No. 689,524. Patented Dec. 24, 1901.

E. H. VOGEL.

MECHANICAL MOVEMENT.

(Application filed Feb. 23, 1901.)

(No Model.) 3 Sheets—Sheet I.

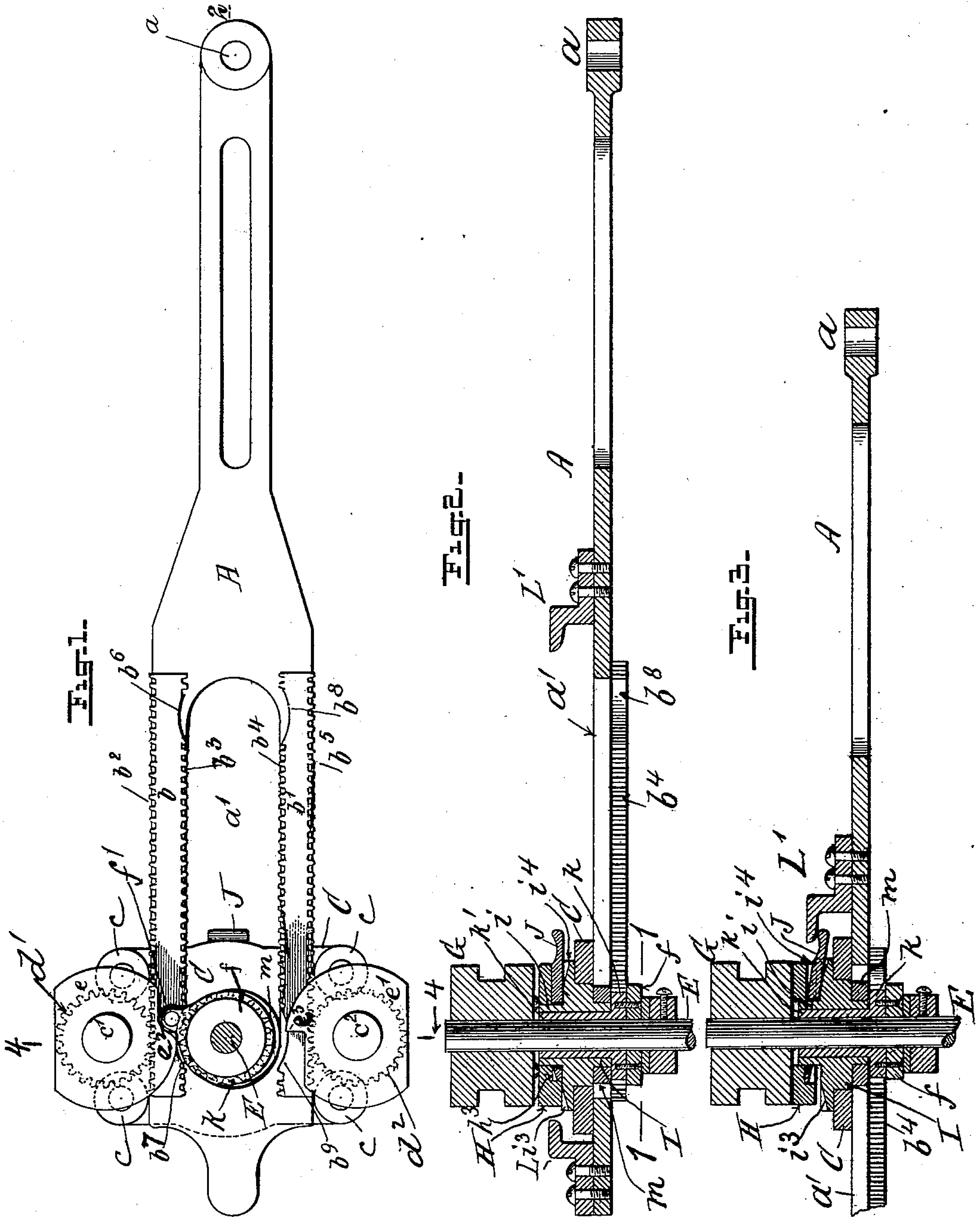

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Fig. 4.

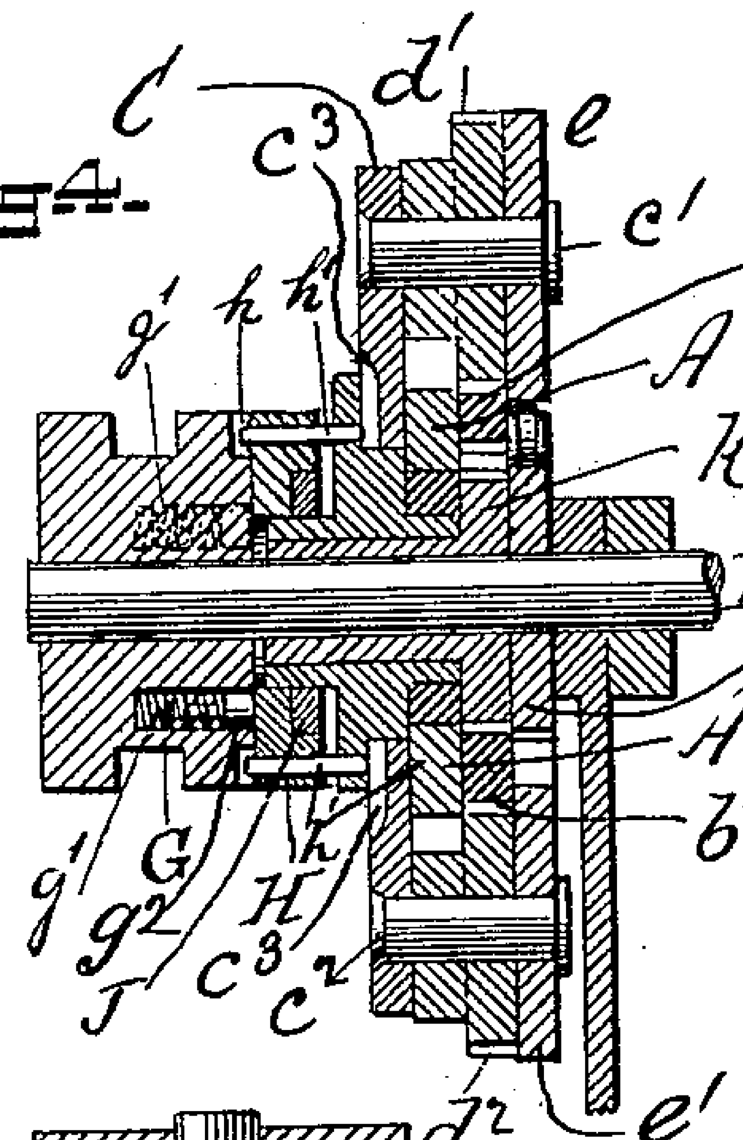

Fig. 5.

