

M. B. MILLS.
 MEANS FOR CONVERTING RECIPROCATORY MOTION INTO ROTARY MOTION.
 APPLICATION FILED DEC. 14, 1911.

1,054,594.

Patented Feb. 25, 1913.

2 SHEETS—SHEET 1.

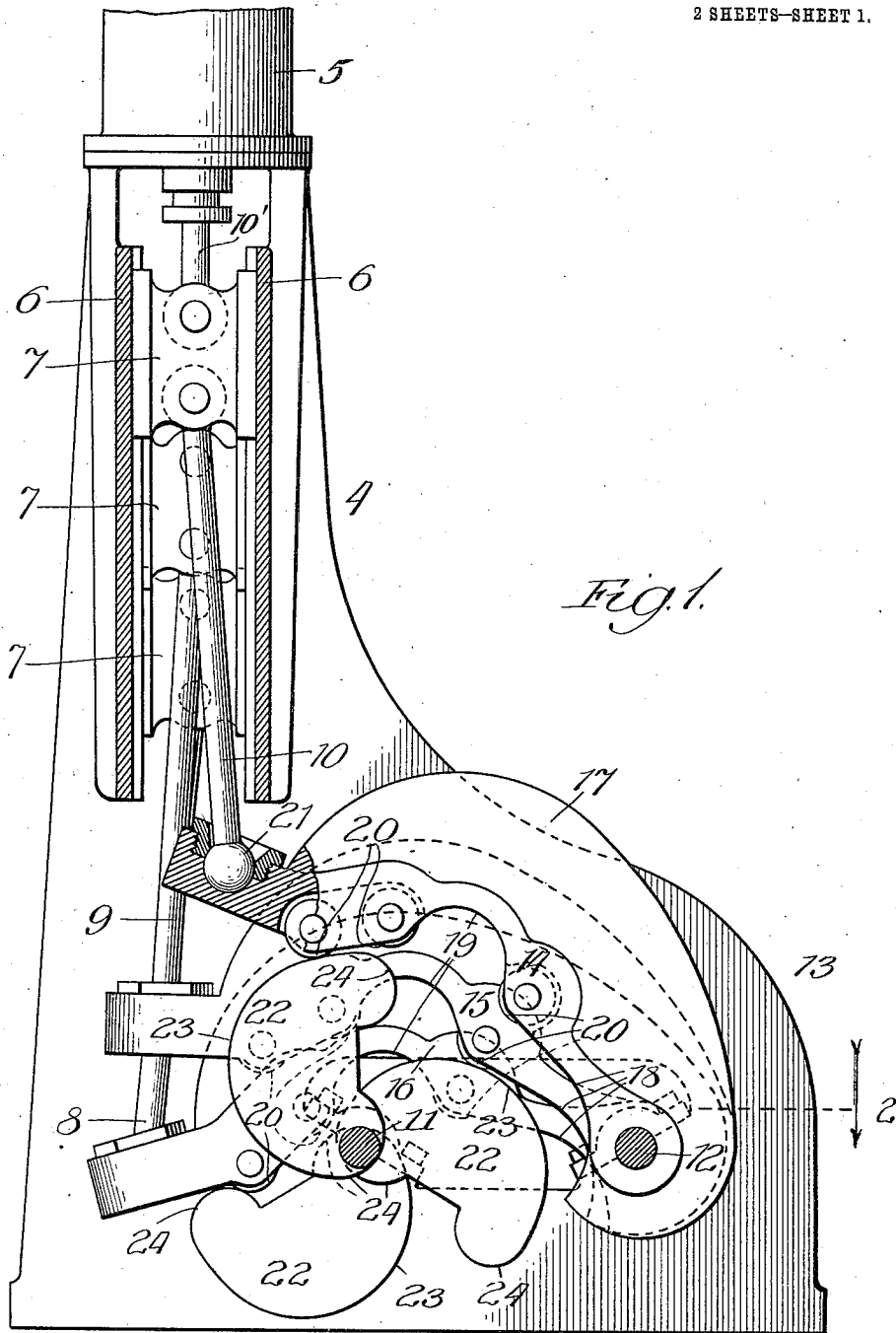


Fig. 1.

Witnesses:
E. C. Gaylord,
A. J. Chase.

Inventor:
Mortimer B. Mills,
By J. W. Smith, Lee, Crittton & Miles,
Attys.

M. B. MILLS.
 MEANS FOR CONVERTING RECIPROCATORY MOTION INTO ROTARY MOTION.
 APPLICATION FILED DEC. 14, 1911.

1,054,594.

Patented Feb. 25, 1913.

