

No. 893,258.

PATENTED JULY 14, 1908.

F. H. MILLS.
MECHANICAL MOVEMENT.
APPLICATION FILED JUNE 27, 1907.

2 SHEETS—SHEET 1.

Fig: 1.

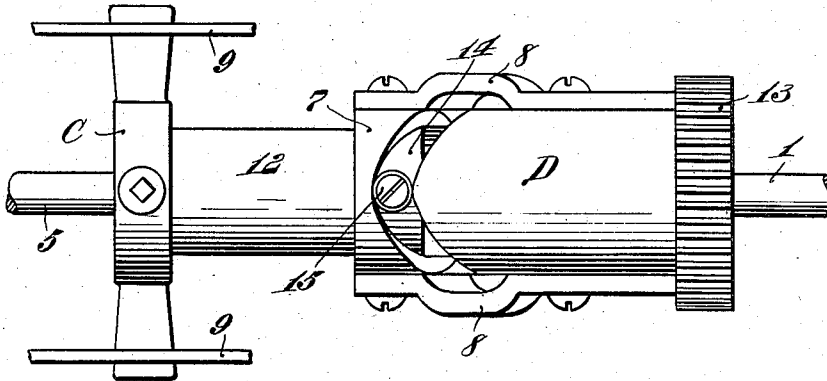
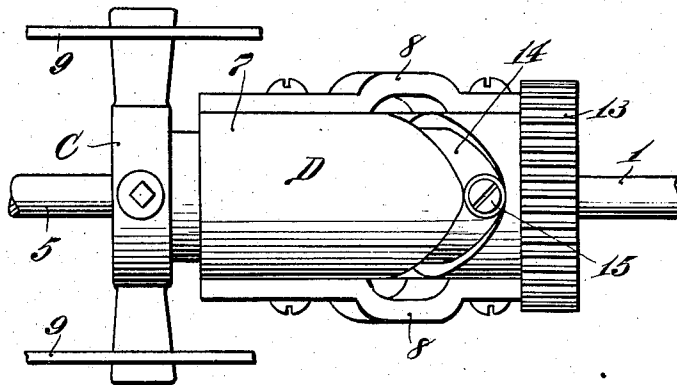


Fig: 2.



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Fig. 3.

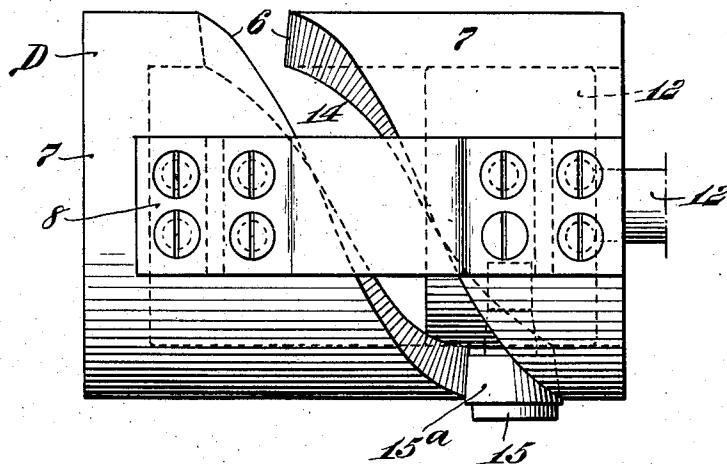
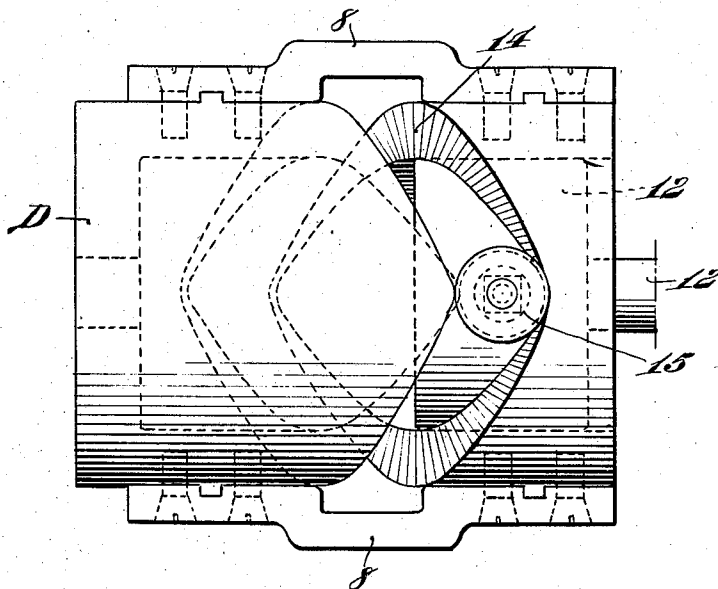


Fig. 4.



