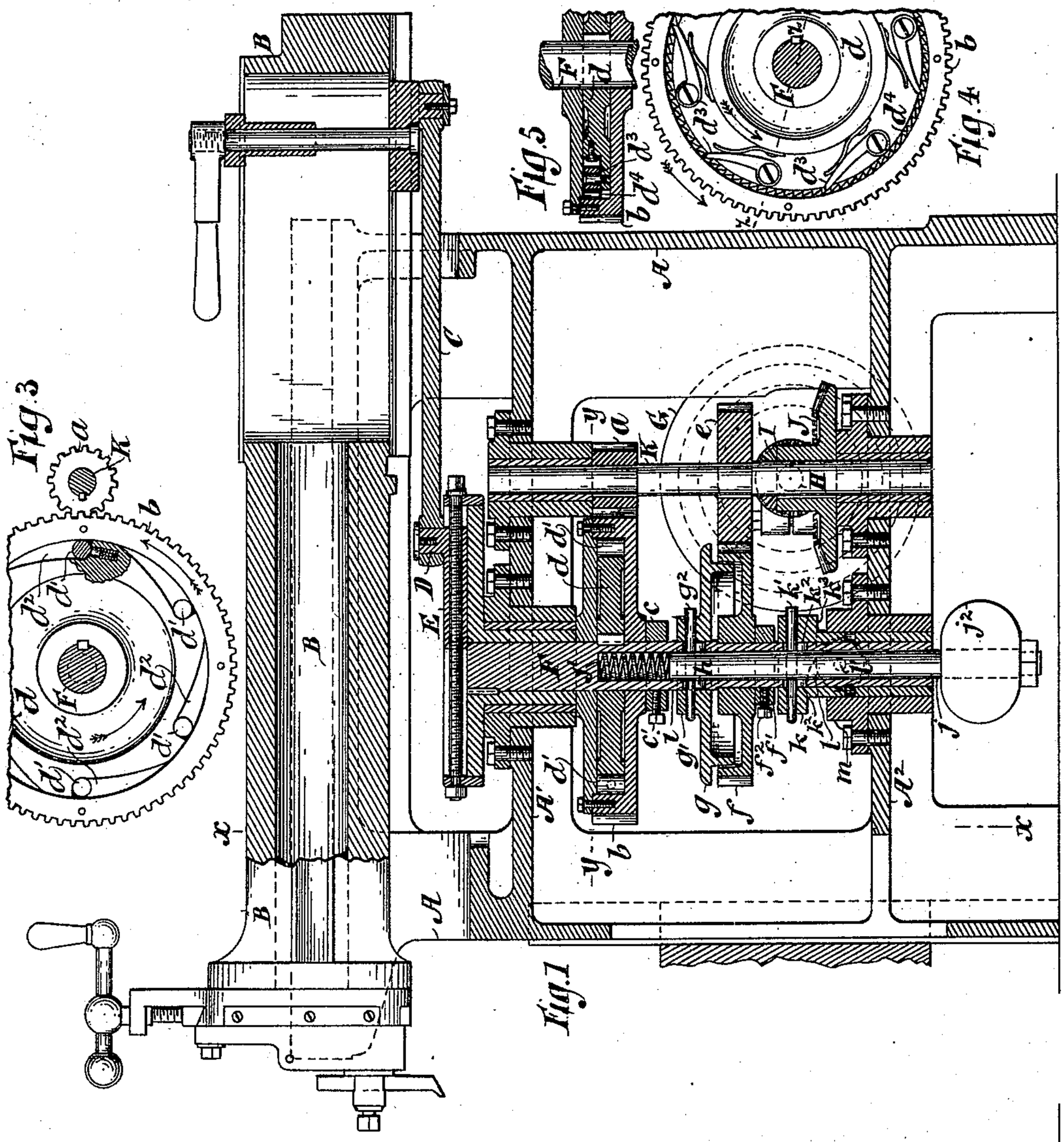
(No Model.)