2 SHEETS—SHEET 2.

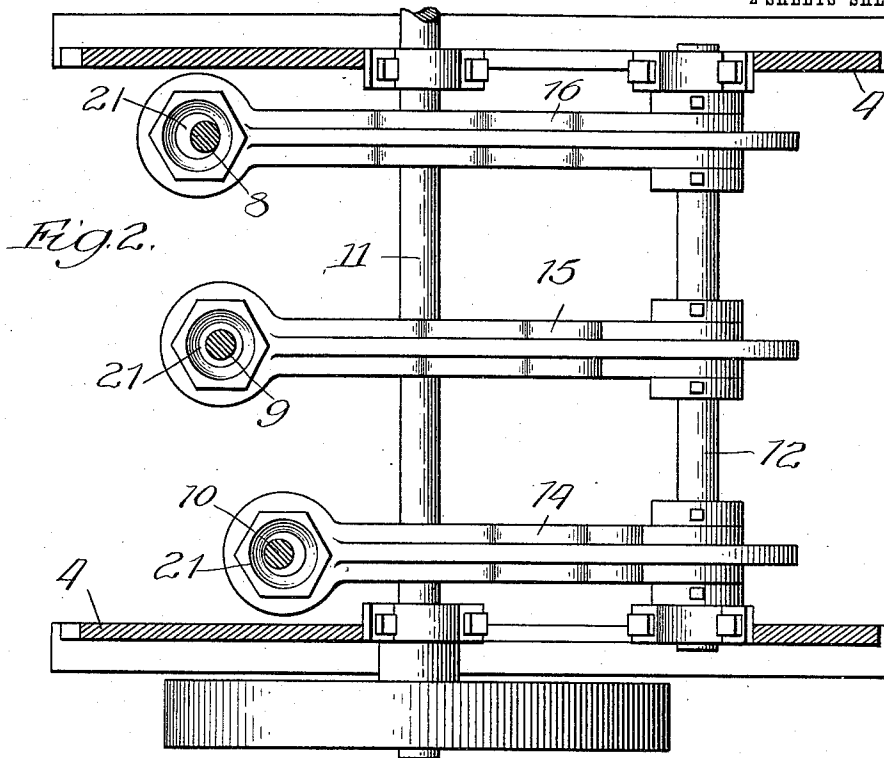
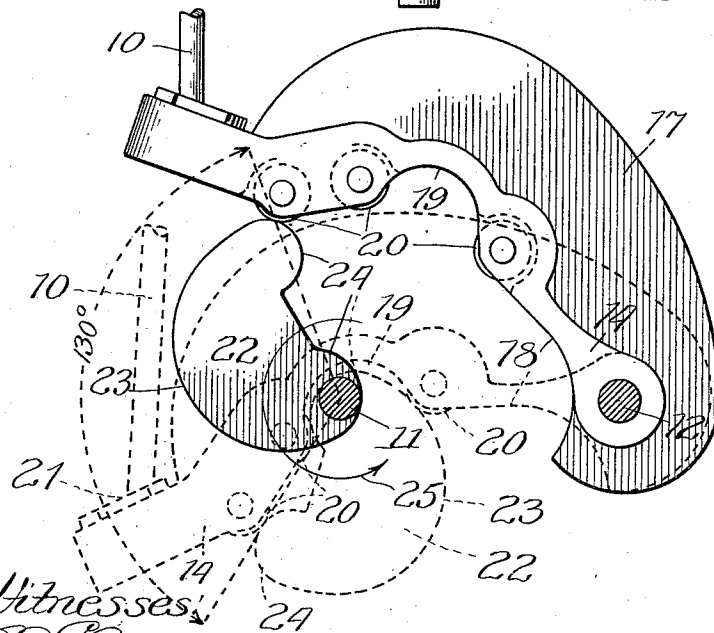


Fig. 3.

Witnesses
 E. C. Paylor,
 A. F. Chase.

Inventor:
 Mortimer B. Mills.
 By *Wm. H. Smith, Sec. Clinton S. Miles*
 Attys.

UNITED STATES PATENT OFFICE.

MORTIMER B. MILLS, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-HALF TO H. S. MILLS,
OF CHICAGO, ILLINOIS.

MEANS FOR CONVERTING RECIPROCATORY MOTION INTO ROTARY MOTION.

1,054,594.

Specification of Letters Patent.

Patented Feb. 25, 1913.

Application filed December 14, 1911. Serial No. 665,784.

To all whom it may concern:

Be it known that I, MORTIMER B. MILLS, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Means for Converting Reciprocatory Motion into Rotary Motion, of which the following is a specification.

My invention relates to improved means for converting reciprocatory motion into rotary motion; and my primary object is to materially increase the efficiency in leverage of the direct action of the reciprocating part or member against the rotary part or member.

I have more immediately devised my improvement for application to piston-driven engines generally, and shown it in the accompanying drawings and hereinafter describe it in connection with an engine in that general class; but I wish to be understood as intending it for use wherever applicable for its motion-converting function referred to.

In the accompanying drawings, Figure 1 is a broken view in side elevation of a three-cylinder engine equipped with my improvement, showing parts in section; Fig. 2 is a diagrammatic plan view of the same, showing the side-members of the engine-frame in section on line 2, Fig. 1, and Fig. 3 is a broken sectional view in the nature of a diagram, showing the parts interposed between a piston-rod and the shaft in elevation in one extreme position by full-line representation and in their other extreme position by dotted representation.

