

2 Sheets—Sheet 1.

No. 586,829.

Patented July 20, 1897.

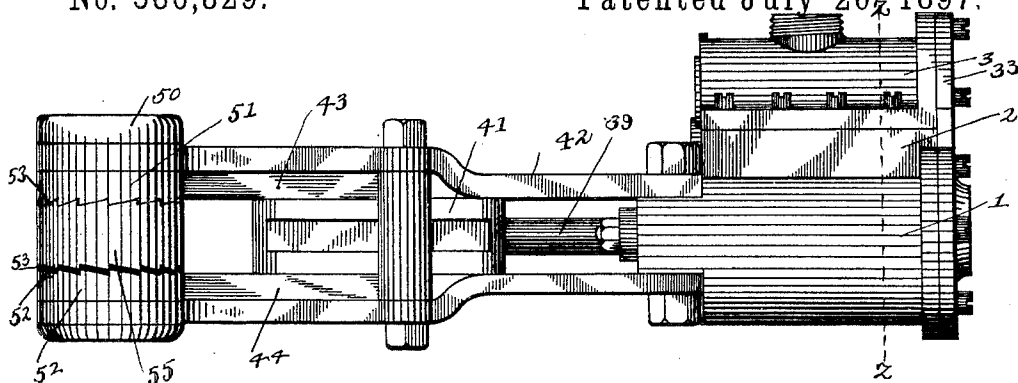


Fig 1

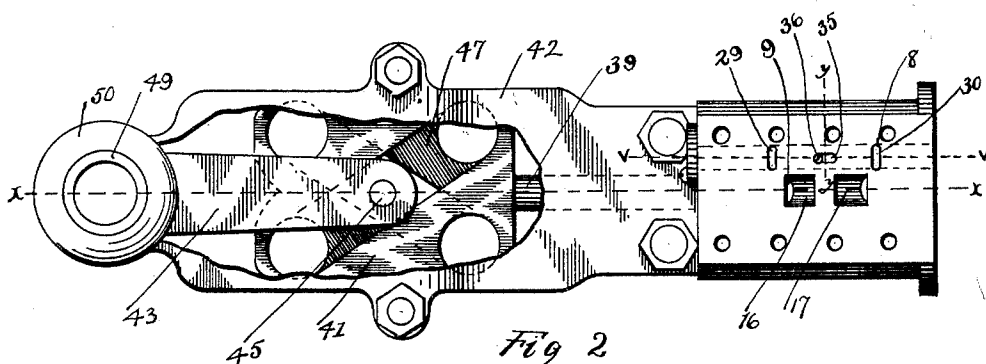


Fig 2

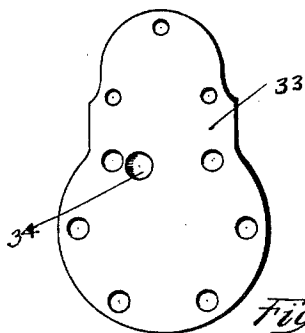


Fig 3

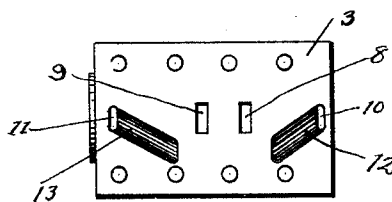


Fig 4

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(No Model.)

2 Sheets—Sheet 2.

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MECHANISM FOR CONVERTING RECIPROCATING MOTION INTO ROTARY
MOTION.

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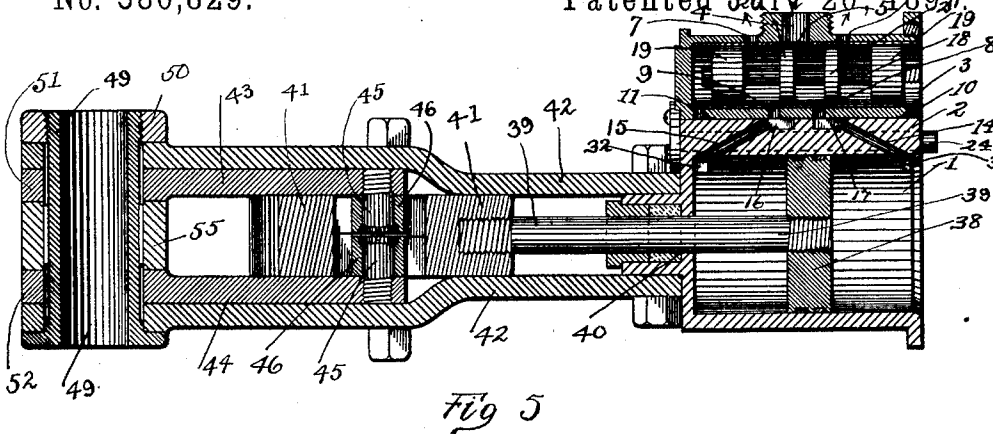


