(No Model.)

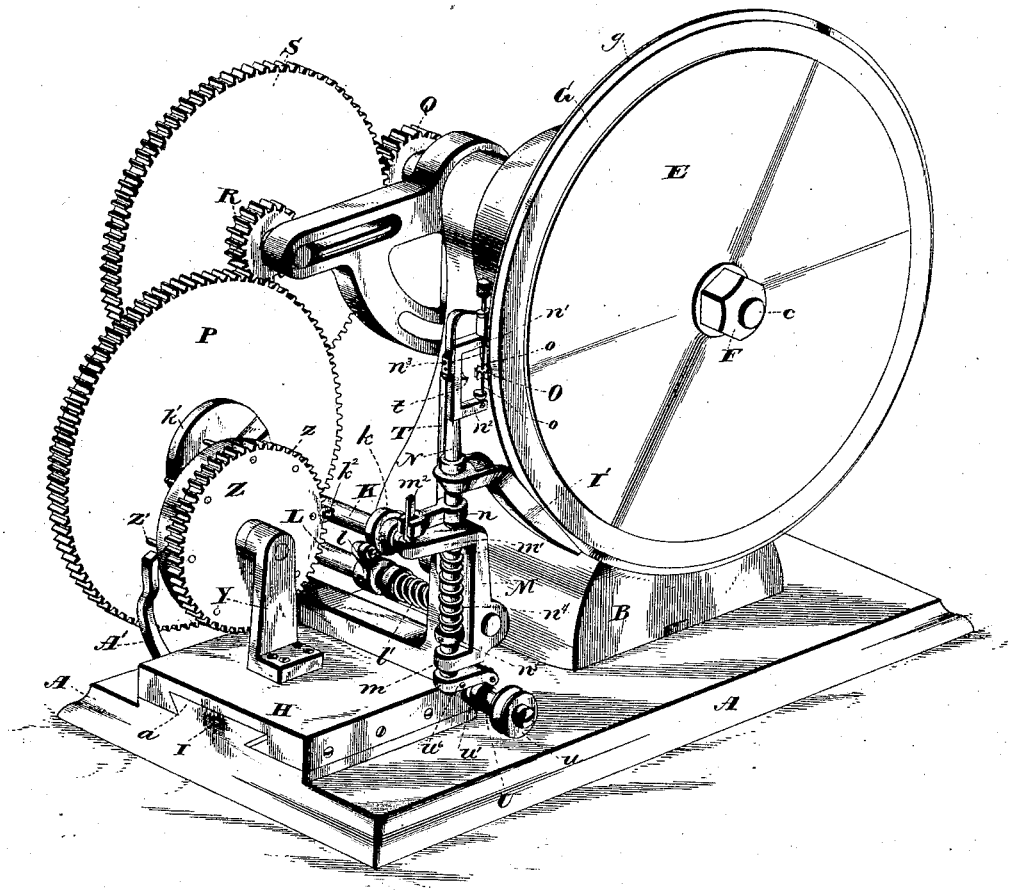
5 Sheets—Sheet 1.

J. N. LAPOINTE.

MACHINE FOR POLISHING PINION LEAVES.

No. 371,847. Patented Oct. 18, 1887.

Fig. 1.



Witnesses:
Chas. J. Williamson.
Henry C. Hazard.

Inventor:
Joseph N. Lapointe, by
Prindle & Russell, his Att'ys.