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UNITED STATES PATENT OFFICE.

FRANK H. MILLS, OF CAMDEN, NEW JERSEY.

MECHANICAL MOVEMENT.

No. 893,258.

Specification of Letters Patent.

Patented July 14, 1908.

Original application filed December 23, 1903, Serial No. 186,287. Divided and this application filed June 27, 1907.
Serial No. 380,999.

To all whom it may concern:

Be it known that I, FRANK H. MILLS, a citizen of the United States, residing at Camden, in the State of New Jersey, have invented a certain new and useful Mechanical Movement, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention consists of a new embodiment of a mechanical movement operating to directly rotate a power-transmitting sleeve or tubular shaft, rotatably supported, by means of an alining shaft reciprocated within said sleeve; and while it may be employed for several distinct purposes, it is particularly designed for application to a motor engine operated by steam or other motive fluid, for directly converting the motion of a reciprocating piston rod and its adjunctive parts, of such an engine, into rotary motion as a functional substituted for the ordinary crank-mechanism, and for imparting such motion, through the instrumentality of suitable power-transmitting devices to belting, shafting or otherwise. Such an engine is shown and described in an application for patent filed by me, December 23, 1903, Serial No. 186,287, of which the present application is a division.

To these ends my invention consists of the elements and the combination of them hereinafter described, and constituting such novel embodiment of the aforesaid mechanical movement; the distinctively novel features elementally and in the combination of them hereinafter recited, being pointed out in the appended claims.

In the drawings illustrating my invention: Figures 1 and 2 are top plan views illustrating my invention applied to the piston rod of a reciprocating engine, Fig. 1 showing the position of the parts when the piston is at full inward stroke in the cylinder, and Fig. 2 when the piston is at end of its outward stroke; and Figs. 3 and 4 are respectively side and plan views, partly in section and partly in dotted lines, taken from two different peripheral points, of the elements constituting my new mechanical movement.

Referring now to said drawings, I will first describe the device in its application to a motor engine of the ordinary reciprocating type, in which, as shown in Figs. 1 and 2 of the drawings, 5 represents the reciprocating piston

rod of such an engine, C the cross-head working in guides 9, 9, and 12 is an extension of the piston rod in the form of a projecting cylindrical piston shaft which is operatively guided, as well as supported against rotation, by being rigidly connected to the cross head; which latter element also operates as an interposed barrier against rearward transmission of torsional strain. The said shaft 12 carries the cam-pin or stud 15 hereinafter described.

Power-transmitting devices are shown in the form of a cog-gearing 13 mounted on the power-sleeve D and also a power-shaft 1 which is rotatably supported upon the engine frame, in alinement with the piston shaft 12, and directly rotated thereby through the medium of the elements constituting my new mechanical movement and which I will now describe.

Referring to Figs. 3 and 4, is shown a tubular shaft or sleeve D on the rearward end of which is rigidly secured the aforesaid cog-gearing 13 and power transmitting shaft. This sleeve is provided with a reversely-set spiral cam-groove 14. As the groove extends throughout the complete periphery of the tubular sleeve, severing it in two parts 7, 7, these are secured together by a pair of oppositely-disposed connecting brackets 8, 8. The walls 6 of the cam groove are inwardly inclined, for the purpose hereinafter stated. An essential characteristic of the cam-groove is that it consists of a pair of grooves of like character, the apex of each being on diametrically opposite sides of the periphery of the sleeve and near each end thereof, and extending thence, in a curve, towards the longitudinal center of the sleeve, the ends of the two grooves, being reversely set, thus meeting and forming a double spiral cam groove. The co-acting element is a cam-shaft 12 of a diameter fitting the interior of the tubular shaft or sleeve D, adapted to reciprocate freely therein, and carrying a cam pin or stud 15, which is adjustable longitudinally to adjust the friction ring or collar hereinafter mentioned.

