

(No Model.)

2 Sheets—Sheet 1.

J. L. OAKES.
MECHANICAL MOVEMENT.

No. 547,446.

Patented Oct. 8, 1895.

FIG. 1.

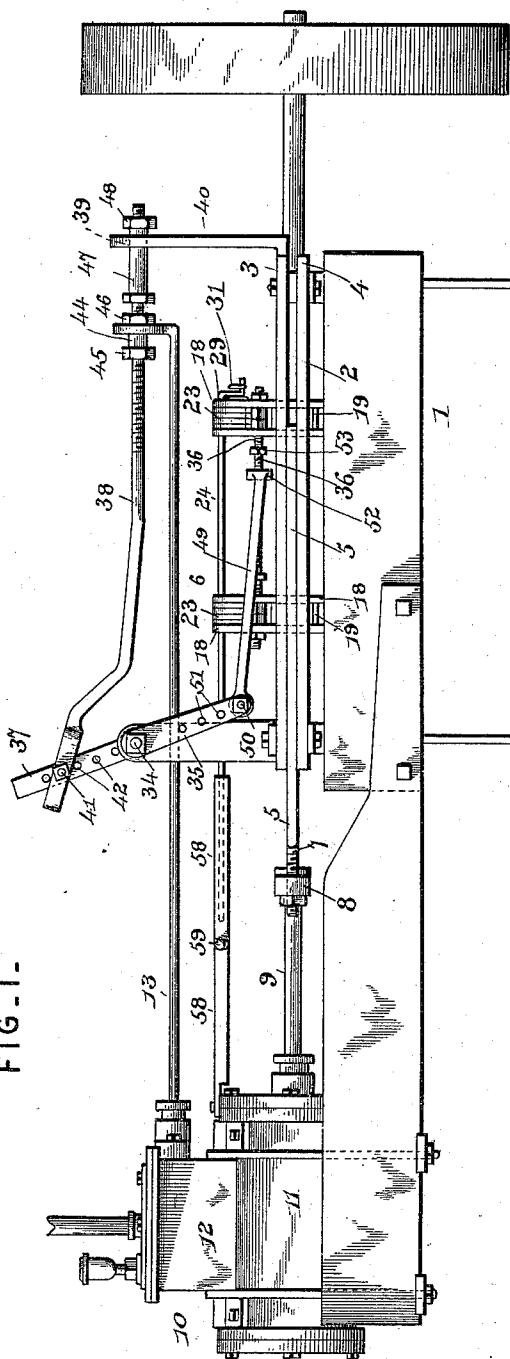
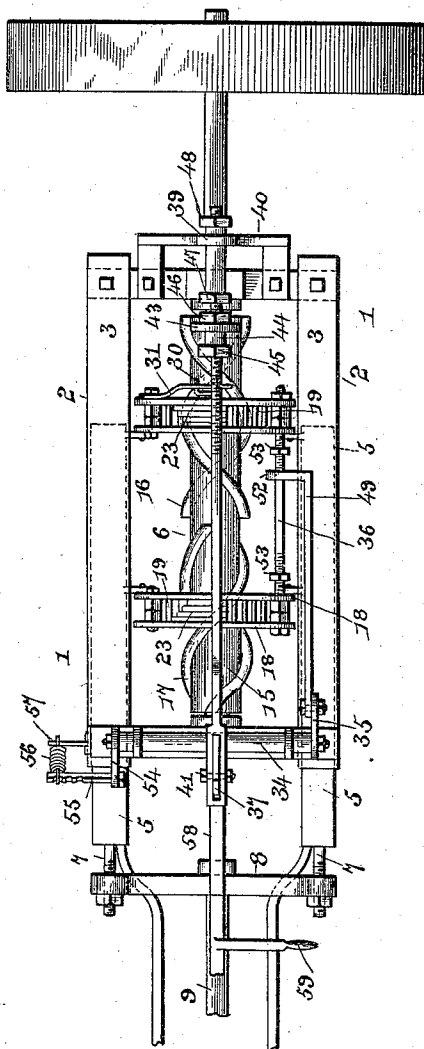


FIG. 2.



Inventor

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By *Tris* Attorneys.

Cashow & Co.