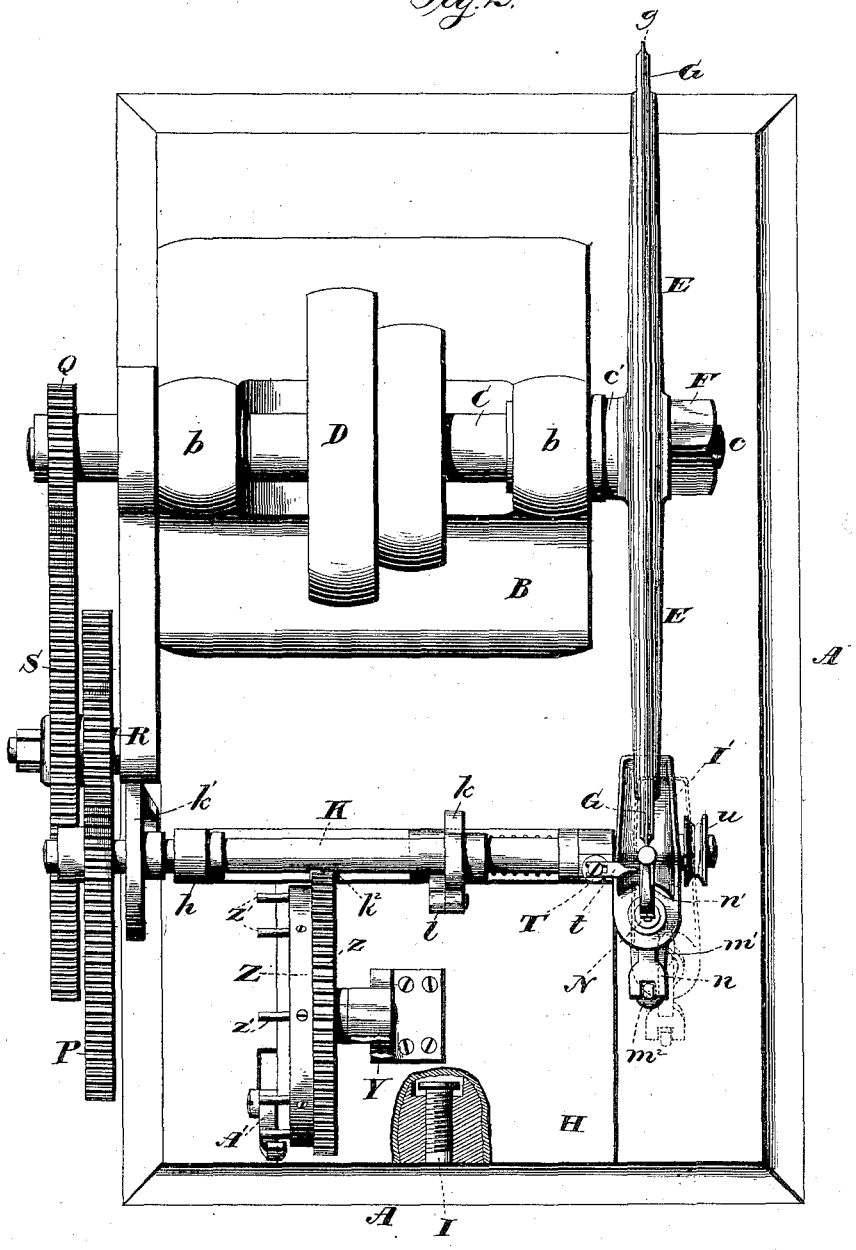
(No Model.) 5 Sheets—Sheet 2.

J. N. LAPOINTE.

MACHINE FOR POLISHING PINION LEAVES.

No. 371,847. Patented Oct. 18, 1887.

Fig. 2.



Witnesses:
Chas. J. Williamson.
Henry C. Hazard.

Inventor:
Joseph N. Lapointe, by
Brindle & Russell, his Attys.