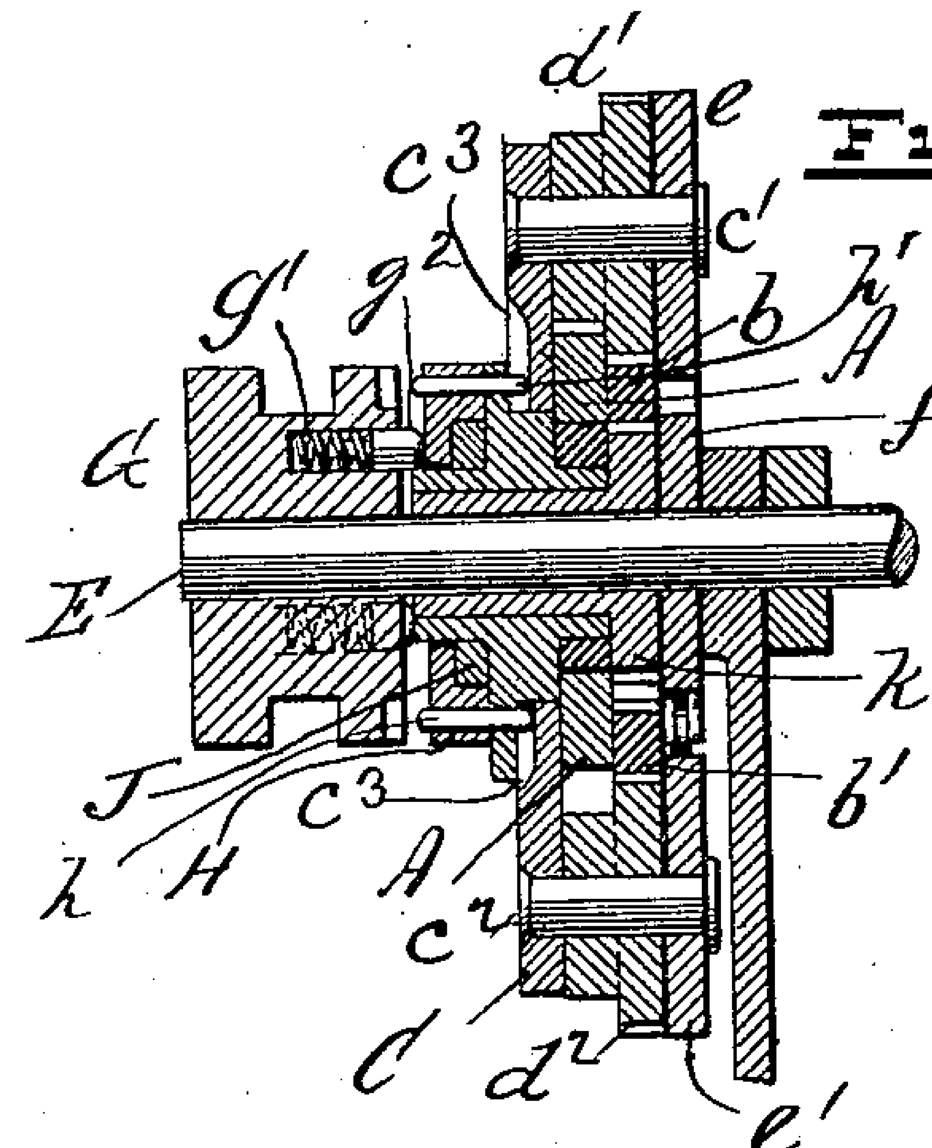

Fig. 17.

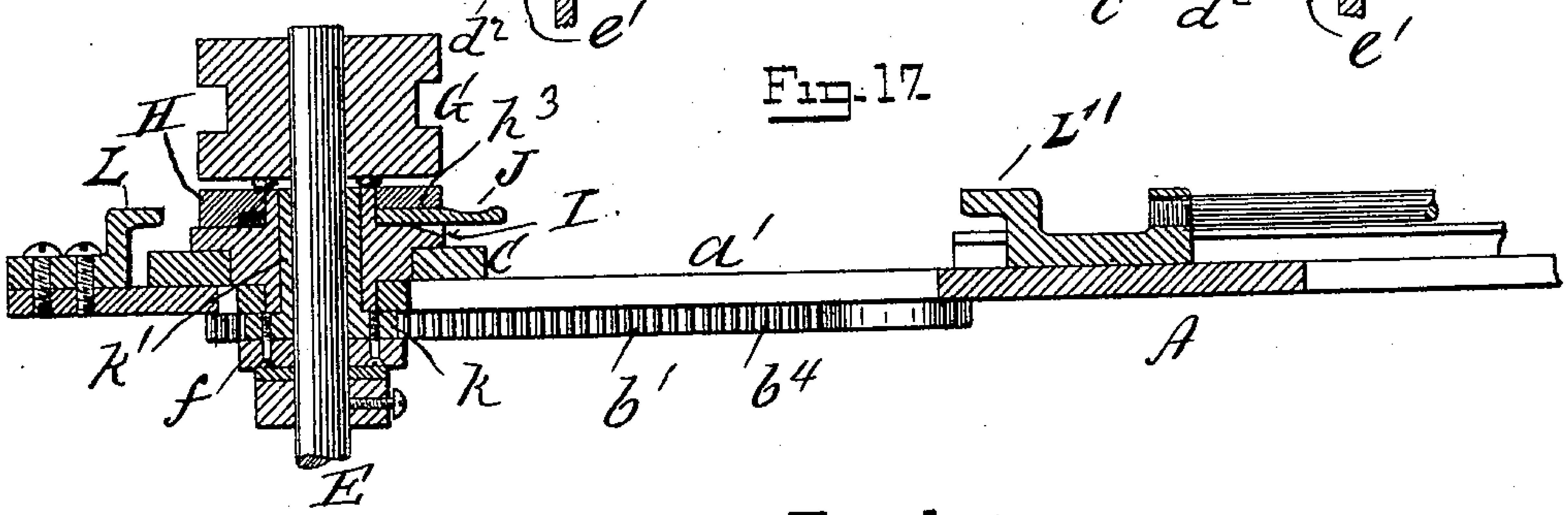

Fig. 6.