Witnesses

Jas. K. McElathran
[Signature]

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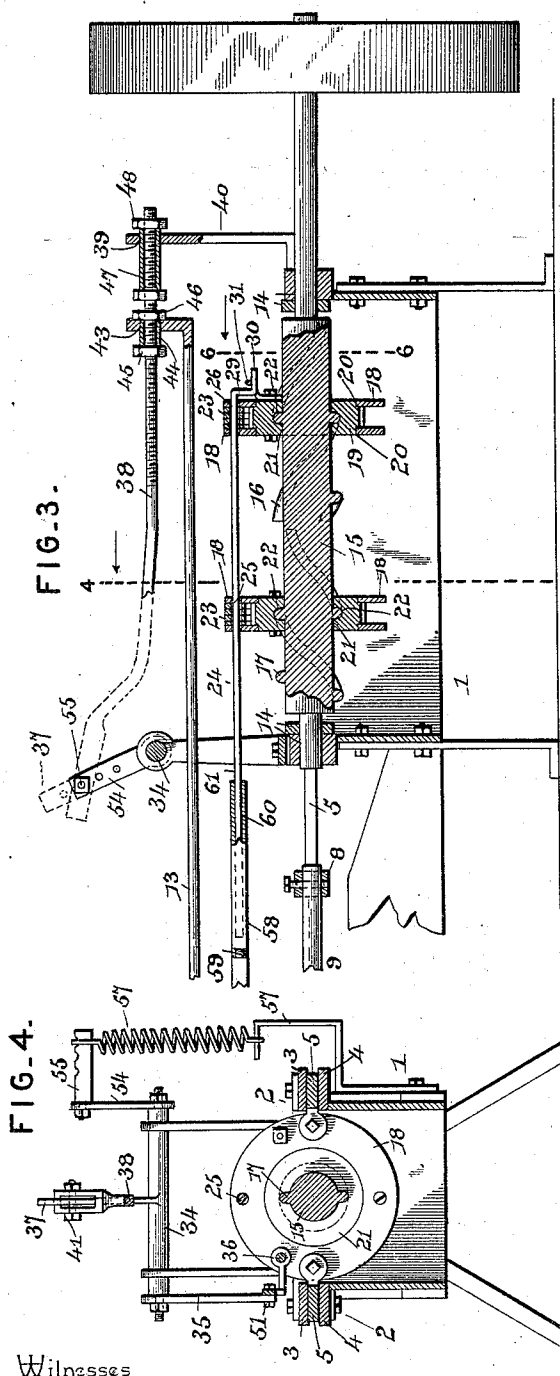


FIG. 4.

FIG. 3.

FIG. 6.

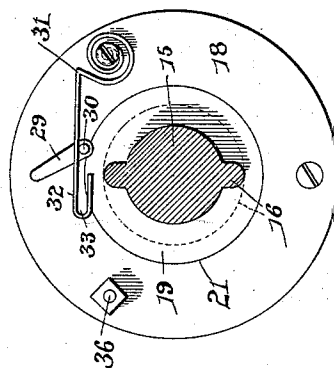


FIG. 7.

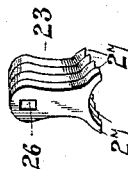
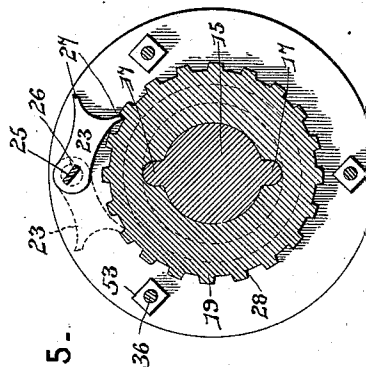


FIG. 5.



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UNITED STATES PATENT OFFICE.

JOHN L. OAKES, OF PITTSBURG, OHIO.

MECHANICAL MOVEMENT.

SPECIFICATION forming part of Letters Patent No. 547,446, dated October 8, 1895.

Application filed January 21, 1895. Serial No. 535,658. (No model.)

To all whom it may concern:

Be it known that I, JOHN L. OAKES, a citizen of the United States, residing at Pittsburg, in the county of Darke and State of Ohio, have

invented a new and useful Mechanical Movement, of which the following is a specification.

My invention relates to mechanical movements, and particularly to means for converting reciprocatory rectilinear movement into continuous rotary movement, the objects in view being to provide means, in connection with reciprocatory heads for co-operation with a double reversed screw or worm, whereby lost motion at the extremities of the strokes is avoided; to provide simple and efficient means for reversing the direction of rotation of the rotary part of the mechanism, such reversal being accomplished while the machine is in operation or without cutting off the supply of motive agent; to provide means for operating the valve mechanism which controls the inlet and exhaust of the motive agent, whereby the stoppage of the machine on a dead-center is prevented, and, furthermore, to provide suitable means for the adjustment of the various parts, whereby the length of the path of the reciprocatory member and the times of inlet and exhaust may be varied to suit the conditions under which the mechanism is operated.

Further objects and advantages of the invention will appear in the following description, and the novel features thereof will be particularly pointed out in the appended claims.