Fig 5

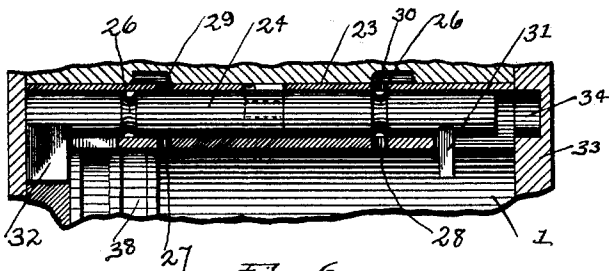


Fig 6

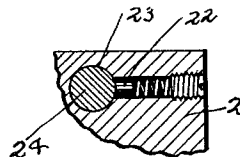


Fig 7

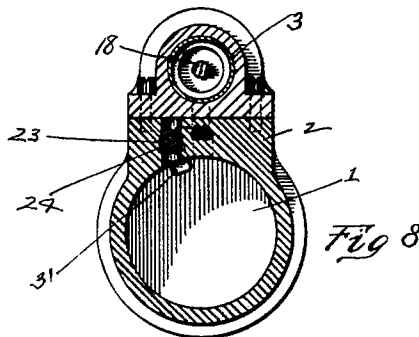


Fig 8

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UNITED STATES PATENT OFFICE.

JOHN ULRICH AND CARL WITTKÉ, OF COLUMBUS, OHIO.

MECHANISM FOR CONVERTING RECIPROCATING MOTION INTO ROTARY MOTION.

SPECIFICATION forming part of Letters Patent No. 586,829, dated July 20, 1897.

Application filed September 8, 1896. Serial No. 605,204. (No model.)

To all whom it may concern:

Be it known that we, JOHN ULRICH and CARL WITTKÉ, citizens of the United States, residing at Columbus, in the county of Franklin and State of Ohio, have invented a certain new and useful Improvement in Mechanism for Converting Reciprocating Motion into Rotary Motion, of which the following is a specification.

Our invention relates to improvements in mechanism for converting reciprocating motion into rotary motion; and the objects of our said invention are to so construct and arrange the parts of our improved mechanism as to convert the ordinary reciprocating motion of a steam or air actuated piston-rod into a rapid and uniform rotary motion; and to this end it consists in certain improved details of construction and arrangement of parts which will be more fully pointed out hereinafter. These objects we accomplish in the manner illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation of our improved mechanism in connection with an engine. Fig. 2 is a plan view of the same with a portion of the framework broken away and showing the outer valve-cylinder removed. Fig. 3 is a view in elevation of the cylinder end plate. Fig. 4 is a view of the under side of the valve-cylinder. Fig. 5 is a central longitudinal section on line *xx* of Fig. 2. Fig. 6 is an enlarged sectional view on line *vv* of Fig. 2. Fig. 7 is a detail sectional view on line *yy* of Fig. 2, and Fig. 8 is a transverse section on line *zz* of Fig. 1.

Similar numerals refer to similar parts throughout the several views.

In carrying out our invention we employ a suitable engine, which is preferably of the construction shown and hereinafter described.

1 is the main steam or air cylinder, the upper side of the casing of which is thickened to form an enlarged top portion 2. On the outer side of this enlargement 2 is supported and secured a valve-cylinder 3. This valve-cylinder is provided on its upper side with an inlet-neck 4, which through the medium of a small port 5 communicates with the interior of said valve-cylinder. On opposite sides of the neck 4 and adjacent thereto the valve-cylinder has formed therein ports 6 and 7.