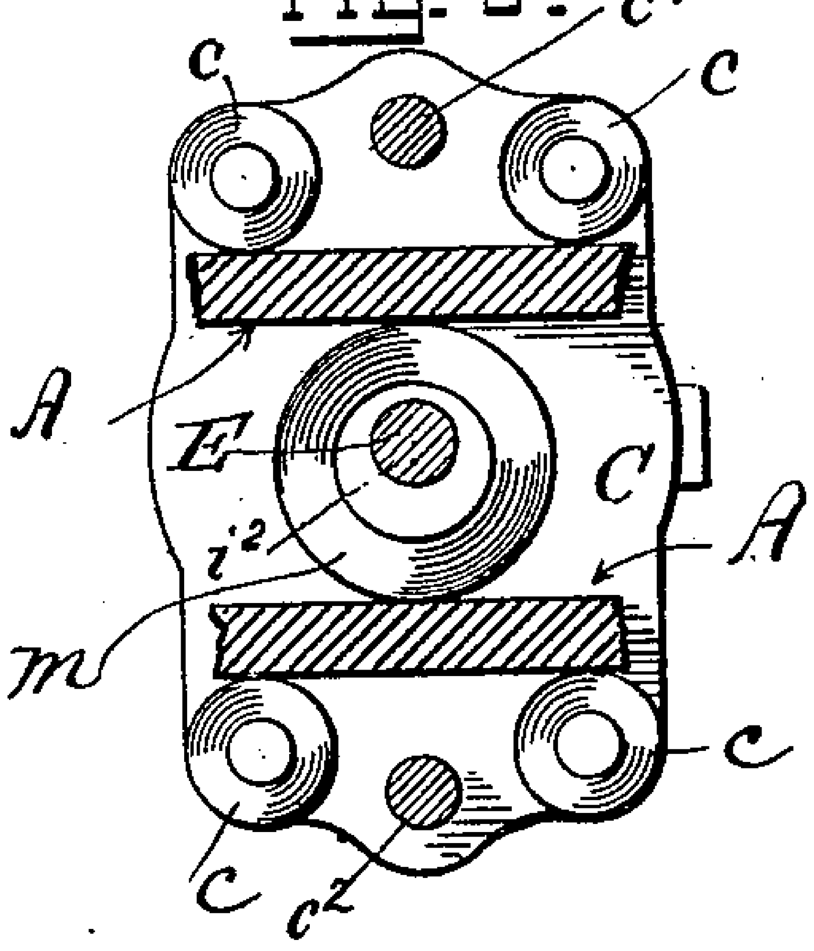

Fig. 19.

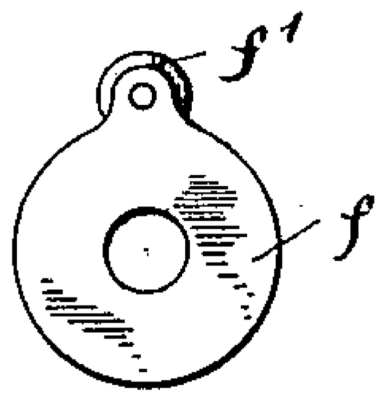

Fig. 20.

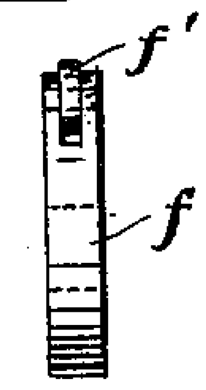

Fig. 18.

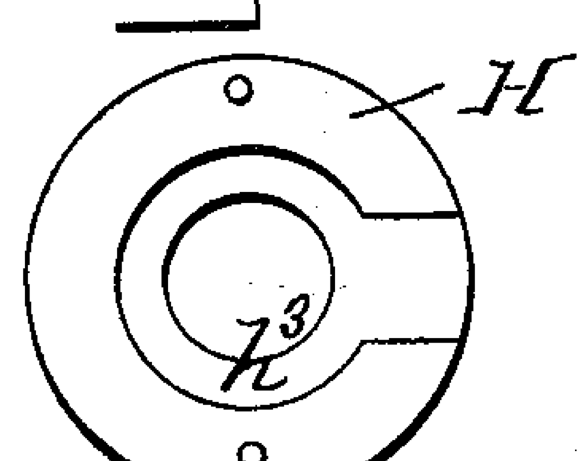

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Fig. 7.

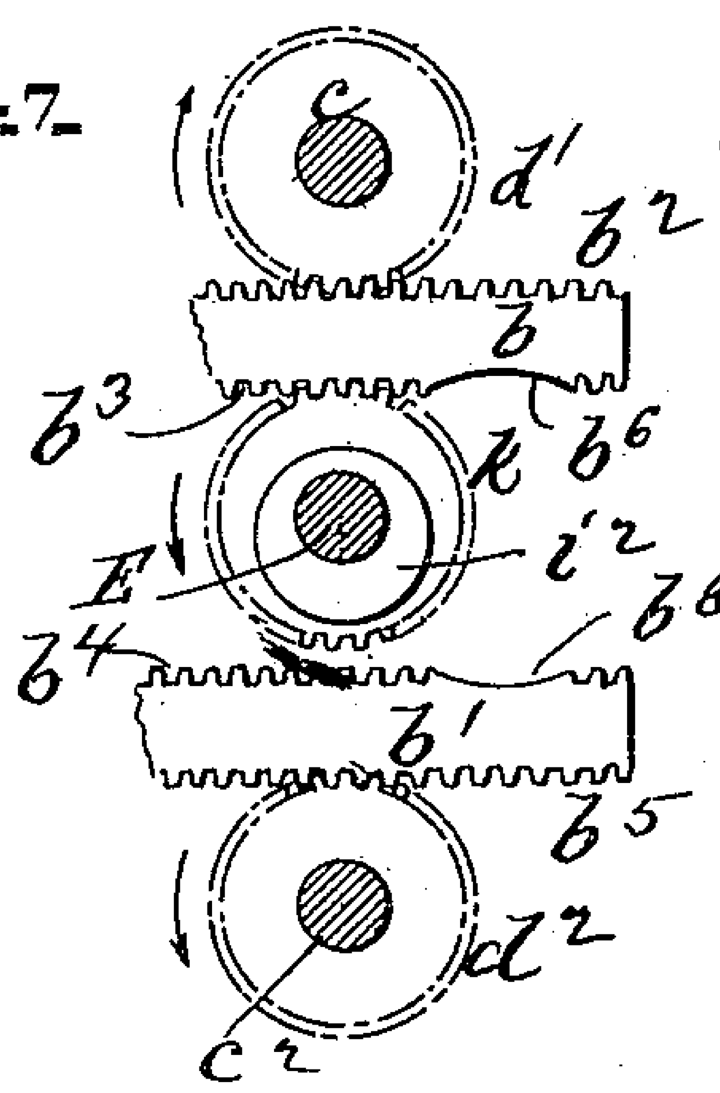


Fig. 8.