J. C. GITHENS.

MECHANICAL MOVEMENT.

No. 485,625. Patented Nov. 8, 1892.



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MECHANICAL MOVEMENT.

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To all whom it may concern:

Be it known that I, JOSEPH C. GITHENS, of the city and State of New York, have invented an Improvement in Mechanical Movements, of which the following is a specification.

This improvement relates to the class of mechanical movements for transmitting a comparatively-slow rate of motion to a tool-carriage or sliding bed during that one of its movements while work is being done and a relatively-rapid return movement preparatory to a repetition of the slower working movement.

The invention consists in alternately imparting to the crank-shaft which drives the reciprocating tool-carriage a slow speed of rotation and a more rapid speed of rotation, respectively, from two gears which are loosely mounted upon the crank-shaft, one of which gears is constantly rotated at a slow speed, while the other is constantly rotated at a relatively-rapid speed. The slow-moving gear incloses a wheel keyed to the crank-shaft and is made to communicate the slower motion to said wheel and to the crank-shaft by means of an intervening system of friction-rollers, or a pawl-and-ratchet system. At a prescribed stage in the rotation of the crank-shaft a conical friction-clutch sliding on the crank-shaft and splined thereto drops inside the flaring rim of the more-rapidly rotating gear, and thereby imparts rapid rotatory movement to the crank-shaft, and likewise to the said inclosed wheel, in which case the pawls draw over the inclined sides of the ratchet-teeth; or if the friction-roller system is employed the friction-rollers roll out of the position in which they jam between the slow-moving gear and the said wheel keyed to the crank-shaft which the said slow-moving gear incloses. By this organization the changes in the speed of the rotatory movements in the crank-shaft are effected without involving the stoppage or reversal in the motions of any of the driving-gears. There being no static inertia to overcome, the changes are effected without serious shocks to the driving-gear. Owing to the compactness and simplicity of the organization, a crank of large radius may be employed, so that the working stroke may be imparted to the carriage or other reciprocating object by a comparatively-small part of the revolution of the crank and during that part of its revolution in which the arc of the circle described by the crank-pin departs to a relatively-small extent from parallelism with the path of the reciprocating carriage.

In the accompanying drawings the device is represented as applied to a shaper employing a horizontally-reciprocating tool-carriage, and so much only of the shaper is shown as suffices to illustrate the application of the invention to it.

The drawings are as follows: Figure 1 is a side elevation of a shaper, partly in section. Fig. 2 is a transverse vertical section taken through the plane indicated by the dotted line *x x* on Fig. 1. Fig. 3 is a portion of a horizontal section taken through the plane indicated by the dotted line *y y* on Fig. 1, showing a portion of the friction-roller system for enabling the slow-running gear to impart its motion to the inclosed wheel keyed to the crank-shaft. Fig. 4 is a partial horizontal section, similar to that shown in Fig. 3, illustrating a modification which consists in substituting the pawl-and-ratchet system in place of the friction-roller system shown in Fig. 3. Fig. 5 is a vertical section of a portion of the modification illustrated in Fig. 4, taken through the plane indicated by the dotted line *z z*.

The drawings represent portions of the frame A of a shaper provided with the usual sliding tool-carriage B, deriving its reciprocating motion through the pitman C, which links it to the radially-adjustable crank-pin D, projecting upward from the crank-plate E, mounted upon the upper end of the vertical crank-shaft F, having its bearings in boxes arranged upon the horizontal members A′ and A^2 of the frame. The usual cone-pulley G (shown partly in dotted lines in Fig. 1) is affixed to the driving-shaft H, which imparts rotation through the bevel-gears I and J to the vertical counter-shaft K, to the upper part of which is affixed a relatively-small pinion *a*, meshing with the gear *b*, loosely mounted upon the crank-shaft, and preferably supported upon the collar *c*, fixed upon the crank-shaft by the set-screw *c′*. The gear *b* is a cylindrical box inclosing the wheel *d*, which is keyed to the crank-shaft. When the gear *b* rotates in the appropriate direction, its motion is im-

