No. 743,737. PATENTED NOV. 10, 1903.

R. C. LEWIS.

TAPPING MACHINE.

APPLICATION FILED JUNE 3, 1903.

NO MODEL. 4 SHEETS—SHEET 1.

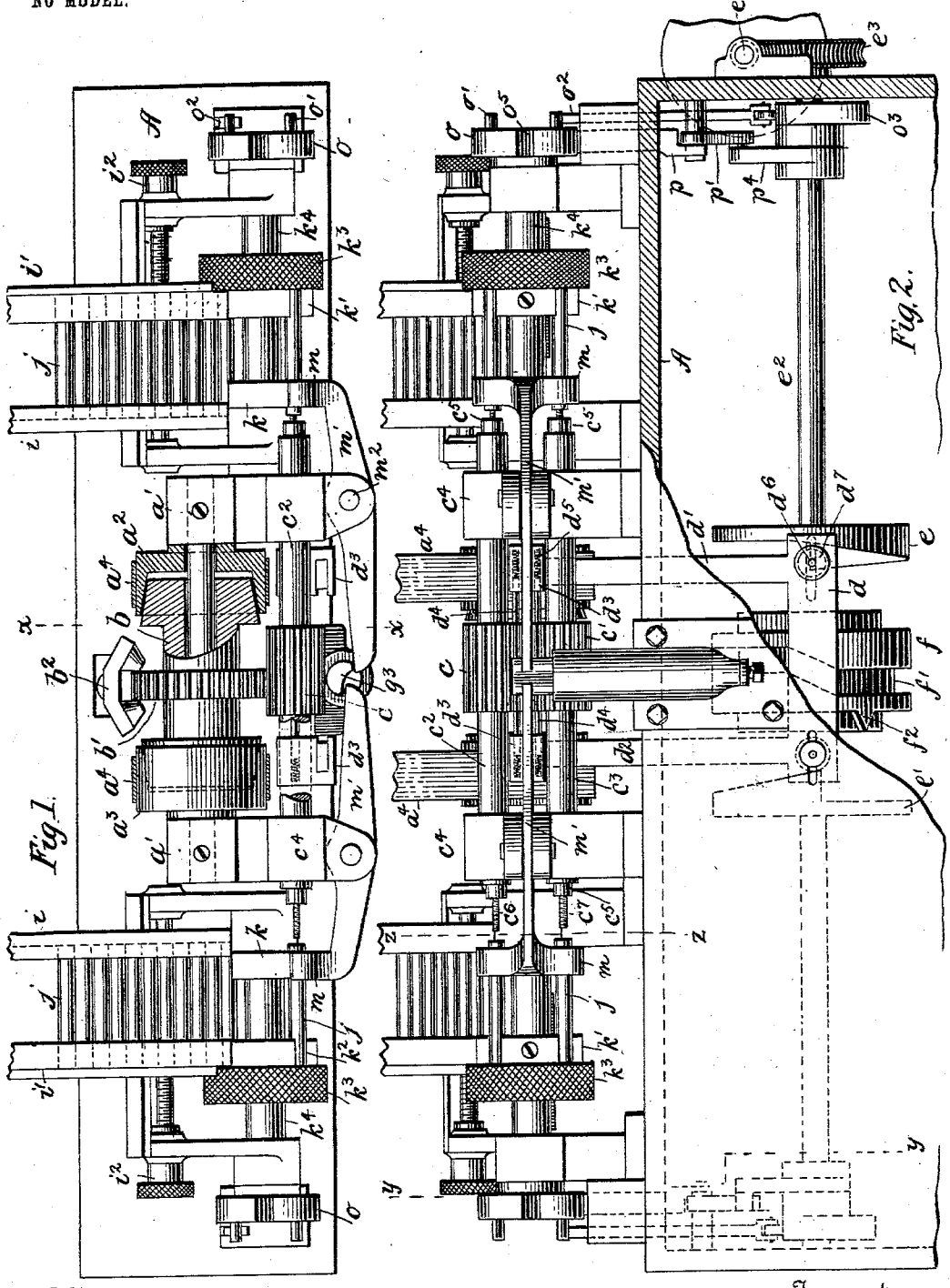

Fig. 1.