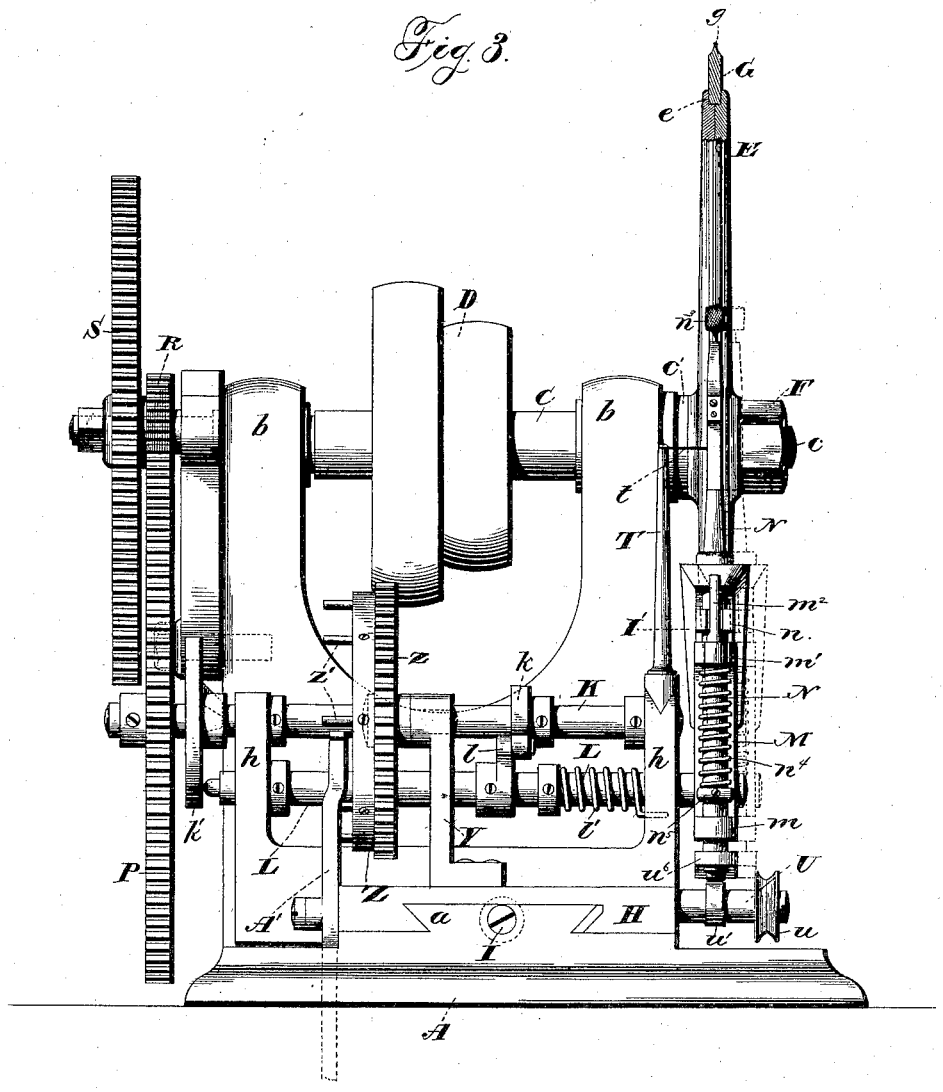
(No Model.) 5 Sheets—Sheet 3.

J. N. LAPOINTE.

MACHINE FOR POLISHING PINION LEAVES.

No. 371,847. Patented Oct. 18, 1887.

Fig. 3.



Witnesses
Chas. J. Williamson.
Henry C. Hazard.

Inventor:
Joseph N. Lapointe, by
Linville & Russell, his Attys.