parted to the wheel *d*, and hence to the crank-shaft F, either by the jamming of the friction-rollers *d'* between the inner side of the rim of the gear *b* and the eccentric bottoms of the recesses d^2, formed in the periphery of the wheel *d* if the device illustrated in Fig. 3 is employed, or by the engagement of one or more of the pawls d^3 with the ratchet-teeth d^4 if the pawl-and-ratchet system illustrated in Figs. 4 and 5 is employed. The working stroke of the tool-carriage is imparted during the slower part of the revolution of the crank-shaft while it is being driven from the pinion *a*. The return stroke of the tool-carriage is imparted during the more rapid part of the revolution of the crank-shaft while it is being driven by the larger driving-pinion *e*, which meshes with the gear *f*, loosely mounted upon the crank-shaft and supported upon the collar *f'*, fixed upon the crank-shaft by the set-screw f^2. The gear *f* is annularly recessed upon its upper side and constitutes the female member of a familiar form of friction-clutch, the male member *g* of which is a wheel with a tapering periphery, adapting it when lowered to jam against the flaring inner surface of the rim of the gear *f*. The lower portion *i* of the crank-shaft F is hollow. The hub *g'* of the wheel *g* is transversely perforated to receive a pin g^2, which extends through the vertical slots *h h*, formed in the opposite sides of the hollow portion *i* of the crank-shaft F.

The pin g^2 is inserted transversely through the clutch-rod *j*, which extends upward through the hollow portion *i* of the crank-shaft. An expanding spiral spring *j'* is interposed between the upper end of the clutch-rod *j* and the bottom of the solid part of the crank-shaft F, and, if desired, the projecting lower end of the clutch-rod may have attached to it a weight j^2. Either or both the spring *j'* and the weight j^2 may be used to impart a constant tendency of the clutch-rod to drop downward, and thus carry the male member *g* of the clutch into engagement with the female member *f*, and thereby cause the crank-shaft to be driven at the more rapid rate of speed desired, in order to effect the return stroke of the tool-carriage.

It will be seen that the friction-roller system illustrated in Fig. 3 or the pawl-and-ratchet system illustrated in Figs. 4 and 5 permit the crank-shaft and the wheel *d* to be rotated at a more rapid rate than the rate at which the gear *b* constantly rotates.

In order to disengage the clutch-wheel *g* from the gear *f* at the appropriate stage in the revolution of the crank-shaft, there is provided a sleeve *k*, which is adapted to slide on the crank-shaft, and which is made to move with the clutch-rod *j* by means of the pin *k'*, which is inserted through the enlarged upper portion of the sleeve *k* and transversely through the clutch-rod, and which extends through the vertical slots k^2 k^2, formed in the opposite sides of the shell of the hollow lower portion of the crank-shaft. The under face of the enlarged portion of the sleeve *k* is formed into the cam k^3, which bears upon the antifriction-roller *l*, adapted to rotate upon the horizontal pivot *l'*, inserted in the box *m*, which affords the bearing for the lower part of the sleeve *k*.

It will of course be perceived that the relative positions of the cam k^3 and the antifriction-roller *l* can be reversed without altering the result—that is, the friction-roller might be pivoted to the sleeve *k* and be made to travel upon the upper end of the box *m*, which in that case would be given the form of the cam k^3. By means of the cam k^3 the clutch-rod is held upward during any desired part of the revolution of the crank-shaft and at any desired stage in the revolution of the crank-shaft is permitted to fall and thereby carry the clutch-wheel *g* into engagement with the gear *f*, by which engagement the speed of rotation of the crank-shaft is increased, and such increased speed is maintained during any desired part of the revolution of the crank-shaft until the conclusion of the return stroke, after which the clutch-rod is lifted and thereby releases the crank-shaft to the action of the smaller driving-pinion *a*, which drives the crank-shaft during the working stroke of the tool-carriage.

