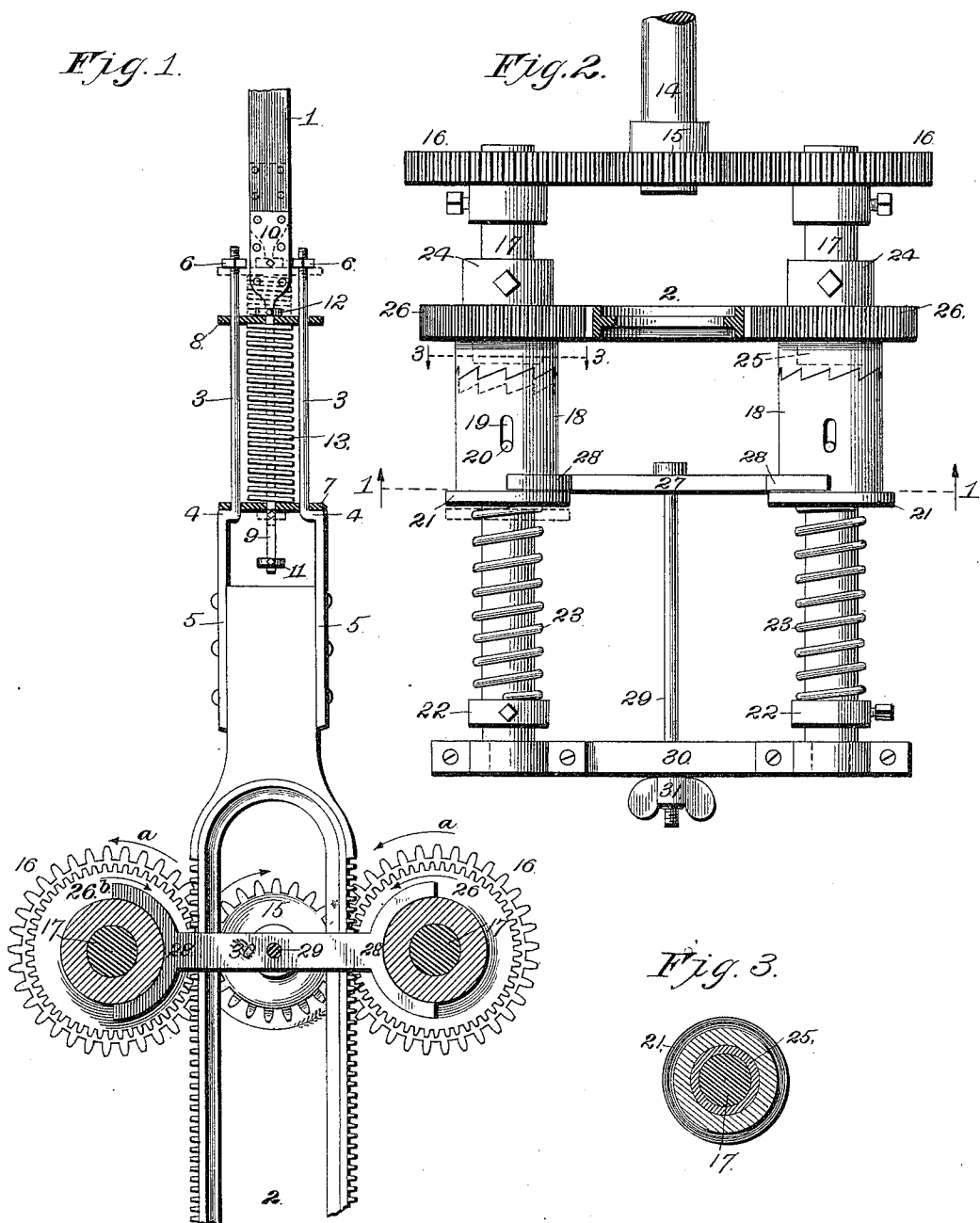


(No Model.)

J. A. O. LIVONI.
POWER CONVERTER MECHANISM.

No. 566,198.

Patented Aug. 18, 1896.



Witnesses:

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UNITED STATES PATENT OFFICE.

JOHN A. O. LIVONI, OF MARION, KANSAS.

POWER-CONVERTER MECHANISM.

SPECIFICATION forming part of Letters Patent No. 566,198, dated August 18, 1896.

Application filed October 10, 1895. Serial No. 565,211. (No model.)

To all whom it may concern:

Be it known that I, JOHN A. O. LIVONI, of Marion, Marion county, Kansas, have invented certain new and useful Improvements in Power-Converter Mechanisms, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part thereof.

My invention relates to power-converters, and more particularly to mechanism for converting a reciprocating into a rotary movement.