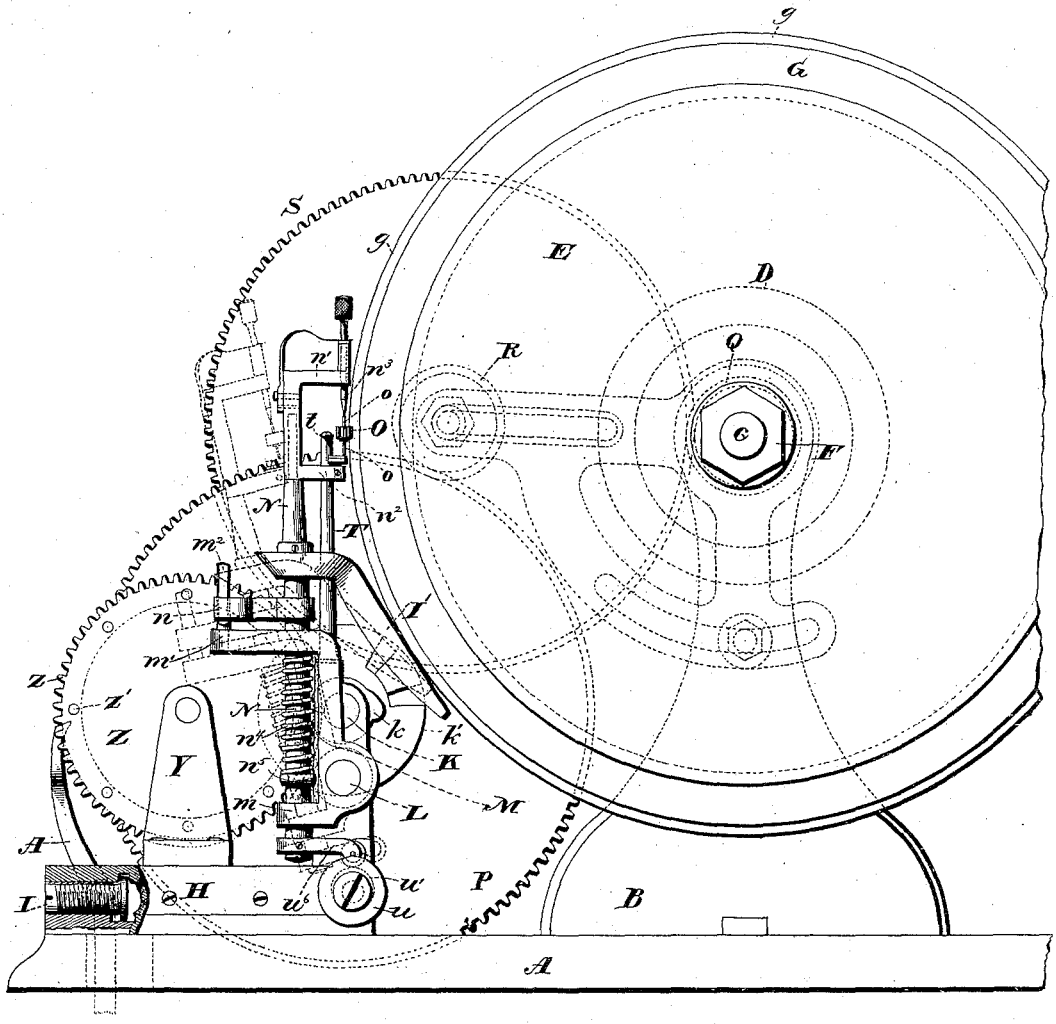
(No Model.) 5 Sheets—Sheet 4.

J. N. LAPOINTE.

MACHINE FOR POLISHING PINION LEAVES.

No. 371,847. Patented Oct. 18, 1887.

Fig. 4.



Witnesses:
Chas. J. Williamson.
Henry C. Hazard.

Inventor
Joseph N. Lapointe, by
Brindle & Russell, his Attys

(No Model.) 5 Sheets—Sheet 5.

J. N. LAPOINTE.

MACHINE FOR POLISHING PINION LEAVES.

No. 371,847. Patented Oct. 18, 1887.

Fig. 6.

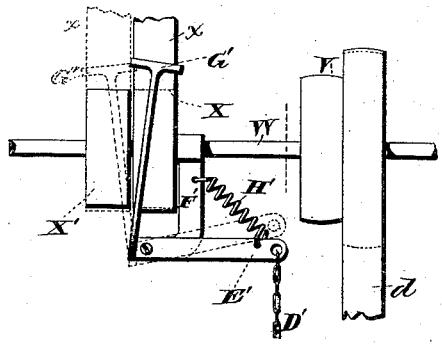


Fig. 5.

Witnesses
Chas. J. Williamson
Henry C. Hazard

Inventor
Joseph N. Lapointe, by
Prindle & Russell, his Attys

UNITED STATES PATENT OFFICE.

JOSEPH N. LAPOINTE, OF WATERBURY, CONNECTICUT.

MACHINE FOR POLISHING PINION-LEAVES.

SPECIFICATION forming part of Letters Patent No. 371,847, dated October 18, 1887.

Application filed June 10, 1886. Serial No. 204,724. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH N. LAPOINTE, of Waterbury, in the county of New Haven and the State of Connecticut, have invented certain new and useful Improvements in Machines for Polishing Pinion-Leaves; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, in which—

Figure 1 is a perspective view of my improved mechanism as arranged for use. Fig. 2 is a plan view of the upper side of the same. Fig. 3 is a front elevation of said mechanism. Fig. 4 is a side elevation of the same. Fig. 5 is an end elevation of said machine and the driving and belt-shifting mechanisms employed, and Fig. 6 is a front elevation of the counter shaft and belt-shifter.

Letters of like name and kind refer to like parts in each of the figures.