Means are provided to compensate for wear in the cam-grooved sleeve, consisting of a ring 15^a, which is tapered to conform to the angle of inclination of the cam-grooves in the power-sleeve, and is mounted loosely sleeve-like on the cam-pin 15 and rotatable thereon and therefore interposed and rotates

table between the cam-pin 15 and the walls of the spiral groove 14 in the sleeve D. This rotatable ring operating as a collar reduces friction and at same time compensates for wear, as the walls of the spiral groove in the sleeve are preferably made with a slight incline towards the base in order that any wear may be taken up by screwing down the cam-pin 15, carrying the rotatable friction ring 15^a lower into the cam-groove and into closer relation thereto.

For better enabling a person skilled in the art to construct, with greater certainty and accuracy, the cam-grooved sleeve element and its co-actuating member, I have shown in Figs. 3 and 4, plan and side views of these elements, detached, these figures being working drawings of one-half actual size of the various parts, for an engine with a cylinder piston having a four-inch stroke, measured from the center of the actuating pin, in Fig. 4, to the opposite center of the double spiral cam-groove; this figure showing in solid lines the actuating stud at the apex of one section of the spiral groove, on one side, and in dotted lines the relative position of the oppositely-disposed portion of the double spiral groove, on the opposite side of the periphery of the sleeve; while in Fig. 3 is shown a side elevation of the same parts, on a quarter turn of the sleeve on the actuating pin, and showing also the correct curvature of each half of the reversely-set spiral cam-groove and of the incline of the walls thereof. The operation is illustrated by reference to Fig. 4, showing a full inward stroke of the piston (which is also that represented in Fig. 1), from which it will be seen that the cam-stud has caused the cam-grooved sleeve to make exactly a half revolution, which in turn has rotated the power shaft and the gearing; while the return or full outward stroke (shown in Fig. 2) has caused another half revolution of the sleeve and power-shaft; so that each full reciprocation of the piston causes a full revolution of the sleeve and power shaft.

The constructive principles of my invention can be embodied in an engine for either stationary or marine purposes, or for light work such as in automobiles.

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

1. Mechanism for imparting a continuous rotary motion in either direction, said mechanism comprising a cam-sleeve composed of two sections united peripherally, with a reversely-set spiral cam-groove formed between their coinciding faces, in combination with a reciprocating shaft, a cam-stud on its periphery adapted to engage with the cam-grooves in said sleeve, and with means to

support said shaft and cam sleeve in operative alinement.

2. Mechanism for imparting a continuous rotary motion in either direction, said mechanism comprising a sleeve composed of two sections, united peripherally in spaced relation and so shaped in respect to their contiguous and coinciding faces as to form between them a reversely-set double spiral cam-groove with inwardly tapering walls, in combination with a reciprocating shaft, a tapering cam stud on its periphery and operatively engaging said inclined groove in either reciprocatory movement, with means interposed between said shaft and sleeve adapted to guidingly support and maintain said elements in operative relation.

3. In a motor engine, the combination with a reciprocating rod, a shaft, guiding devices for said rod and shaft, and power-transmitting devices, of connecting actuating mechanism between said shaft and the power-transmitting devices, consisting of an alining and rotatably-supported tubular shaft, mounted sleeve-like on said shaft, and formed in two sections each with inclined and reversely-set contiguous spiral faces, said sections being united peripherally in spaced relation to form between them an inwardly tapering double spiral cam-groove, an adjustable tapering cam-stud carried on the periphery of said shaft, said cam-stud adapted to operatively engage the inclined walls of said cam-groove of the tubular shaft.

4. In a motor engine, the combination with a reciprocating rod, guiding devices to restrain it from rotation, a stationary frame power-transmitting devices rotatably-supported thereon, of mechanism interposed between the rod and the power transmitting devices operating to directly impart rotary motion to the latter from the reciprocating motion of the former, said mechanism consisting of a rotatably mounted tubular shaft formed in two sections which are united peripherally in spaced relation and with their contiguous faces so shaped as to form between them a reversely-set double spiral cam-groove, having inwardly-inclined walls, a reciprocating cam-shaft on which said tubular shaft is journaled, a cam-stud on the periphery of said shaft, and a rotatable tapering collar co-acting therewith, said collar being adapted to operatively engage the tapering cam-groove in said sectional tubular shaft.

In testimony whereof, I have hereunto affixed my signature this first day of June A. D. 1907.

FRANK H. MILLS.

Witnesses:

A. M. BIDDLE,
JAS. C. WOBENSMITH.