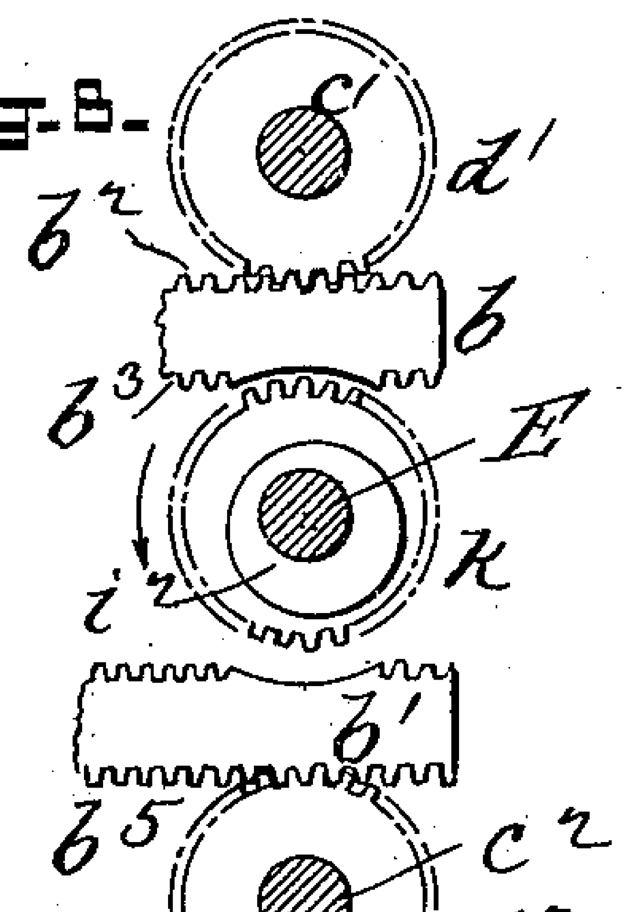


Fig. 9.

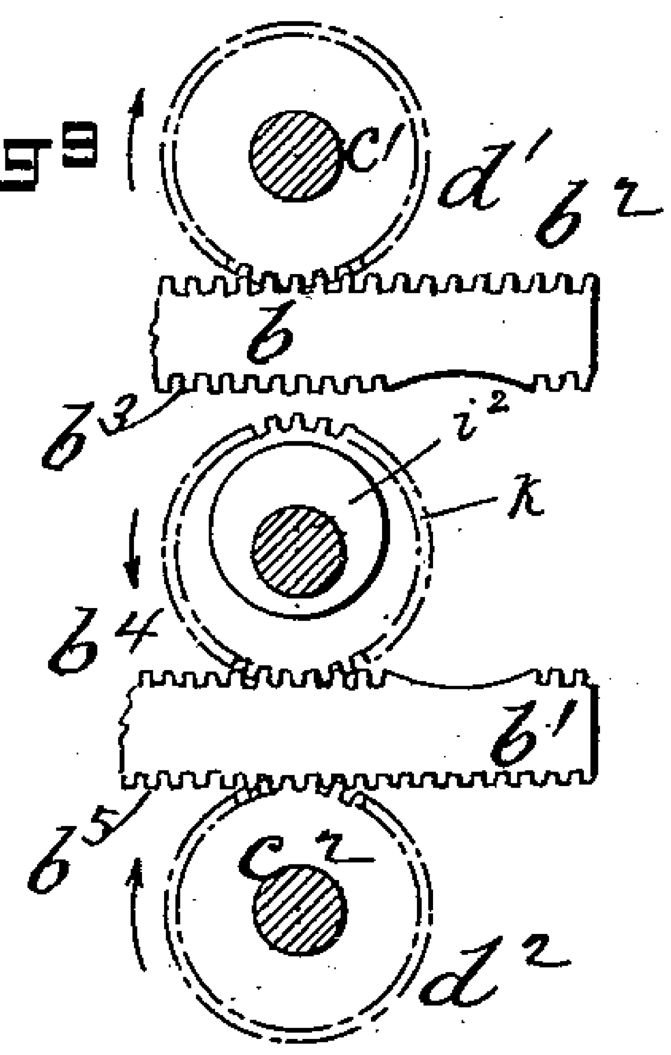


Fig. 10.