The object of my invention is to enable the teeth of pinions to be automatically polished by machinery, so as thereby to dispense with the skilled hand-labor usually employed for such purpose; and to this end my said invention consists in the construction and combination of parts, whereby a pinion is moved into contact with, is reciprocated longitudinally upon, and then moved away from a polishing-lap, and is then partially rotated and again returned to contact with the same, and after a predetermined number of repetitions of such actions the motion of the operative mechanism is arrested, such operations being automatic, substantially as hereinafter described and claimed.

In carrying my invention into practice I employ a base-plate, A, which has a rectangular form in plan view, and from which, near its rear end, projects upward a standard, B, that at its upper end is provided with two journal-boxes, *b* and *b*, within which is journaled a shaft, C.

Upon the central portion of the shaft C is secured a belt-pulley or cone of belt-pulleys, D, and to or upon one of its projecting ends is attached a disk or wheel, E, which is constructed from wood or metal, and within its periphery is provided with a circumferential groove, *e*. Said wheel is preferably constructed in two sections, that unite upon a line at or near the transverse center of said groove, and are held together by means of a nut, F, which fits over the threaded end *c* of said shaft and operates to press them together and against a collar, *c'*, that is formed upon said shaft, and furnishes a bearing for the hub of said inner section.

Within the groove *e* of the wheel E is fitted a ring, G, constructed from wood, soft metal, or other material used for polishing purposes, which ring is provided with a peripheral tongue, *g*, that transversely has the form of the space between two leaves of the pinion which is to be operated upon and circumferentially is continuous. In order that said ring or lap may be placed in or removed from position within the wheel, it is only necessary that the outer section of said wheel should be separated from the inner section.

Upon the front end of the base-plate A is formed a V-shaped way, *a*, that receives a slide, H, of usual construction, which slide is adapted to be moved toward or from the rear end of said base-plate by means of a screw, I, in substantially the same manner as is the tool-rest of a lathe. As, however, said slide requires only an occasional adjustment to position, the end of the screw I does not project, but is provided with a transverse groove, which is adapted to receive the end of a screw-driver, by means of which said screw may be rotated as required. Secured to or forming part of the front end of the slide H are two arms, *h* and *h*, which project upward from opposite sides of the same and furnish bearings for a shaft, K, and rock-shaft L, that are journaled horizontally therein. Upon the projecting end of the rock-shaft L, directly in front of the lap G, is secured a frame, M, which consists of a vertical body and two horizontal arms, *m* and *m'*, that project forward from the lower and upper ends, respectively, of said body. Within suitable openings in said arms is loosely fitted a spindle, N, which is adapted to move vertically within certain limits, but is prevented from moving circumferentially by means of an arm, *n*, that projects horizontally forward and has its outer bifurcated end engaged by a rod, m^2, which projects upward from said frame M.

The spindle N projects upward to or slightly above the axis of the lap-wheel E, and upon its upper portion is provided with two arms, *n'* and n^2, which respectively project horizontally rearward to equal distances from the upper end of said spindle and from a point a short distance below the same. Within the rear end of the lower arm, n^2, is provided a

recess or opening for the reception of one of the pivots *o* of a pinion, O, while within the corresponding end of the upper arm, *n'*, is placed a spring-actuated pump-center, n^3, that is adapted to engage with the opposite pivot *o* of said pinion, the arrangement being such as to enable said pinion to be securely held in the position shown directly in front of said lap-wheel. If desired, said pinion-holding frame may be constructed separate from and attached to said spindle N.

In order that the pinion O may be properly presented for the action of the lap G, it is necessary that it should be moved forward into contact therewith, should be reciprocated vertically during such contact, should then be moved away from said lap and partially rotated, so as to bring another groove into position, and then moved into contact with said lap again, all of which movements are effected by means of the following-described mechanism: The shaft K is connected with the lap-wheel shaft C by means of a gear-wheel, P, which is secured upon the end of the former, a pinion, Q, that is secured upon the end of the latter, and an intermediate pinion, R, and gear-wheel S, which are secured together and suitably journaled, and are adapted to engage, respectively, with said gear-wheel P and pinion Q, the arrangement being such as to cause said shaft K to make one complete revolution while said shaft C is revolving a predetermined number of times. Secured upon and revolving with the shaft K is a cam, *k*, which at each revolution of said shaft engages with an arm, *l*, that projects from the rock-shaft L, and pressing said arm toward the front of the machine gives to said rock-shaft a partial rotation and causes the pinion-holding frame to be moved in the same direction away from the lap-wheel, as shown by dotted lines of Fig. 4. When said arm is released by the passage of said cam, said rock-shaft and pinion-holder are returned to their normal position by means of a spring, *l'*, which is coiled around said rock-shaft, with one of its ends attached to the same and the other end attached to some relatively stationary part.