Fig. 2.

Witnesses
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NO MODEL. 4 SHEETS—SHEET 2.

Fig. 4.

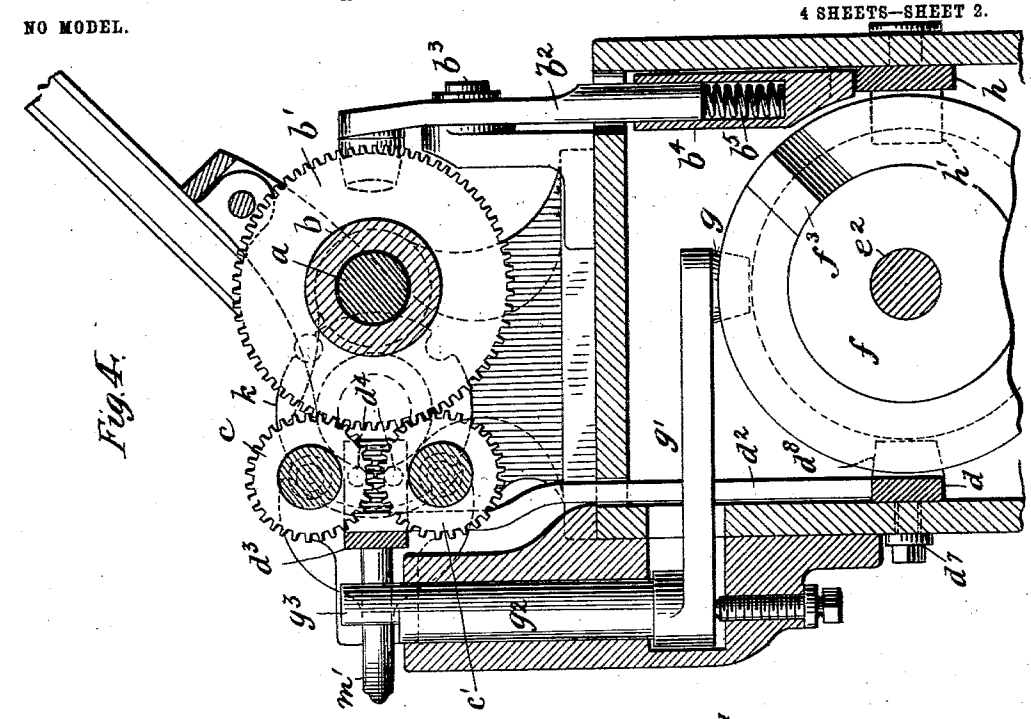
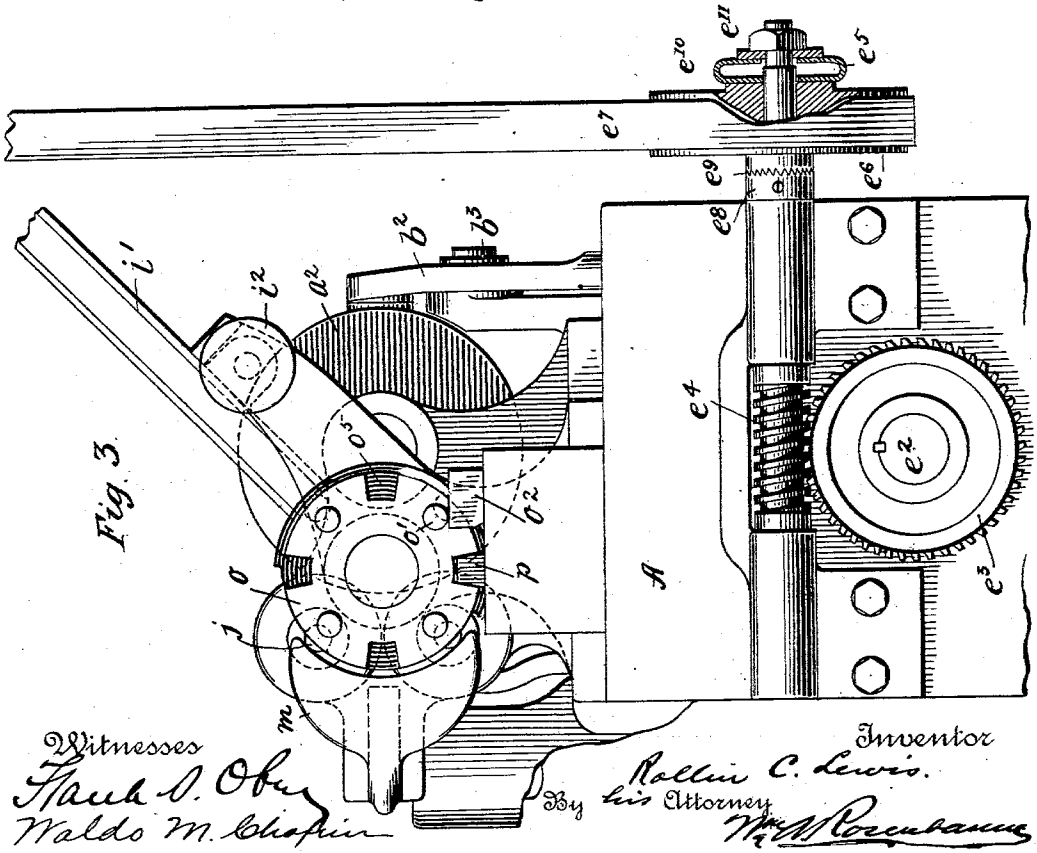