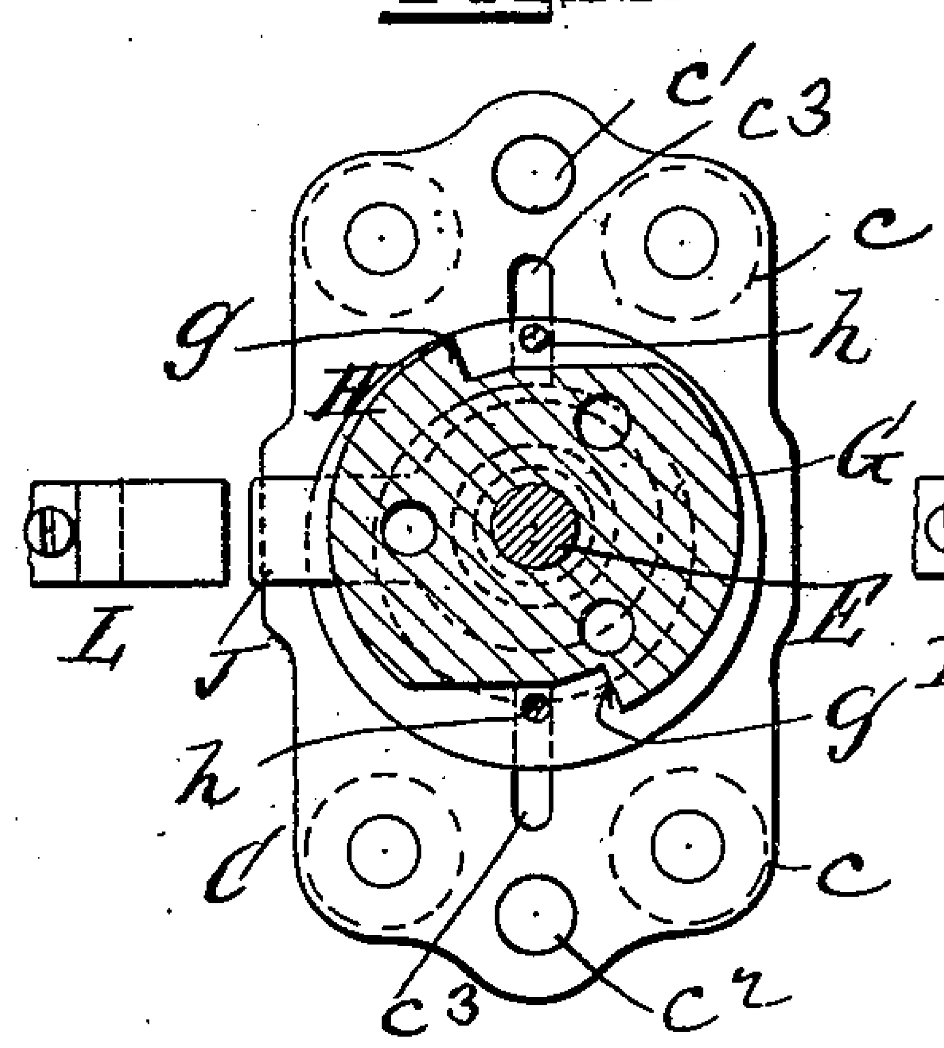


Fig. 11.

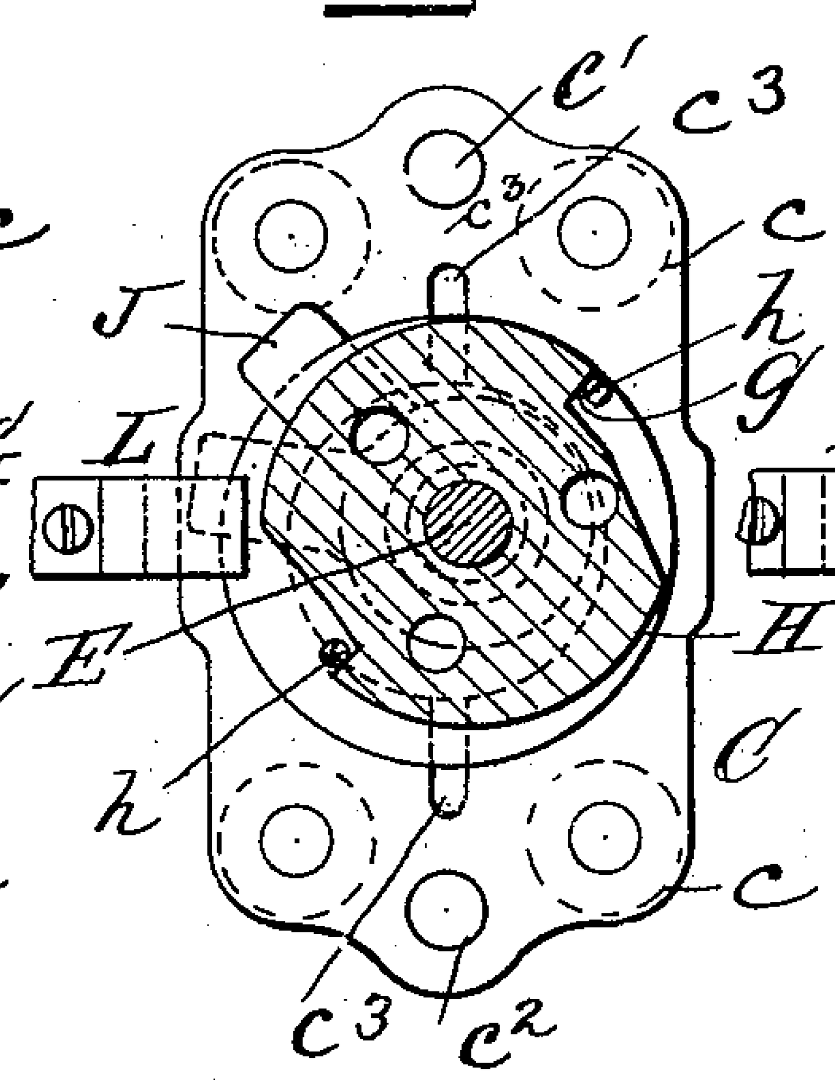


Fig. 12.

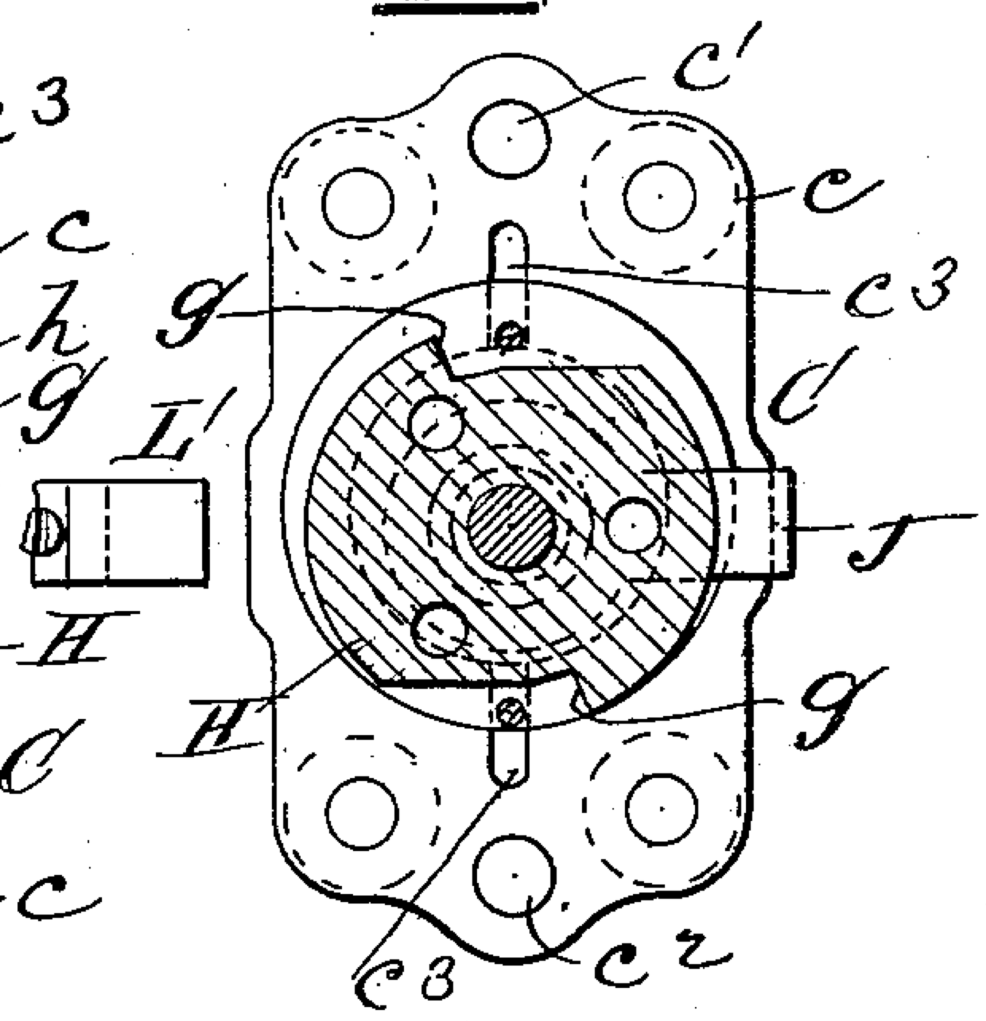


Fig. 13.