The object of the invention is to provide a simple, strong, durable, and inexpensive mechanism for accomplishing the object in view and obviating the usual rack or jar which is incident to the beginning and end of each stroke of a plunger on the mechanism thereto connected. To accomplish this, the invention contemplates the employment of a spring or cushion which will cushion the plunger stroke by yielding slightly, so that the power of the stroke will be imparted gradually to the connected mechanism, and which at the end of the stroke of the plunger will expand to cause the further operation of the said connected mechanism, whereby the power lost at the beginning of the stroke is regained at the end.

Other objects of the invention will appear in the following description, and will be pointed out in the claims to be hereto appended.

In order that the invention may be fully understood, reference is to be had to the accompanying drawings, in which—

Figure 1 represents a vertical section of a power-converter, taken on the line 1 1 of Fig. 2, and on a smaller scale. Fig. 2 represents a horizontal section of the same. Fig. 3 represents a section taken on the line 3 3 of Fig. 2.

In the said drawings, 1 designates a reciprocating plunger of a windmill or other machinery, and 2 designates a rack-frame, which forms a part of said plunger.

3 designates a pair of parallel guide-rods, which are formed in a suitable plane with horizontal shoulders 4, and have their lower extensions 5 bolted or otherwise secured rigidly to the rack-frame. The upper ends of said rods are engaged by the retaining-nuts 6.

7 designates a sliding plate which is mounted upon said guide-rods 3, and 8 designates a similar sliding plate, which is also mounted upon said guide-rods 3. 9 designates a guide-rod which extends slidingly and centrally through said plates, and at its upper end is preferably enlarged, as at 10, and securely bolted to the plunger 1. At its lower end, below the plate 7, it carries rigidly the collar 11, and above the plate 8 the adjustable collar 12.

13 designates a stiff spring which spirally surrounds the rod 9 and bears at its opposite ends against the opposing faces of the plates 7 and 8. Said spring in operation alternately contracts and expands in a manner to be hereinafter explained.

Arranged in the vertical plane of and extending at right angles to the plunger 1 is a shaft 14, to which may be connected a pump (not shown) or any other machinery to which motion is to be imparted. Mounted rigidly upon said shaft is a gear-pinion 15, and meshing with said pinion are the gear-wheels 16, secured rigidly upon the parallel shafts 17, which are journaled in any suitable supporting-framework. Also mounted upon said shafts are the ratchet-teeth clutch-sections 18, which have their teeth disposed in the same direction. Said clutch-sections are provided with longitudinal slots 19, engaged by pins 20, projecting from the shafts, so that while rotating with them they may slide upon said shafts. At their rear ends said clutch-sections are provided with annular external shoulders 21. Rearward of said clutch-sections the collars 22 are rigidly and adjustably secured upon said shafts, and bearing at their opposite ends against said collars and said clutch-sections and spirally encircling said shafts are the expansion-springs 23. Forward of said clutch-sections the collars 24 are rigidly mounted upon the shafts, and said collars are diminished diametrically to form the tubular extensions 25, upon which are rotatably mounted the cog-wheels 26, which engage the opposite sides of said rack-frame, and are provided with ratchet-teeth which oppose the ratchet-teeth of the clutch-sections 18. The parts of the shaft 17 upon which the clutch-sections 18 are mounted are diametrically greater than the extensions 25, (see

dotted lines, Fig. 2,) in order that the cog-wheels 26 may not follow the clutch-sections when the latter are withdrawn to throw the mechanism out of gear, as hereinafter referred to. The collars 24 prevent the said wheels sliding in the opposite direction.

27 designates a cross-bar which is provided at its opposite ends with semicircular yokes 28, embracing the clutch-sections 18 forward of their shoulders, and extending through said cross-bar is a headed rod 29. Said rod has its threaded end projecting through one of the bearing-plates 30, preferably, and is engaged by a wing or adjusting nut 31. By adjusting this wing-nut properly the clutch-sections can be moved simultaneously out of engagement with the cog-wheels 26, and thereby throw the shaft 14 out of gear with the reciprocating plunger 1. To throw them in gear, the adjustment of said nut upon said rod is reversed, and the springs force the clutch-sections 18 again into engagement with the clutch-sections of the cog-wheels 26.

From the foregoing it will be apparent that as the rack-bar moves downwardly the cog-wheels 26 will rotate in the direction indicated by their respective arrows, Fig. 1, and that owing to the fact that their clutch-teeth are depressed in the same direction the right-hand one will cause the rotation of its companion clutch-section 18, and therefore of its shaft 17, in the same direction, while the clutch-teeth of the other slide inoperatively over the teeth of its companion clutch-section 18, the spring 23 yielding sufficiently for this purpose, as indicated by dotted lines in Fig. 2. At the same time said companion clutch-section 18, with its shaft, is rotated in the opposite direction by reason of the engagement of its gear-wheel 16 with the operating gear-pinion 15. When the rack-bar rises, the shaft 14 continues to operate in the same direction; but in this case the gear-wheel 26 formerly the inoperative gear-wheel is the power-wheel, while the gear-wheel 26 formerly the power-wheel is the inoperative gear-wheel, as will be readily understood.