Fig. 3.



Witnesses
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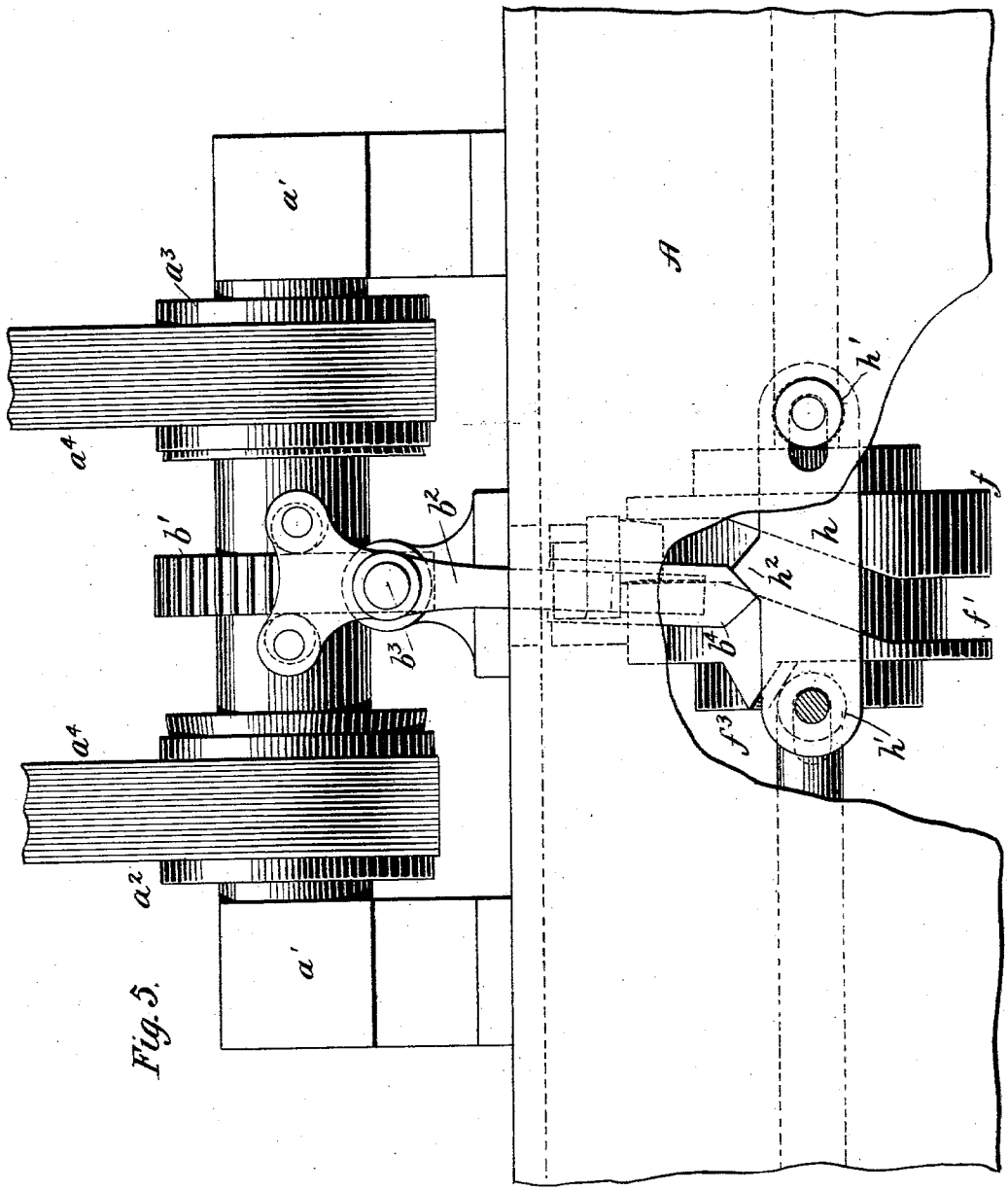