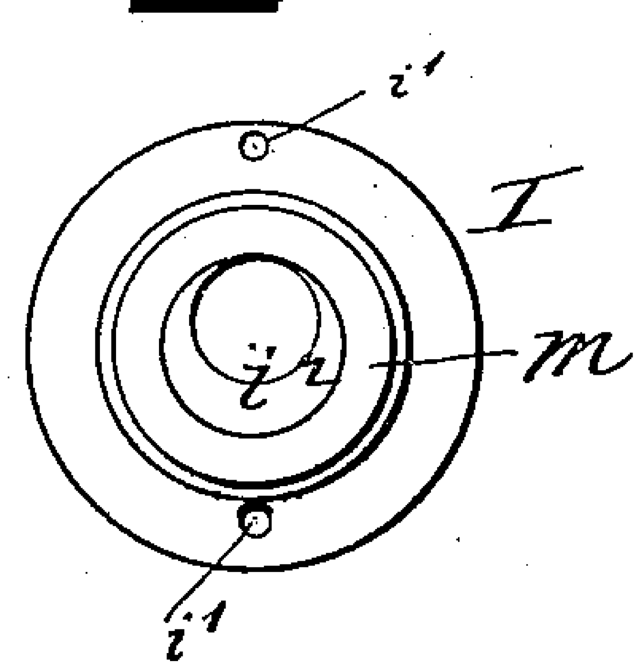


Fig. 14.

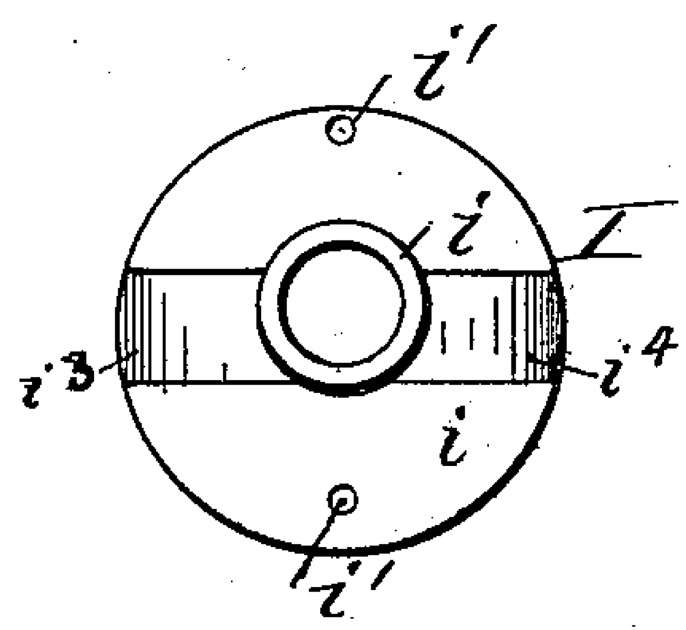


Fig. 15.

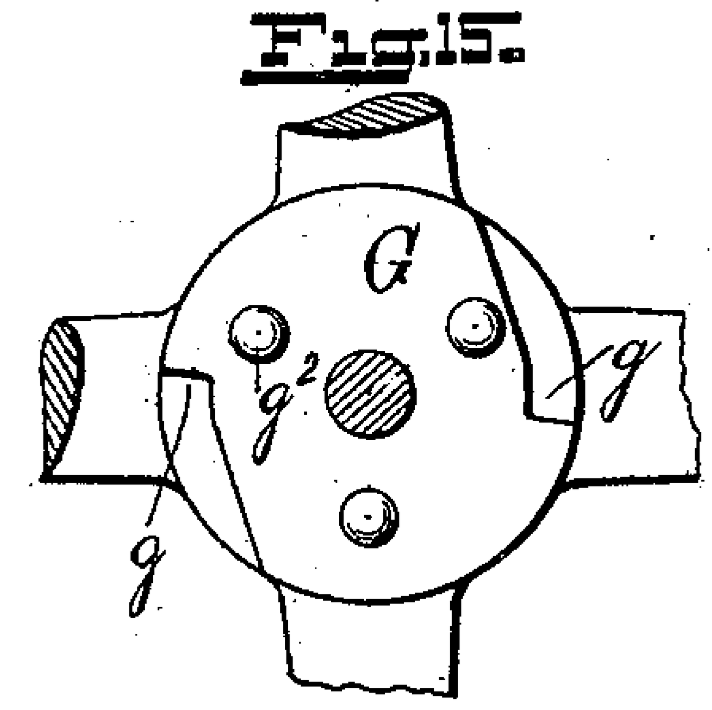
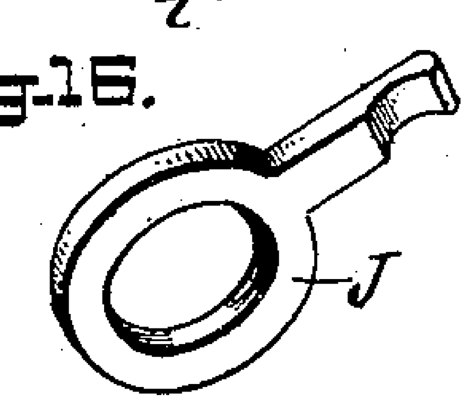


Fig. 16.



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ERNEST H. VOGEL, OF BROOKLYN, NEW YORK.

MECHANICAL MOVEMENT.

SPECIFICATION forming part of Letters Patent No. 689,524, dated December 24, 1901.

Application filed February 23, 1901. Serial No. 48,400. (No model.)

To all whom it may concern:

Be it known that I, ERNEST H. VOGEL, a citizen of the United States, residing in the city of New York, borough of Brooklyn, county of Kings, and State of New York, have invented certain new and useful Improvements in Mechanical Movements, of which the following is a specification sufficient to enable others skilled in the art to which the invention appertains to make and use the same.