After the pinion has been moved forward sufficiently to enable its teeth to clear the lap it is moved laterally a short distance by means of a cam, *k'*, which is secured upon the shaft K in such position as to enable its cam-face to bear against the end of the rock-shaft L opposite to the end that carries the pinion-holding frame, when, as said rock-shaft is adapted to be moved longitudinally, said cam carries it forward, as shown by the dotted lines of Fig. 3, the predetermined distance, and then permits said rock-shaft to be returned to its normal longitudinal position by the action of the spring *l'*.

The speed, shape, and relative arrangement of the cams *k* and *k'* are such as to cause the pinion to remain in contact with the lap a certain time, to be then moved outward, then laterally, again outward, then laterally to its former position in such direction, and then inward again into contact with said lap. The first outward movement clears said pinion from said lap. The following lateral movement clears it from a pointer, *t*, which is secured to and projects horizontally from a vertical bar, T. The next outward movement carries said pinion beyond said pointer. The next lateral movement carries it behind the latter, and upon the final inward movement one of the leaves of the pinion engage with said pointer and the former is partially rotated, so as to present a different portion of its periphery to the action of said lap.

By means of the mechanism described a pinion is held against the lap until the latter has made a predetermined number of revolutions, is then moved away from the same and rotated partially, so as to bring a different groove into position, and is then returned to contact with said lap, such operation being automatically repeated until each leaf of said pinion has been acted upon one or more times, as may be necessary for the proper polishing of the same.

In order that the straight lines of the pinion-leaves may be preserved and the polishing-lap prevented from cutting grooves in the faces of said leaves, a vertically-reciprocating movement of said pinion is produced by the following means, viz: The spindle N is held at the lower limit of its longitudinal motion by means of a spring, n^4, which is coiled spirally around the same with its ends in engagement with the arm *m'* of the frame M, and a collar or shoulder, n^5, that is provided upon said spindle. Beneath and in rear of the lower end of the spindle N is journaled a short shaft, U, which is adapted to receive motion from a belt through a grooved pulley, *u*, upon one end, and is provided with a cam, *u'*, that is located in a line with said spindle and is adapted to engage with an arm, u^6, which extends rearward from the former, the arrangement being such that at each rotation of said shaft said spindle will be moved longitudinally upward a distance equal to the throw of said cam, and will then be returned to its normal position by the action of the spring u^4, such operation being repeated several times during each period of contact between a pinion and the lap. As the pinion-holding mechanism moves a pinion away from the lap said lifting-arm u^6 passes out of engagement with said cam *u'*, and the vertical motion of said spindle ceases until said pinion is again brought into contact with said lap.

The shaft C is caused to rotate by means of a belt, *d*, that passes around one of the pulleys of the cone D, and from thence upward and around one of the pulleys of a corresponding cone, V, that is secured upon a counter-shaft, W, said counter-shaft being in turn driven from a main shaft by a belt, *x*, which passes around a pulley, X, that is secured to said counter-shaft and is capable of being shifted from the same to an adjacent loose pul-

ley, X′, whenever it is desired to arrest the motion of the machine.

In order that the motion of the machine may be automatically arrested when a pinion being operated upon has been rotated one or more times, the following means are employed, viz: Journaled upon a bracket-arm, Y, that is secured to and extends upward from the slide H, is a toothed wheel, Z, which is adapted to rotate in the same plane with the shaft K, and to have its teeth *z* successively engaged by a spur, k^2, that projects radially from said shaft, the arrangement being such that at each revolution of the latter said wheel is rotated a distance equal to the circumferential length of one of said teeth.