Fig. 5.

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No. 743,737. PATENTED NOV. 10, 1903.

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TAPPING MACHINE.

APPLICATION FILED JUNE 3, 1903.

NO MODEL. 4 SHEETS—SHEET 4.

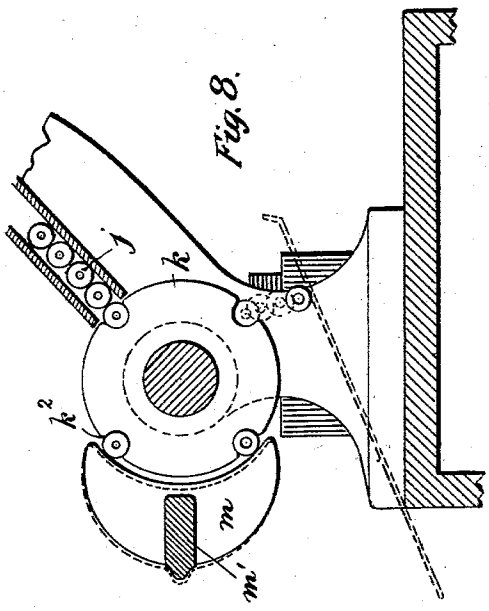

Fig. 8.

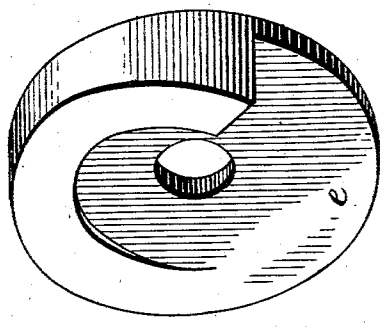

Fig. 10.

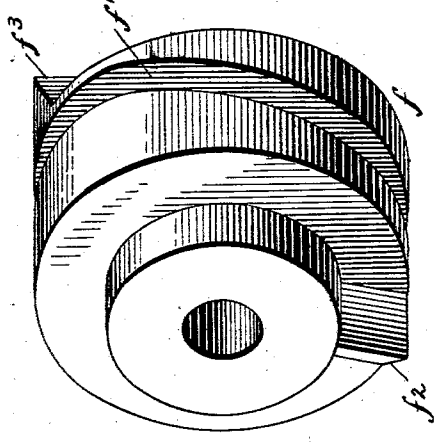

Fig. 9.

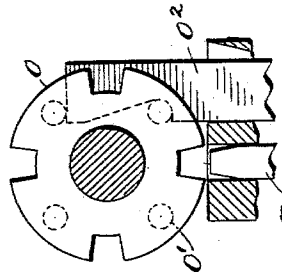

Fig. 7.