8 and 9 represent, respectively, ports which are arranged in the bottom of the valve-cylinder and on opposite sides of the center of the length thereof.

10 and 11 represent, respectively, ports which are formed through the bottom of the valve-cylinder at the ends thereof. These ports 10 and 11 have communicating therewith inwardly-inclined recesses or grooves 12 and 13, which are formed on the under side or in the bottom plate of the valve-cylinder 3.

Through the upper side or top plate 2 of the cylinder 1 are formed inclined passages or ports 14 and 15, the upper ends of these passages or ports leading, respectively, from depressions or recesses 16 and 17, which are formed in the upper side of said cylinder top plate and which communicate through the medium of the ports 8 and 9 with the interior of the valve-cylinder 3. The inner ends of the passages 14 and 15 communicate with opposite end portions of the cylinder 1.

18 represents a horizontally-placed valve stem or rod which carries thereon at each end a valve-disk 19 and which carries on opposite sides of the center of its length valve-disks 20 and 21, these valve-disks all fitting and sliding within the cylinder 3. In the top plate or upper portion 2 of the steam-cylinder and on one side of the center of the width thereof is formed a valve-chamber or longitudinally-arranged socket 23, in which is adapted to fit and slide a valve-rod 24, this valve-rod being provided at proper points on each side of the center of its length with peripheral grooves 25 and 26. On opposite sides of the center of the length of the steam-cylinder and in the upper portion thereof I provide ports 27 28, which are adapted, as hereinafter described, to be alternately brought into communication with the grooves or recesses 26 of the valve-rod 24. Through the upper side of the valve cylinder or socket 23 are formed ports 29 and 30, which communicate with the inner ends of the port ways or grooves 13 and 12.

The front and rear end portions of the valve-rod 23 are provided with downwardly-extending lugs 31 and 32, which, as indicated in the drawings, project within the main cylinder 1.

In the end plate 33, which, as indicated in Fig. 1 of the drawings, covers the ends of the valve and main cylinder, we provide a re-

ceiving-socket 34 for the outer end of the rod 24.

Through the upper side of the cylinder top plate 2 and centrally therein is formed a short slotted opening 35, within which projects a stop-pin 36, which extends upward from the rod 24 and is designed to limit the longitudinal movement of said rod.

22 represents a spring-actuated brake-bolt which is arranged in an opening formed in one side of the cylinder portion 2, the inner end of said bolt being adapted to bear against the valve-rod 24.

Within the cylinder 1 we provide a piston-head 38, which fits and slides therein, said piston-head being provided with a piston-rod 39, which extends outward through a suitably-packed opening 40 in the end of the cylinder 1. This piston-rod carries on its outer end a sliding head or block 41, which, as indicated in the drawings, is adapted to travel between the inner faces of two outwardly-extending guide-plates 42, the outer portion of these guide-plates being bent outward one from the other. The upper and lower sides of the block 41 are embraced by drive-arms 43 and 44, the inner ends of each of these drive-arms being provided with a forwardly-projecting pin 45, on which is mounted a roller 46. The upper and lower rollers thus provided bear and travel, respectively, within diagonally-arranged ways or recesses 47, which are formed in the upper and lower faces of the block 41.

Through the outer ends of the guide-plates 42 passes loosely a shaft 49, which may be of the tubular form shown or may be formed solid, as desired. This shaft-section 49 is provided at one end with a flanged head portion and at its remaining end with a detachable ring-flange 50. Each of the driving-arms 43 44 is provided with a rounded outer end or head, as indicated at 51 and 52, and on the inner face of each of these latter are formed inclined teeth, as shown at 53. These enlarged heads or end rings of the arms 43 and 44 are made to loosely surround the shaft 49 on the inner sides of the plate ends 44. Surrounding the shaft 49, between the heads 51 and 52, is a driving-ring 55, the latter being keyed to said shaft. This driving-ring has its upper and lower ends provided with notches or teeth corresponding with the teeth on the adjoining faces of said driving-arm heads. The width of the ring 55 is such as to result, when the teeth on one side thereof are in engagement with the teeth of the adjoining driving-arm head, in the teeth of the remaining side thereof being out of engagement with the teeth of the remaining driving-arm head.