In the drawings, Figure 1 is a side view of a mechanism constructed in accordance with my invention, showing the same applied to the piston of a horizontal engine. Fig. 2 is a plan view of the movement. Fig. 3 is a longitudinal central section of the same. Fig. 4 is a transverse section on the line 4 4 of Fig. 3. Fig. 5 is a detail transverse sectional view of one of the reciprocatory heads, with the core or nut carried thereby, and showing the connection between such core or nut and the rotary shaft, the reversed position of the pawls carried by the head being shown in dotted lines. Fig. 6 is a detail view of one of the heads, showing the means for reversing the pawls and holding them in their adjusted positions. Fig. 7 is a detail view in perspective of a set of pawls.

Similar numerals of reference indicate corresponding parts in all the figures of the drawings.

1 designates a base or bed upon which are arranged parallel longitudinal tracks or guides 2, each track or guide consisting of parallel upper and lower plates 3 and 4, and mounted on the tracks or guides, with its lateral flanges 5 fitting between the upper and lower plates 3 and 4, is a carriage 6, connected by means of rods 7 and a cross-rod 8 to a reciprocatory piston-rod 9. This piston-rod may be actuated by any suitable means, but in the construction illustrated in Fig. 1 it forms a part of a horizontal engine 10, of which 11 represents a cylinder, 12 a valve-chamber, and 13 a valve-rod.

Bearings 14 are formed at the centers of the opposite ends of the bed 1, and therein are mounted the extremities of a shaft 15, this shaft being provided upon its surface with spirally-disposed threads or ribs 16 and 17, the threads or ribs 16 at one end of the shaft and extending from said end to the center thereof being passed around the shaft in one direction, while the threads or ribs 17 at the other end of the shaft, and extending from said end to the center thereof, are passed around in the opposite or reverse direction. The carriage 6, in addition to having the parallel side flanges 5, comprises duplicate pairs of parallel spaced rings or annular plates 18, the pairs of rings or plates being spaced apart a distance approximately equal to one-half the length of the shaft. Mounted in the bearings formed by the inner peripheries of these rings or annular plates 18 are the rotary cores or nuts 19, provided with rabbeted edges 20 to receive the inner edges of the rings or annular plates and having central openings 21, which are fitted upon the shaft 15. These cores or nuts are provided in their bores with spirally-disposed grooves or channels 22 to engage and receive the spirally-disposed threads or ribs 16 and 17 on the shaft, one of the cores or nuts being arranged upon and being adapted to traverse each of the sections or portions of the shaft. By sections or portions of the shaft are meant those parts thereof which are provided with the opposite or reversely-coiled threads or ribs 16 and 17; and, as will be understood, I do not desire to limit myself to

the two sections or portions illustrated in the drawings, but reserve to myself the right of using any desired number to secure the necessary power to suit the conditions under which the machine is employed.

Pivotally mounted between the parallel rings or annular plates 18, which, with the cores or nuts carried thereby, form the heads of the carriage 6, are mounted pawls 23, a plurality being carried by each head and all being arranged upon a common center, which, in the construction illustrated, consists of a reversing-rod 24, which extends longitudinally over the shaft 15 and parallel with its axis, whereby it is parallel with the direction of movement of the carriage. This spindle is angular, as shown at 25, to fit in the similar angular openings 26 in the pawls, whereby the pawls may be reversed by turning the spindle through an arc of a circle, the pawls being provided with opposite engaging points or lips 27, whereby they may be reversed or turned from the position indicated in full lines in Fig. 5 to that indicated in dotted lines in the same figure. Obviously the pawls are constructed of different lengths in order to insure the engagement of one of the set in any position of the core, to prevent lost motion between the pawls, and hence the carriage and the cores or nuts, the latter being provided with peripheral teeth or spurs 28 for engagement by the pawls. In order to allow independent engagement of the pawls, comprising a set with the teeth or spurs of the cores or nuts, the openings 26 in the pawls are somewhat larger than the angular portions 25 of the spindle 24, whereby sufficient looseness is provided without preventing the reversal of the pawls by the rotation of the spindle.

In order to maintain the spindle in any of its adjusted positions and prevent accidental displacement during operation, I provide said spindle at one end with a crank-arm 29, having a terminal wrist-pin 30 and a retaining-spring 31, fixed to the contiguous ring or annular plate 18, and having an arm 32 to engage said wrist-pin, the extremity of the spring-arm being provided with a loop 33 to prevent said extremity from slipping out of engagement with the wrist-pin when the crank-arm is in the opposite position to that which is indicated in Fig. 6.