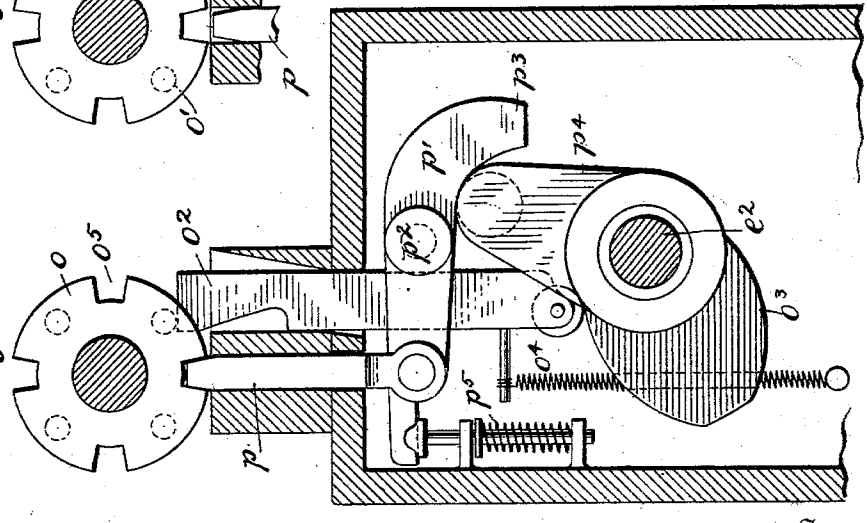

Fig. 6.

Witnesses
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No. 743,737. Patented November 10, 1903.

UNITED STATES PATENT OFFICE.

ROLLIN CARROLL LEWIS, OF STAMFORD, CONNECTICUT, ASSIGNOR TO VARLEY DUPLEX MAGNET COMPANY, A CORPORATION OF NEW JERSEY.

TAPPING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 743,737, dated November 10, 1903.

Application filed June 3, 1903. Serial No. 159,951. (No model.)

To all whom it may concern:

Be it known that I, ROLLIN CARROLL LEWIS, a citizen of the United States, residing at Stamford, in the county of Fairfield and State of Connecticut, have invented certain new and useful Improvements in Tapping-Machines, of which the following is a full, clear, and exact description.

This invention relates to tapping-machines, and is a special machine of its class designed to tap holes in the ends of short rods or pins. The machine is duplex and automatic in its action, since it embodies two taps or sets which are alternately brought into operation upon the rods or pins supplied or fed at two different points in the machine. Each set of taps preferably includes two or more acting simultaneously and respectively upon two or more of the rods or pins, the taps being graduated in size and acting successively on each rod or pin, so as to cut the thread in stages.

The invention consists of the constructions and combinations hereinafter fully described, and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a plan of the complete machine with parts in section and other parts broken out for clearness. Fig. 2 is a front elevation of the machine with parts broken away. Fig. 3 is a front elevation of the machine with parts in section. Fig. 4 is a section on line $x\,x$ of Fig. 1. Fig. 5 is a rear elevation of the middle portion of the machine. Fig. 6 is a section on line $y\,y$ of Fig. 2. Fig. 7 is a portion of Fig. 6, showing a different position of the parts. Fig. 8 is a section on line z of Fig. 2, and Figs. 9 and 10 are perspective views of two different cams.