In order to illustrate the manner of operating and utilizing the herein-described form of engine and the improved converting mechanism, we will assume that the piston-head is in the outer end portion of the cylinder 1, adjacent to the port 14, that the valve-rod 18

is in such position within its cylinder as to result in the space between the valve-disks 20 and 21 forming a means of communication between the port 5 and port 8, and the space between the forward valve-disk 19 and valve-disk 20 forms a means of communication between the port 7 and the port 9. The parts being in this position, the air or steam which enters the port 5 from a suitable source passes through the port 8, thence into the depression 17, and through the port or passage 14 and into the outer end of the cylinder 1. The volume of air or steam thus discharged into said cylinder end serves to drive the piston-head 38 forward in its cylinder until it comes into contact with the lug 32 of the rod 24, thereby moving the latter until its groove 26 is in communication with the ports 28 and 30, as indicated more clearly in Fig. 6 of the drawings. This forward movement of the piston being accomplished, it is obvious that the air or steam contained in the outer portion of the cylinder will find a means of exit through the port 28, rod-groove 26, and ports 30 and 10 to the outer portion of the valve-cylinder 3. The volume of air thus discharged into the outer end of the valve-cylinder results in the valve-stem being forced inward until the valve-disks 20 and 21 are in such position as to establish communication between the port 5 and port 9 and to cut off communication between said port 5 and port 8. This inward movement of the valve-stem and change in positions of the valve-disks results in establishing communication between the exhaust-port 6 and port 8, thereby allowing the air or steam to escape from the forward portion of the cylinder 1 through the ports 14, 8, and 6. The air or steam which enters the inner end of the cylinder through the medium of the ports 7, 9, and 15 serves to drive the piston-head to the outer end of the cylinder 1, at which point said head comes into contact with the lug 31 and drives the rod 24 outward. This movement of the rod 24 closes the communication between the ports 28 and 30 and establishes communication between the ports 27 and 29, thereby allowing a sufficient quantity of air in the inner end of the cylinder 1 to pass outward through the port 11 into the inner end of the valve-cylinder, where, by pressure on the inner valve-disk 19, it operates to drive the valve-rod to the first-described position.

From the above-described operation it will be seen that the movement of the valve-rod 24 is occasioned just as the piston-head is completing its stroke, thereby providing for the desired change in the position of the valve-rod 18 at the proper moment for the return of said piston-head.

The reciprocating motion which is imparted to the block or head 41 through the above-described operation of the piston must result, as will readily be seen, in the ends of the arms 43 and 44 traveling back and forth within their ways or channels 47. The fact

that these ways or channels are, as indicated in the drawings, arranged to extend in diagonally opposite directions causes the arm 43 to move inward as the arm 44 moves outward, and vice versa. It is obvious that the teeth of one of the driving-arms will not only disengage from the teeth of the ring 55 when said driving-arm is making its backward stroke, but in thus disengaging said ring will have its teeth on its opposite side forced into engagement with the teeth of that driving-arm which is moving outward. In this manner it will be observed that the arms 43 and 44 will be moved in succession to impart a rotary motion to said ring 55, and consequently to the shaft on which said ring is mounted. It is obvious that this shaft may be employed as a tool-holder or for any other purpose where rotary motion is required.

Having now fully described our invention, what we claim, and desire to secure by Letters Patent, is—

In an engine the combination with the main cylinder, a piston-head therein and piston-

rod extending therefrom and means for imparting a reciprocating motion to said piston-head and rod, of parallel guide-plates extending from said cylinder, a sliding block or head 41 between said guide-plates with which said piston-rod is connected, diagonally-arranged ways or channels in opposite sides of said block or head, said channels running in diagonally opposite directions, driving-arms 43, 44, a roller projecting inwardly from each of said arms, said rollers bearing in said block or head channels, a shaft 49, a ring 55 keyed thereon, inclined teeth on the outer sides of said ring, said driving-arms loosely surrounding the shaft 49 on opposite sides of said ring 55 and inclined teeth on said driving-arm ends corresponding and adapted to engage with the teeth of said ring, substantially as and for the purpose specified.

JOHN ULRICH.
CARL WITKE.

In presence of—

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A. L. PHELPS.