My invention relates to means for converting rotary into intermittent reciprocatory motion, as hereinafter set forth, the object being to attain a uniform even motion as compared with the ordinary crank-motion and also to attain the transmission of the maximum of power within prescribed limits.

The invention consists in the construction and arrangement of parts hereinafter described and claimed specifically.

My improvements are applicable to power stamping-presses, printing-presses, &c., in which alternating operations are performed—as, for instance, a stamping-press in which blanks are subjected successively to the action of two dies.

In the accompanying drawings, Figure 1 is an elevation of my improved mechanism, the shaft being shown in section upon plane of line 1 1, Fig. 2; Fig. 2, a section upon plane of line 2 2, Fig. 1; Fig. 3, a similar view illustrating the operation of tripping; Fig. 4, a section upon plane of line 4 4, Fig. 1; Fig. 5, a similar view showing the parts reversed in position as compared with Fig. 4; Fig. 6, an elevation of the carrier-plate; Figs. 7, 8, and 9, diagrammatic views illustrating the different positions of the actuating-pinion with relation to the transmitting rack-plate. Figs. 10, 11, and 12 are sections upon plane of line 10 10, Fig. 4. Fig. 13 is an elevation of the inner side of the eccentric disk; Fig. 14, an elevation of the opposite side thereof; Fig. 15, an elevation of the inner side of the reversing-disk; Fig. 16, a perspective view of the clutch-lever. Fig. 17 is a view similar to Figs. 2 and 3, showing a modification in the tripping mechanism. Fig. 18 is an elevation of the inner side of the clutch-plate; Fig. 19, a side elevation of the starting-disk; Fig. 20, an edge view.

In the drawings, A represents the transmitting rack-plate to be reciprocated, it being formed at one end *a* to receive a wrist-pin or other mechanical expedient for connecting it pivotally to the part to which it is desired to transmit motion. The rear portion of the transmitting rack-plate A is formed with a longitudinal slot *a'*, upon the inner edges of which are formed the parallel rack-bars *b b'*. These rack-bars *b b'* are each formed with inner and outer rows of teeth b^2 b^3 and b^4 b^5. The inner edges of the racks *b b'* are formed with recesses or depressions b^6 b^7 b^8 b^9, respectively, near their opposite extremities by the removal or omission of the rack-teeth at these points.

C is a carrier-plate provided with rollers *c*, upon which it is supported on the upper and lower edges of the rear portion of the transmitting rack-plate A, which edges extend parallel adjoining and beyond the racks *b b'*, substantially as shown in Fig. 1 of the drawings. The carrier-plate C is also formed with journals or studs c' c^2, upon which are mounted pinions d' and d^2, respectively, engaged with the rack-teeth b^2 and b^5. These pinions d' d^2 carry the starter-disks *e e'*, formed with the shoulders e^2 e^3, respectively, the function of which is hereinafter to be described.

E is the power-shaft, continuously rotated by any suitable means. *k* is a pinion rigidly secured to said shaft E in line with the racks *b b'* and adapted for engagement alternately with the racks b^3 b^4. Adjoining the pinion *k* and also rigidly secured to the shaft E in the same plane as the starting-disks *e e'* is the reversing-disk *f*, carrying the contact-roller or equivalent *f'* for engagement with the shoulders e^2 e^3 on the said starting-disks *e e'*. The only other operative part of the device secured rigidly to the power-shaft E is the clutch-operating disk G, which may constitute a portion of the hub of the power-pulley, if desired, as indicated in Fig. 15. This clutch-actuating disk G is formed with shoulders *g g* for engagement with projections *h h* upon the outer face of the clutch-plate H, said clutch-plate H being mounted upon the hub *i* of the eccentric disk I, which in turn is mounted upon the hub *k'* of the actuating-pinion *k* or directly upon the shaft, if preferred, since the hub *k'* may be omitted, if desired. The clutch-disk H may also be mounted directly upon the shaft E, if desired, instead of upon the hub or sleeve of the eccentric disk, the essential feature in this connection being that the clutch-disk H and the eccentric disk I shall be free to rotate under certain conditions independent of the clutch-actuating disk G and reversing-disk *f*.

Studs h' project from the inner side of the clutch H and pass through perforations i' i' in the eccentric disk I and into recesses c^3 in the carrier-plate C under normal conditions under the pressure exerted by the springs g' through the plungers g^2 upon the outer side of the clutch-disk H. The clutch-disk H is forced back to release the studs h' from the recesses c^3 against the resistance of the springs g' by means of a trip-lever J when the latter is brought into contact with one of the tripping-toes or equivalent devices L L'. This tripping-lever J is situated mainly in the recess h^3, formed for its reception in the inner side of the clutch H, its outer end projecting sufficiently to engage with either of the tripping-toes L L'. The outer surface of the eccentric disk I is beveled slightly, as at i^3 i^4, to receive the outer end of the tripping-lever J when depressed.

i^2 is the eccentric upon the inner surface of the plate I. On this eccentric is mounted the annular bearing *m*, which latter is of a diameter corresponding to the width of the longitudinal slot a' in the transmitting rack-plate under the action of the eccentric, so as to bring either one or the other of the sets of racks b^3 b^4 into engagement with the pinion *k*, as the case may be.

In Figs. 2 and 3 both reversing tripping-toes L L' are shown as secured to the transmitting rack-plate A directly, although this is not essential, since they may obviously be situated upon any stationary part so related to the motion of the rack-plate A as to effect the tripping of the lever J at the end of each stroke, or obviously they may be arranged adjustably with relation thereto, as indicated at L'' in Fig. 17, in which case the reversing of the tripping-rod A may be delayed and controlled indefinitely or definitely by the aid of suitable automatic mechanism for advancing and receiving the tripping-toe L''.