A is the main frame of the machine, consisting, essentially, of a flat top or table with depending plates reaching toward the floor. Above the table is mounted a short horizontal shaft a, fixed in bearings a', between which are arranged two loose pulleys a^2 and a^3, driven in opposite directions by belts a^4 and each forming one-half of a clutch member. Between the pulleys is a loose sleeve b, having at each end a clutch member adapted to engage, respectively, with the pulleys. This sleeve also carries a large gear-wheel b', centrally located and embraced at the rear by two antifriction-rollers carried on the upper end of a lever b^2, pivoted at the point b^3 and extending downward through an opening in the table, where its lower end enters a sleeve b^4. The extremity of this sleeve is wedge-shaped, and it contains a spring b^5, permitting it to telescope more or less over the end of the lever. This lever is used to throw the sleeve b to the right or left into and out of engagement with the pulleys to change the direction of rotation of the gear b'. The gear engages with two elongated pinions c and c', respectively fixed upon two shafts c^2 and c^3, mounted to both rotate and slide in brackets c^4. These shafts have a reciprocatory movement to right and left, and the pinions are elongated so that the gear will remain in engagement with them in all of their positions. Shafts c^2 and c^3 project beyond their bearings and carry chucks c^5, in which the taps c^6 and c^7 at each end are held. The upper taps c^6 are smaller than the lower taps, and the article to be tapped is first engaged by the upper or smaller taps and then by the larger, as will hereinafter appear. The reciprocation of the shafts c^2 and c^3 is obtained by means of a plate d, arranged below the table, from which project upwardly two arms d' and d^2, carrying blocks d^3 at their upper ends, located each side of the two elongated pinions and between the shafts on which they are mounted, said blocks each carrying two pins d^4, projecting, respectively, against the ends of the two pinions. The pins d^4 have springs d^5 backing them up in the block, so that they will yield to extraordinary resistance when they are pressed against the pinions. The plate d carries pins d^6, which pass through slots in the frame of the machine and are capped by nuts d^7, and on the same pins are mounted rollers d^8, which engage, respectively, with cam-disks e and e' on a shaft e^2. The disks have oppositely-arranged tracks, so that in the rotation of the shaft the plate d will be gradually moved back and forth to the right and left, such movement causing the pinions and the shafts c^2 and c^3 to correspondingly reciprocate. Shaft e^2 is driven by means of a worm-gear e^3 and worm

e^4 on a shaft e^5. This shaft is driven by means of a loose pulley e^6 and belt e^7. The hub of the pulley has a yielding clutch engagement with a fixed collar e^8 on the shaft. The clutch (indicated at e^9) is held in engagement by a spring e^{10}, the tension of which can be adjusted by a nut e^{11}. This arrangement is provided to allow the clutch to open and the shaft e^2 to stop in case the machine "sticks" in operation, and thus prevent breakage. On the shaft e^2 and located between the two disks e and e' is another cam, f, having a peripheral cam-groove f' and two wedge-shaped lugs f^2 and f^3, one on each side and at diametrically opposite positions. Groove f' engages with a lug or roller g on a crank-arm g', fixed to a vertical shaft g^2, suitably mounted in a bracket at the front of the machine. The cam oscillates the shaft g^2 first in one direction and then in the other, with intervals between the movements during which the tapping is done. The upper end of the shaft carries a flattened lug g^3, which coöperates with the other parts, as will be hereinafter described. At the back of the machine below the table is mounted another sliding plate, h, connected by pins and slots with the plate of the main frame in a manner similar to that with which the plate d is connected. Plate h carries two rollers h', one at each end, which stand in positions to be engaged by the respective lugs f^2 and f^3 on cam f. First one lug acts and moves the plate in one direction, and after a half-turn the other lug engages the other roller and moves the plate in the opposite direction. On its upper edge the plate has a wedge-shaped projection h^2, which engages with the wedge-shaped end of the sleeve b^4. When plate h is moved in one direction, it causes the sleeve to ride upward on the projection h^2, meanwhile telescoping over the end of lever b^2, and when the apexes of the two wedge-shaped formations pass each other the tension which has been stored in spring b^5 causes the sleeve to quickly slide down the opposite side of projection h^2 and at the same time throw lever b^2 to the opposite position. This throws out one clutch and throws in the other to reverse the direction of rotation of gear b'.