In connection with the above-described mechanism I employ valve-operating gear connected with the valve-stem 13 and comprising, essentially, a rock-shaft 34, having a crank-arm 35, connected to a stop-rod 36, extending between the heads of the carriage, and another crank-arm 37, also carried by said rock-shaft and operating a longitudinal slide 38. This slide is mounted at one end in a bearing 39, formed in a bracket 40 at one end of the bed, and at the other end is connected by means of a transverse bolt 41 to the crank-arm 37. The crank-arm 37 is provided with a plurality of perforations 42 for engagement

by the bolt 41, whereby the throw of the slide 38 may be varied to alter the extent of movement of the valve-stem, and the latter has a sliding connection with the slide, the same comprising a terminal eye 43, receiving a sleeve 44, embracing the slide 38 and adjustably held in place by means of nuts 45 and 46. By means of this adjustable connection between the valve-stem and the slides 38, the valve, which is not shown in the drawings for the reason that its construction forms no part of my invention, may be arranged to properly open and close the inlet and exhaust ports of the cylinder. An auxiliary sleeve 47 is also fitted upon the end of the slide 38 to form a journal to fit in the bearing 39, said sleeve 47 being adjustably secured in place by means of nuts 48, also threaded upon the slide. The adjustment of this bearing-sleeve 47 is necessary to allow for the connection of the slide with different points of the crank-arm 37.

The connecting-rod 49, between the crank-arm 35 and the stop-rod 36, is adjustable with relation to said crank-arm by means of a bolt 50, which is adapted to engage one of a series of perforations 51 in said arm, and the other end of the connecting-rod is provided with an eye 52 to slide upon the stop-rod 36. This stop-rod is threaded, as shown clearly in Fig. 2, and adjustably fitted thereon are the terminal stops 53, one of which is adapted to engage the eye 52 adjacent to the limit of movement of the carriage in either direction. By adjusting these stops upon the stop-rod, the times of engagement with the connecting-rod may be varied to admit and cut off the steam or other motive agent at the desired intervals. The rock-shaft 34 is also provided with a crank-arm 54, having a wrist-pin 55, to which is connected the upper end of a coiled reversing-spring 56, the lower end of said spring being attached to the frame or bed of the machine by means of a lateral bracket 57.

From the above description it will be seen that in operation the reciprocation of the carriage caused by the movement of the piston-rod will be converted by the cores or nuts and the reversely-threaded shaft with which they engage into rotary movement of such shaft, the cores or nuts being held by the pawls against rotation during the movement of the carriage in one direction, whereby they operate upon the shaft through the spiral threads or ribs and turn freely in the opposite direction, during which movement the pawls slip idly over the teeth or spurs on the peripheries of the cores. By reason of the reverse arrangement of the threads or ribs at different parts of the shaft, one of the cores, or one-half the entire number of cores employed, is held stationary with the carriage during the movement of the carriage in one direction, while the other core, or one-half the number of cores employed, slips idly or turns with the shaft. Thus one of the cores operates to impart rotary motion to the shaft throughout each rectilinear movement of the carriage.

The stops 53 do not communicate motion to the rock-shaft except as the carriage approaches the limits of its movement, and the rock-shaft is adapted to turn and thus move the slide 38 until the arm 54 thereof is in an approximately-vertical position, or in the plane of the reversing-spring 56, before the nut 45 engages the eye 43. Thus when the nut 45 strikes the eye 43 the reversing-spring 56 is strained and is brought into action to accomplish the movement of the valve-stem, and hence the reversal of the valves. Thus the valve-stem remains at rest throughout the greater portion of the movement of the carriage and the reversal of its position is accomplished quickly and at the ends of the strokes of the carriage. I preferably employ a continuous series of teeth or spurs 28 upon the periphery of each of the cores or nuts 22, whereby the pawls are adapted to engage the teeth or spurs in any position of the cores, thus avoiding lost motion at the ends of the strokes.

In order that the reversal of the pawls 23 may be accomplished from a point near the cylinder, I employ a stem 24 of telescoping members, the tubular member 58 being mounted at one end in a bearing upon the contiguous head of the cylinder and being provided with a handle or lever 59 for the use of the operator. This tubular member is provided with a cross-sectionally angular bore 60, in which fits the corresponding cross-sectionally angular portion of the other member 61 of the stem.

It will be understood that I do not desire to limit my invention to use in connection with a steam motor, inasmuch as it is applicable to any construction of mechanism in which it is necessary to convert a reciprocatory into a continuous rotary movement, and as freedom of movement under the influence of momentum is provided at the ends of the strokes of the carriage a high rate of speed may be attained without back-pressure in the cylinder and without the continuous friction which is unavoidable in those constructions in which a direct connection between the piston-rod and a driven shaft is employed.