The operation is as follows: Suppose, by way of illustration, that the transmitting rack-plate A has completed its retractile or left-hand stroke, bringing the tripping-toe L' into contact with the clutch-lever J, and thereby forcing back the clutch-disk H, so as to withdraw the studs h' from the recesses c^3 in the carrier-plate C, it being of course understood that the actuating-pinion *k* is between the recessed surfaces b^6 b^8 and out of engagement with either of the series of rack-teeth b^3 b^4. Under these conditions the continued rotation of the shaft E carries the studs h' beyond the recesses c^3, so that the clutch H is held out of engagement with the carrier-plate until the completion of one-half a revolution of the shaft E. During this one-half revolution of the shaft E the eccentric i^2, acting through the contact-roller f', raises the transmitting rack-bar A sufficiently to bring the teeth in the wheel *k* into alinement with the series of teeth b^4 upon the lower rack *b*. Just prior to the completion of this one-half revolution the contact-roller f' upon the reversing-disk *f* encounters the shoulders e^3 upon the starting-disk e', thereby rotating the latter and the wheel d^2 sufficiently to start the transmitting rack-plate A upon its forward or right-hand stroke, the wheel *k* immediately meshing with the teeth b^4, and thus insuring the completion of the forward stroke. Upon the completion of the forward stroke, bringing the wheel *k* between the depressed surfaces b^7 b^9 the end of the tripping-lever J encounters the tripping-toe L, said lever J having obviously been reversed in position by the half-revolution of the shaft E, as described, so as to project toward said tripping-toe L, upon encountering which it releases the studs h' from the recesses c^3 in the carrier C, thereby rotating the eccentric so that it lowers the transmitting rack-plate A sufficiently to bring the teeth of the wheel *a* into alinement with the teeth b^3 in the rack-bar *b*, the contact-roller f' upon the reversing-disk *f* in this case striking the shoulder e^2 on the starting-disk *e*, thereby causing the wheel *d* to act upon the teeth b^3 to start the transmitting rack-plate A in its retractile movement, at the same time releasing the trip-lever J from the tripping-toe L, so that the studs h' are free to again enter the recesses c^3 in the carrier-plate C under the impulse of the springs g' in the clutch-actuating disk G. These operations are repeated automatically at the end of each stroke, provided the tripping-toes L L' are rigid or permanent in position. If a tripping-toe, as L'', Fig. 17, is withdrawn temporarily or otherwise from position, it is obvious that when the wheel *k* reaches a position, say, between the depressed surfaces b^6 b^8 the studs h' will continue to engage the recesses c^3 in the carrier-plate C and will thereby hold the eccentric plate against rotation until such time as the tripping-toe L'' is brought forward automatically or otherwise to engage the tripping-lever J and release the studs h', as hereinbefore set forth. In the meantime the shaft E and pinion *k* will continue to rotate without acting upon the transmitting rack-plate A.

It is obvious that, if preferred, the eccentric i^2 may be made of sufficient diameter to fill the slot a' in the transmitting rack-plate A, thereby dispensing with the annular contact-roller *m*, although I prefer ordinarily to use the latter.

The rollers *c* on the carrier-plate C are bearing upon the parallel edges of the transmitting rack-plate A to preserve the alinement of the parts. In the construction shown in the drawings the parts are timed so that the shaft E makes one revolution between the extremes of motion. In other words, there are three revolutions for each complete reciprocation of the transmitting rack-plate—that is to say, one-half a revolution in reversing, a whole revolution in the forward movement, one-half a revolution in reversing, and one whole revolution in the retractile movement. It is obvious that by lengthening the rack-plate any desired number of revolutions of the shaft E may be provided for between the reversal at either end of the stroke, provided always that the number of teeth employed represents a definite number of complete revolutions.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a mechanical movement, the combination of a rotatable shaft, an eccentric mounted loosely thereon, a transmitting rack-plate straddling said eccentric and provided with two sets of rack-teeth for alternately engaging a pinion rigid on said shaft, said pinion, and means for automatically operating the eccentric at the end of each stroke of the transmitting rack-plate in such manner as to bring the pinion alternately into engagement with the opposite racks on the transmitting-plate, substantially as set forth.

2. In a mechanical movement, the combination of a rotatable shaft, an eccentric loosely mounted thereon, a pinion rigid on said rotatable shaft, a transmitting rack-plate formed with a longitudinal slot in which the said eccentric is situated, two series of racks upon the transmitting rack-plate for engagement with the pinion, and automatic clutch mechanism for operating the eccentric for raising and lowering the transmitting rack-plate so as to throw the racks alternately into engagement with the actuating-pinion, substantially as set forth.

3. In a mechanical movement the combination of a rotatable shaft, a fixed pinion mounted thereon, a loosely-mounted eccentric on said rotatable shaft, a transmitting rack-plate straddling the eccentric, and formed with four series of rack-teeth, a carrier-plate resting upon the parallel outer edges of said transmitting rack-plate, supporting-gears on said carrier-plate which engage with the outer racks on said transmitting rack-bar, starting-disks connected with said supporting-gears and formed with shoulders, a reversing-disk rigidly secured to the rotatable shaft in the same plane with the starting-disks, and formed with a contact-surface for engagement therewith, and automatic clutch mechanism for actuating the eccentric whereby the motion of transmitting rack-plate is automatically reversed at the end of the forward and the retractile stroke, substantially as set forth.

4. In a mechanical movement the combination of the rotatable shaft E, the actuating-pinion k, rigidly secured thereto, the transmitting rack-plate A, formed with the longitudinal racks b, b', and with the series of teeth b^2, b^3, b^4, b^5, the carrier-plate C, formed with the recesses c^3, c^3, the gear-wheels d', d^2, mounted upon the carrier C, and engaging with the rack-teeth b^2, and b^5, the rollers c, c, c, c, engaging with the parallel edges of the bar A, the starting-disks connected with the gear-wheels d', d^2, and formed with shoulders e^2, e^3, the starting-disk f, rigidly secured to the shaft E, and formed with the contact-surface f', the eccentric i^2, mounted loosely on the shaft E, and provided with the annular bearing-ring m, fitting the edges of the slot a', formed in the transmitting rack-plate A, the clutch-plate H, formed with the studs h', and projections h, the trip-lever J, and the clutch-actuating disk G, rigidly secured to the shaft E, and provided with shoulders g, g, and springs and plungers g', g^2, and tripping-toes arranged to operate the tripping-lever J, substantially in the manner and for the purpose set forth.

5. In a mechanical movement the combination of a rotatable shaft E, the actuating-pinion k, rigidly secured thereto, the transmitting rack-plate A, formed with the longitudinal slot a', and racks b, b', having series of teeth b^2, b^3, b^4, b^5, with the depressed surfaces b^6, b^7, b^8, b^9, the carrier-plate C, formed with the recesses c^3, the gear-wheels d', d^2, mounted upon said carrier C, and engaging with the rack-teeth b^2, and b^5, the starting-disks e, e', rotating with the said wheels d', d^2, and formed with the shoulders e^2, e^3, respectively, the starting-disk f, rigidly secured to the shaft E, and formed with a contact-surface f', for engagement with shoulders e^2, e^3, on the starting-disks e, e', the eccentric i^2, mounted loosely upon the shaft E, fitting the longitudinal slot a', in the transmitting rack-plate A, the clutch-plate H, formed with the studs h', and projections h, the trip-lever J, and the clutch-actuating disk G, rigidly secured to the shaft E, and provided with shoulders g, g, and springs g', and plungers g^2, the whole arranged and operating substantially in the manner and for the purpose described.

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