Referring to the action of the spring 13, it will be observed that as the plunger begins its downward stroke the spring 13, due to the downward movement of the plate 8, will begin to yield and gradually impart motion to the gear-wheels 26 and the connected mechanism. By the time said plate 8 is moved, say, from the position shown in dotted lines to the position shown in full lines the retractive limit of the spring 13 has been reached and the full power of the plunger is being applied directly to the gear-wheels 26. When the downward limit of the plunger has been reached, the spring 13 reasserts itself, and owing to the fact that the plunger at its upper end is relatively fixed the pressure of the spring against the plate 7 upon the shoulders 4 causes the rack-frame to continue downward a distance corresponding to the yield of the spring, as above described. As the plun-

ger begins its upstroke this action of the spring is repeated, except that in this case the collar 11 comes in contact with and moves the plate 7 a distance above the shoulders 4 equal to the retractive movement of the spring, and the collar 12 moves upwardly above the plate 8, which is against the adjusting-nuts 6, an equal distance. The power of the plunger, until its upward limit of motion is reached, is not applied directly to said gear-wheels 26, and when the upward limit of movement has been reached the spring again reasserts itself and forces the plate 8, with the rods 3 and the rack-frame, upwardly until said plate comes against the fixed collar 12 and the shoulders 4 come against the plate 7. During this expansion of the spring the power lost at the beginning of the upstroke is regained.

From the foregoing it will be apparent that the two sections, forming, practically, a continuous plunger, move relatively together with a yielding and gradually-increasing pressure at the beginning of each stroke, whereby the machinery to be operated is started gradually and is relieved of any severe jar or jolt which ordinarily accompanies the beginning of the stroke of a plunger.

While I have described and illustrated a particular mechanism, it is to be understood that the substitution of mechanical equivalents or changes in the form, proportion, and arrangement of the parts will not be a departure from the spirit and scope or sacrifice any of the advantages of my invention.

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

1. A power-converting mechanism, comprising a shaft having a gear-pinion, a pair of shafts, gear-wheels mounted rigidly thereon and engaging said pinion, cog-wheels mounted to rotate but not to slide upon said shafts and provided with clutch members, a reciprocating rack-bar engaging said cog-wheels, clutch-sections mounted to slide but not to rotate upon said shaft, collars mounted rigidly upon said shaft, expansion-springs spirally encircling said shafts and exerting pressure against said collars and said clutch-sections, and adapted to hold the latter into engagement with the clutch members, a cross-bar provided with yokes embracing the clutch-section, an adjustable rod engaging said cross-bar and a wing-nut thereon for adjusting the cross-bar and throwing the clutch-section out of engagement with the clutch members, substantially as described.

2. In a power-converting mechanism, the combination of a shaft having a gear-pinion, a pair of shafts, gear-wheels mounted rigidly thereon and engaging said pinion, clutch-sections mounted to slide upon and rotate with said shaft and provided with annular shoulders, collars upon said shaft, expansion-springs between said collars and said clutch-sections, a second pair of collars upon said

shafts and provided with diminished portions, cog-wheels mounted to rotate but not to slide upon said collars and provided with clutch members normally in engagement with said
5 clutch-sections, means for throwing said clutch-sections out of gear with said clutch members, and a plunger provided or formed with a rack-bar which engages said cog-wheels and imparts motion thereto, substan-
10 tially as and for the purpose set forth.

3. In a power-converting mechanism, a shaft, a pinion therein, a pair of shafts geared thereto, a reciprocating rack-bar, 2, cog-wheels, 26, meshing therewith, loosely mounted
15 upon said shafts and provided with ratchet-teeth 25, a pair of ratchet clutch-sections 18 mounted to slide upon and rotate with said shafts and acting in conjunction with the ratchet-teeth 25, collars 22 fixed upon said
20 shafts, springs 23 spirally encircling the shafts and exerting pressure constantly against the said collars and said clutch-sections, and means for moving said clutch-sections in opposition to said springs, substantially as
25 shown and described.

4. In a power-converting mechanism, a shaft having a gear-pinion, a pair of shafts, gear-wheels mounted rigidly thereon and engaging said pinion, clutch-sections mounted
30 to slide upon and rotate with said shafts, and provided with shoulders, collars upon said shafts, expansion-springs between said collars and said clutch-sections, a second pair of collars upon said shafts, having diminished portions, cog-wheels mounted rotatably thereon
35 and formed with clutch-sections, a cross-bar provided with yokes embracing the first-named clutch-sections forward of their shoulders, an adjustable rod engaging said cross-bar, and a wing-nut thereon for adjusting
40 said cross-bar and throwing the clutch-sections out of gear or permitting them to re-engage, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN A. O. LIVONI.

Witnesses:

B. R. DAVIS,

JOHN BARTLEY.