It is obvious that various changes in the form, proportion, and the minor details of construction may be resorted to without departing from the spirit or sacrificing any of the advantages of this invention.

Having described my invention, what I claim is—

1. The combination of a reciprocatory carriage, a reversely threaded shaft arranged parallel with the path of the carriage, cores or nuts mounted upon the carriage and engaging, respectively, the reversely right-hand and left-hand threads of said shaft, said cores or nuts being peripherally and continuously toothed or spurred, a plurality of sets of reversible pawls on the carriage arranged in continuous engagement with the toothed or spurred peripheries of the cores or nuts, a common spindle for the pawls of both nuts or

cores, and means whereby the spindle may be turned to reverse the positions of the pawls, substantially as specified.

2. The combination of a reciprocatory carriage, a reversely threaded shaft arranged parallel with the path of the carriage, rotary cores or nuts mounted upon the carriage and engaging, respectively, the right-hand and left-hand threads of the shaft, a spindle mounted upon the carriage and provided with means whereby it may be turned, and reversible pawls arranged in sets in engagement with the cores or nuts, said pawls being of graded lengths, having opposite engaging points or lips whereby they may be reversed to impart motion in opposite directions to the shaft, being provided with angular openings for the reception of angular portions of said spindle, and being loosely fitted thereon to allow independent vibration of the free ends of the pawls, and yet enable the pawls to be reversed by turning the spindle, substantially as specified.

3. The combination of a reciprocatory carriage, a reversely threaded shaft arranged parallel with the path of the carriage, rotary cores or nuts mounted upon the carriage and engaging, respectively, the threaded portions of the shaft, a spindle constructed of telescoping members of which one member is mounted for rotation in fixed bearings and the other member is mounted upon the carriage and is slidably connected with the first-named member, and reversible pawls arranged in engagement with the cores or nuts and having opposite points or lips whereby they may be reversed to impart motion in opposite directions to the shaft, said pawls having angular openings loosely fitted upon angular portions of the member of the spindle which is mounted upon the carriage, whereby said pawls are adapted to reciprocate independently to suit the positions of the teeth or spurs on the cores or nuts and whereby said pawls may be reversed simultaneously by turning the member of the spindle which is mounted in fixed bearings without previously checking the motion of the mechanism, substantially as specified.

4. The combination with a stationary base or bed, of parallel tracks or guides having upper and lower parallel plates, a carriage having lateral flanges fitting between said parallel plates and connected by pairs of transverse perpendicularly-disposed rings or annular plates arranged in co-axial alignment the members of each pair having their adjacent faces spaced apart, a core or nut having rabbeted edges mounted in the bearings formed by the inner peripheries of each pair of rings or annular plates, the cores having peripheral teeth or spurs and interior spirally-disposed grooves or channels, a shaft arranged parallel with the path of the carriage and provided with reversely arranged threads or ribs, said shaft extending through the bores of said cores or nuts and having its threads or ribs

engaged by the grooves or channels thereof, and pawls mounted in the intervals between said rings or annular plates and engaging the teeth or spurs of the cores or nuts, substantially as specified.

- 5 5. The combination with a reciprocatory member, of a rock shaft, a reversing spring connected with the rock shaft and adapted to turn the same from its intermediate point of
10 movement toward either limit of movement, a stop rod slidably mounted upon and arranged parallel with the path of the reciprocatory member, adjustable stops mounted upon said stop rod, a crank arm fixed to the rock shaft,
15 a connecting rod between said crank arm and the stop rod and provided with an eye which is slidably fitted thereon, and connections between the rock shaft and a valve stem, substantially as specified.
- 20 6. The combination with a reciprocatory member, of a rock shaft, a reversing spring connected therewith and adapted to move the rock shaft from an intermediate point to its limits of movement, a sliding connection be-

tween the rock shaft and the reciprocatory 25 member, whereby the latter imparts motion to the former at points near its limits of movement, a slide connected at one end to a crank arm on the rock shaft and fitted to slide at the other end in a suitable bearing, a bearing 30 sleeve adjustably fitted upon said slide, nuts threaded upon the slide and bearing against the ends of said sleeve to secure it at the desired adjustment, a valve stem having an eye fitted to slide upon said sleeve and adapted 35 to be engaged by said nuts, and an auxiliary bearing sleeve held in place by adjusting nuts and forming the journal by which the adjacent end of the slide is mounted, substantially as specified.

40 In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

JOHN L. OAKES.

Witnesses:

JOHN H. SIGGERS,
G. C. SHOEMAKER.