto and mounted to move in unison therewith, and engaging members on said body, with a rotary body having spiral threads engaged by the said members and arranged in sets, each set comprising two 70 threads of equal but opposite pitch, connected or running into each other at their ends.

2. The combination of a reciprocating part, a body swiveled thereto and mounted to move in unison therewith, and slides carried by 75 said body out of alinement with the swivel-axis, with a rotary body having spiral threads engaged by said slides and arranged in sets, each set comprising two threads of equal but opposite pitch connected or running into each 80 other at their ends.

3. The combination of a reciprocating part, a body swiveled thereto and mounted to move in unison therewith, and slides pivoted to said body about an axis approximately at a 85 right angle to the swivel-axis, with a rotary body having spiral threads engaged by said slides and arranged in sets, each set comprising two threads of equal but opposite pitch connected or running into each other at 90 their ends.

4. The combination of a reciprocating body carrying one or more engaging members, and provided with rounded projections, with a rotary body having connected spiral threads of 95 equal but opposite pitch engaged by said members, and heads having rounded recesses arranged for engagement with said projections.

In testimony whereof I have signed my 100 name to this specification in the presence of two subscribing witnesses.

LOUIS KRAMER.

Witnesses:

JOHN LOTKA,
JNO. M. RITTER.