What is claimed as the invention is—

1. Apparatus for successively imparting to a reciprocating object two different velocities of motion, the same consisting of a rotating shaft, means for transmitting motion from said shaft to the said reciprocating object, a slow-moving gear loosely mounted upon said shaft, means for constantly rotating said gear at a prescribed relatively-low speed, a wheel keyed to said shaft, a pawl-and-ratchet system acting in one direction only for transmitting rotatory motion to said shaft from said slow-moving gear, a quick-moving gear loosely mounted upon said shaft, means for constantly rotating said gear at a prescribed relatively-high speed in the same direction as that of said slow-moving gear, a clutch splined to said shaft, means for moving said clutch into engagement with said quick-moving gear at a prescribed stage in the revolution of said shaft, and thereby imparting relatively-rapid rotatory motion to said shaft, and means for throwing said clutch out of engagement with said quick-rotating gear at another prescribed stage in the revolution of said shaft, and thereby leaving said shaft to be driven by said slow-moving gear.

2. In apparatus for successively imparting to a reciprocating object two different velocities of motion, the combination, as herein set forth, of a rotating hollow shaft closed at one end and open at the other, means for transmitting motion from said shaft to said reciprocating object, a slow-moving gear loosely mounted upon said shaft, means for constantly rotating said gear at a prescribed relatively-slow speed, connections for enabling said slow-moving gear to impel said shaft

when said shaft is not otherwise impelled, a quick-moving gear loosely mounted upon said shaft, means for constantly rotating said quick-moving gear at a prescribed relatively-high speed in the same direction as that of the slow-moving gear, a clutch adapted to slide on said shaft, a clutch-rod inserted in the hollow portion of said shaft, a pin extending transversely through said clutch-rod and through longitudinal slots in the shell of said hollow shaft and through the hub of said clutch for fastening said clutch to said clutch-rod and at the same time operating to spline said clutch to said shaft, a spring for forcing said clutch-rod endwise in the appropriate direction to carry said clutch into engagement with said quick-running gear, and a cam for moving said clutch-rod in the appropriate direction to disengage said clutch from said quick-moving gear, substantially as and for the purposes described.

3. The combination, as herein set forth, of the reciprocating carriage B, the hollow crank-shaft F, connections for transmitting motion from said crank-shaft to said carriage, the slow-moving gear *b*, loosely mounted upon said crank-shaft, the wheel *b'*, keyed to said crank-shaft, connections for impelling said shaft from said gear *b* when said crank-shaft is not otherwise impelled, the quick-moving gear *f*, loosely mounted upon the said crank-shaft, the clutch *g*, the transverse pin g^2, the clutch-rod *j*, the sleeve *k*, the transverse pin *k'*, the cam k^3, and the antifriction-roller *l*, and means for constantly rotating the gears *b* and *f* in the same direction and at prescribed relatively-different velocities.

4. The hollow crank-shaft F, the clutch-rod *j*, loosely inserted in said hollow crank-shaft and projecting downward from the lower end thereof, the constantly-rotating gear *f*, loosely mounted upon said crank-shaft, the clutch *g*, adapted to slide on said hollow crank-shaft and secured to said clutch-rod by the transverse pin g^2, extending through vertical slots formed in the shell of said hollow crank-shaft and through said clutch-rod, the cam k^3, connected to and rotating with said clutch-rod, and the roller *l*, affording the bearing for said cam.

5. A reciprocating carriage, a rotating shaft, connections for transmitting motion from said shaft to said reciprocating carriage, a gear loosely mounted on said shaft, means for constantly rotating said gear at a relatively-high speed, a clutch for engaging said gear, loosely splined on said shaft, a clutch-rod for operating said clutch, and a cam for governing the operation of said clutch-rod, in combination with a slow-moving gear mounted upon said shaft and means for transmitting motion from said slow-moving gear to impel said shaft when said shaft is not otherwise impelled.

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