Projecting horizontally from one of the faces of the wheel Z are a number of pins, *z′*, each of which, by the rotation of said wheel, is adapted to engage with the upper end, at the rear side, of a lever, A′, that is pivoted centrally upon the slide H in a substantially vertical position, and, extending downward through a slot in the base A, is provided upon its lower end, at its front side, with a hook-shaped tooth, *a′*.

Pivoted centrally within a bearing, B′, beneath the base A is a lever, C′, which extends horizontally from front to rear beneath the machine, and upon its front projecting end is provided with a handle, *c′*, while to its rear end said lever has secured one end of a chain, D′, that from thence extends upward to and is connected with one end of a bar, E′, that is pivoted upon a suitable support, F′, and carries upon its opposite end a shifter, G′, of usual construction, which engages with the belt *x*.

The bar E′ is preferably arranged so that when its outer end is at the lower limit of its motion the belt *x* will be in engagement with the fixed pulley X, while by moving said bar to the opposite limit of its motion said belt will be moved from said fixed pulley into engagement with the loose pulley X′, as shown by dotted lines of Fig. 6, which is the normal position of parts. A spring, H′, extending between the outer end of said bar E′ and the pivotal support F′, causes the former to be held with a yielding pressure at the upper limit of its motion with the belt in engagement with the loose pulley, while by raising the outer end of the lever C′ the rear end of the same will be depressed, and, through the action of the chain D′, said bar E′ will be moved to the position shown by the full lines of Fig. 6, so as to cause said belt *x* to engage with said fixed pulley.

The front portion of the lever C′ is adjacent to the lower end of the lever A′, and is provided with a laterally-projecting stud, c^2, which, when the former is raised to the position shown by the full lines of Fig. 5, engages with the tooth *a′* of the latter and locks said lever C′ in such position. A spring, a^2, engaging with the rear side of the lower portion of said lever A′, holds the latter with a yielding pressure in engagement with said stud, while a second spring, c^3, engaging with the upper side of the front portion of said lever C′, holds said end with a yielding pressure at the lower limit of its motion.

The mechanism described operates as follows, viz: When it is desired to start the machine the front end of the lever C′ is raised until its stud c^2 is engaged by the tooth *a′*, by which movement the driving-belt *x* is shifted from the loose pulley X′ to fixed pulley X. After the shaft C has made the predetermined number of rotations one of the pins *z′* of the wheel Z will engage with the upper end of the lever A′ and move the same outward and its lower end rearward until the tooth *a′* is released from engagement with the stud c^2, when said lever C′ and the belt-shifting mechanism will resume their normal positions and change the driving-belt to the loose pulley, upon which the motion of the machine will cease.

The pins *z′* are equidistant from each other, and the number of teeth *z* between the two contiguous pins determines the number of times that a pinion will be presented for action by the lap, so that by varying the relative positions of said pins any desired number of presentations of the pinion may be had, and at the predetermined time the operating mechanism will be automatically stopped.

In order that the oil and abrasive material used upon the lap may be prevented from fouling the machine, a sheet-metal cup, I′, is secured to the spindle N below the pinion-holding frame, and from thence extends horizontally rearward nearly to the edge of said lap, and thence in a curve downward and rearward, as shown. If desired, said cup may be connected with an exhaust-fan, so as to cause the waste to be drawn into its interior.

The construction described enables two or more machines to be run by one operator, as, after a pinion has been placed in position and the machine started, the work will be automatically done and the mechanism then stopped without further attention, during which operation there is sufficient opportunity for removing completed pinions from other machines and substituting for the same other pinions to be polished.

Having thus described my invention, what I claim is—

1. As an improvement in mechanism for polishing pinions, an organization which is provided with a longitudinally movable holder that is adapted to journal a pinion, in combination with a rotatable cam which is adapted to move the holder in one direction in a line with the axis of the pinion, and a spring that is adapted to press said holder with a yielding force against said cam, substantially as and for the purpose specified.

2. As an improvement in mechanism for polishing pinions, an organization in which is combined a rotating polishing-lap, a yielding spring-pressed and longitudinally-movable holder for journaling a pinion, and revolving

cams and springs, substantially as described, whereby at predetermined times the pinion is automatically moved away from the lap, is moved laterally against a relatively stationary pointer that operates to give to it a partial revolution, is again returned to lateral position, and is then moved into contact with said lap, substantially as and for the purpose shown.