Only so much of an engine is illustrated in the drawings as is necessary for understanding the present invention. The side-members 4, 4 of the engine-frame support upon the connection between their upper end cylinders, of which the lower portion of one is shown at 5 in Fig. 1, three being provided in the present case, though the number may be varied according to requirement. From this connection depend guides 6 for the cross-head 7 between the connecting-rods 8, 9 and 10 and piston-rods, one of which latter is shown at 10¹ in Fig. 1. The connecting rods are, in effect, of course, sections of the respective piston-rods. The engine-shaft 11 is journaled to extend between the cheek-portions 13 of the frame-members 4 parallel with a fulcrum-rod 12

connecting them and in horizontal line with the shaft. On the rod 12 are fulcrumed at one end similar levers 14, 15 and 16, one for each piston shown curved, and formed with a face reinforced by a back-web 17 and having a relatively shallow, elongated concavity 18 extending from near its fulcrumed end and a narrower and deeper concavity 19 near its opposite, free end. These levers carry anti-friction rollers 20 in their bearing-faces and they are preferably connected, as by ball-and-socket connections like the one shown at 21 in Fig. 1, respectively with the connecting-rods 8, 9 and 10 at their outer ends. At intervals corresponding with those at which the levers cross the shaft, the latter carries similar cranks 22 of the general cam-shape illustrated, by which the crank presents a curved back or cam-face 23 terminating at its opposite ends in rounded cam-heads 24.

The operation will be understood from the following explanation relative to the showing in Fig. 3, which illustrates the action of one crank 22: At the beginning of the down-stroke of a piston, the relative positions of its connecting-rod, the respective lever and crank are those of the full-line representation. The movement of the piston-rod forces the lever at the first roller 20 against the outer cam-head 24, and turns the crank 22, and with it the shaft in the direction indicated by the arrow at 25, to the dotted position shown of the crank, the lever bearing continuously, at its said roller, against the cam-head to the end of the piston-stroke. According to the particular arrangement of parts illustrated, this stroke of the piston will turn the shaft to the extent of 130 degrees, though the arrangement may be varied to change that extent; but the action of the connecting-rod against the crank is such, through the interposed lever, fulcrumed at 12, as to cause the lever to exert practically the same purchase or leverage, avoiding all dead centers, throughout the piston-stroke and thus materially increase the efficiency in leverage against the crank for turning the shaft. The several connecting-rods act successively in the same manner, through the interposed levers 16, 15 and 14 against the respective cranks, so that the shaft is turned continuously like an ordinary crank-shaft; and when one crank has been acted on, as described, by a connect-

ing-rod, the continued rotation of the shaft carries that crank back to its initial position. In attaining that position from the one to which the lever forced the crank, its cam-face 23 bears against the roller 20 nearest the fulcrumed end of the lever to raise the latter, until the cam-face clears that point, when it attacks the other two rollers in succession and continues the raising of the lever until it and the crank have attained their initial positions, when they are again in position to be acted upon by the down-stroke of the piston. Where the piston is actuated by steam or other pressure exerted against it in the cylinder in opposite directions, and its connecting rod is joined to the lever, as at 21, of course the upward pressure against the piston will return the lever to its initial position without aid from the crank for raising it.

I realize that considerable variation is possible in the details of construction herein specifically shown and described, and I do not intend by illustrating a single, specific, or preferred form to limit my invention thereto; my intention being in the following claims to claim protection upon all the novelty there may be in the device as broadly as the state of the art will permit.

What I claim as new and desire to secure by Letters Patent is:—

1. Means for converting reciprocatory motion into rotary motion, comprising, in combination, a plurality of reciprocating driving members, a rotary driven shaft, a series of cranks set on the shaft to extend at relatively-different angles therefrom, and a series of single levers fulcrumed eccen-

trically of the shaft to extend across the outer ends of the respective cranks into the paths of said members to be actuated by the movements of the latter against the crank-ends, through the medium of levers, to drive the shaft with the extent of the crank-length.

2. Means for converting reciprocatory motion into rotary motion, comprising, in combination with a series of reciprocating driving members, a rotary shaft, a series of cam-like cranks set on the shaft to extend at relatively different angles therefrom, said cranks having curved cam-faces and rounded ends, and a series of levers fulcrumed eccentrically of the shaft to extend across the respective cranks into the paths of the reciprocating members to be actuated thereby to turn said cranks and drive the shaft.

3. Means for converting reciprocatory motion into rotary motion, comprising, in combination with a series of reciprocating driving members, a rotary shaft, a series of cam-like cranks set on the shaft to extend at relatively different angles therefrom, said cranks having curved cam-faces and rounded ends, and a series of levers fulcrumed eccentrically of the rotary member to extend across the respective cranks into the path of the reciprocating members to be actuated thereby to turn said cranks and drive the shaft, each lever having on its face a series of bearing points for successive contact with the crank engaging them.

MORTIMER B. MILLS.

In the presence of—
R. A. SCHAEFER,
A. W. LARSEN.