3. As an improvement in mechanism for polishing pinions, an organization in which is combined a spring-pressed and longitudinally-movable holder for journaling a pinion and holding the same in position for the action of a rotating polishing-lap, mechanism, substantially as described, whereby the pinion is automatically moved toward and from the polishing-lap and rotated step by step to present its leaves successively to the action of the same, and mechanism, substantially as described, whereby the motion of the polishing mechanism is automatically arrested when each pinion has been operated upon by said polishing-lap a predetermined number of times, substantially as and for the purpose set forth.

4. As an improvement in mechanism for polishing pinions, an organization in which is combined a spring-pressed and longitudinally-movable holder for journaling a pinion and holding the same in position for the action of a revolving polishing-lap, mechanism, substantially as described, whereby the holder with its pinion is moved toward the lap and then reciprocated in a line with the axis of the pinion a predetermined length of time, is then moved away from said lap and said pinion rotated a distance equal to the width of one of its leaves and grooves, and is then again moved toward said lap, substantially as and for the purpose shown and described.

5. As an improvement in mechanism for polishing pinions, an organization in which is combined a spring-pressed and longitudinally-movable holder for journaling a pinion and holding the same in position for the action of a revolving polishing-lap, mechanism, substantially as described, whereby the journaled pinion is presented to, held in yielding contact with, and reciprocated longitudinally upon the polishing-lap, is then moved away from said lap and partially rotated and again moved into contact with the same, and mechanism, substantially as described, whereby the motion of the polishing mechanism is automatically arrested when each pinion has been operated upon a predetermined number of times, substantially as and for the purpose specified.

6. As an improvement in mechanism for polishing pinions, an organization in which is combined a revolving polishing-lap and a longitudinally-movable pinion-holding device which is combined with and supported by a journaled shaft or arbor, and is adapted to be automatically moved toward and from said polishing-lap by a partial rotation of said shaft in opposite directions, substantially as and for the purpose set forth.

7. As an improvement in mechanism for polishing pinions, an organization in which is combined a revolving polishing-lap and a pinion-holding device that is supported by and moved with a longitudinally-reciprocable shaft or arbor, whereby a pinion journaled within such holder will be reciprocated longitudinally upon or with reference to the polishing-lap, substantially as and for the purpose shown and described.

8. As an improvement in mechanism for polishing pinions, an organization in which is combined a revolving polishing-lap and a pinion-holding device that is supported by and moved with a circumferentially and longitudinally reciprocable shaft, whereby a pinion journaled within such holder is moved into contact with and is reciprocated longitudinally upon said polishing-lap, and is then moved out of contact with the same, substantially as and for the purpose specified.

9. In a pinion-polishing machine, in combination with a rock-shaft that supports a pinion-holding device and is provided with a radial arm, a shaft which rotates continuously in one direction and has a cam that engages with said arm and operates to give to said rock-shaft a partial rotation, whereby said pinion-holding device is moved away from a polishing-lap, substantially as and for the purpose specified.

10. In a pinion-polishing machine, in combination with a rock-shaft that supports a pinion-holding device and is provided with a radial arm, a continuously-rotating shaft which has a cam that engages with said arm and operates to give to said rock-shaft a partial rotation in one direction, and a spring that is adapted to return said rock-shaft to its normal position when said cam ceases to act, substantially as and for the purpose shown.

11. In a pinion-polishing machine, a spindle which supports a pinion-holding device and is adapted to be moved longitudinally, in combination with a spring that operates to hold said spindle with a yielding pressure at one limit of its longitudinal motion, and a continuously-rotating cam which at each revolution is adapted to move said spindle to the opposite limit of its longitudinal motion, substantially as and for the purpose set forth.

12. As an improvement in mechanism for polishing pinions, in combination with a rotatable polishing-lap, a longitudinally-reciprocable holder for a pinion to be polished, which is also made movable toward and from the lap, and mechanism, substantially as described, whereby such longitudinally-reciprocating motion is automatically arrested when the pinion is moved out of contact with said lap, substantially as and for the purpose specified.

J. N. LAPOINTE.

Witnesses:
GREENE KENDRICK,
J. WM. PUNCHARD.