At each end of the machine above the table are arranged the feed-hoppers for the articles to be tapped and the devices for holding said articles while being acted upon by the taps. The feed-hopper is an inclined guide or chute consisting of two guides i and i' engaging the ends of the rods or pins j, which are placed therein one above the other and adapted to move downward by gravity each time one is removed from the lower end of the chute. The guide i' is made adjustable laterally by means of the screw-shaft i^2 in a well-known manner. At the lower end of the chute are arranged two disks k and k', fixed upon shaft k^4 and arranged to stand opposite the ends of the rods j. Each disk contains four half-round seats k^2, arranged at similar angular displacements from each other, so that as the shaft k^4 is rotated two of the seats, one in each disk, are presented to the lower rod j at the same time, thereby permitting the rod to leave the chute and enter the two disks, which then in continuing their rotation present their curved peripheries to the end of the chute and prevent the next rod from leaving it until another pair of seats are presented to receive it. The disk k' has a portion k^3 of enlarged diameter, forming a radial shoulder, against which the ends of the rods j find a backing or abutment, and this disk is adjustable longitudinally along the shaft k^4 to accommodate the various lengths of rods adapted to be tapped on the machine, this adjustment being effected at the same time that the adjustment of the guide i' is made. The enlarged part k^3 of the disk is shown with a milled surface, because it is a separate part, which when screwed upon the main part of the disk the finest adjustments of the distance between the backing and disk k can be accomplished. The tapping is simultaneously performed on the two rods seated in the front side of the disks—that is to say, the disks after receiving a rod on the rear side are turned to bring it to the front side into a position in line with the tap. In order to hold the rod immovable in its seat while the tap is acting upon it, the shoe m is provided. This shoe has a curved face adapted to bear simultaneously against the two rods on the front of the holder and hold them by frictional engagement from rotation. The shoe is carried on the end of a lever m', pivoted at m^2, and with its opposite end against the flattened end g^3 on the vertical shaft g^2. When this shaft oscillates in one direction, it throws the end of the lever outward and the shoe at the other end inward, where it is held during the tapping operation. When the tapping is finished, the shaft g^2 oscillates in the opposite direction, and thus releases the pressure from the rods, permitting them to be moved, with the disks k and k', to another position. It will be seen that there are two of the levers m' and that they are moved in opposite directions simultaneously by the central vertical shaft g^2, so that while the rods are clamped on one side of the machine they are free on the other.

The movements of the disks k and k' are accomplished by devices now to be described. On the outer end of shaft k^2 is another disk, o, having four pins o' projecting from its outer face. These pins are adapted to be struck by an upwardly-thrust bolt o^2, each movement of which rotates the shaft ninety degrees, or from the position shown in Fig. 6 to that shown in Fig. 7. The side of the bolt is cut away to prevent the pin next following the one acted upon from interference with the bolt. This bolt is moved upward by a cam o^3 on the shaft e^2, said cam engaging with the lower end of the bolt, while a spring o^4 re-

turns the bolt after being lifted. In the return movement the bolt has a free lateral movement in the opening in the frame through which it passes to permit it to clear the pins. Having moved the shaft a quarter-turn, it is necessary to lock it in position while the tapping is being done, and for this purpose a second bolt p is provided, which engages with one of four notches o^5 in the periphery of disk o. This bolt is carried at the end of a lever p', pivoted at p^2 and having a stubby curved tailpiece p^3, adapted to be engaged by another cam or crank p^4 on the shaft e^2. This cam releases the bolt from the disk with a quick movement. It then rides against the periphery of the disk until another notch is presented, when spring p^5 throws it into engagement therewith. This arrangement of cams and locking devices occurs on both ends of the machine, the same letters indicating corresponding parts.

The operation of the machine is as follows: Power being applied through one of the belts a^4, gear b' rotates both pinions c and c' in the same direction, which direction we will assume to be proper for tapping with the set of taps to the right on Fig. 1. The power applied at the same time to shaft e^2 causes the cam e' to actuate the plate d and force the pins d^4 against the pinions to feed the taps into the two rods or pins j presented to them by the work-holder. The shafts c^2 and c^3 move to the right and rotate simultaneously, the taps cutting their way into the drilled openings in the ends of the rods. When the full depth has been tapped, the cam projection f^2 acts upon plate h and lever b^2 to reverse the direction of rotation of shafts c^2 and c^3. At the same time cam e commences to move plate d in the opposite direction, and the reciprocating motion of said shafts is also reversed. Simultaneously with or immediately after such reversals the shaft g^2 is oscillated by the cam f', whereupon the lever m' to the right is tilted in one direction to release the tapped rods in the holder on that side of the machine, while the other lever m' is moved in the opposite direction to grip the rods in the holder on the other side of the machine. The reversed rotary and reciprocatory motion of shafts c^2 and c^3 withdraws the taps on one side while simultaneously forcing those on the other side into the two rods held in position to receive them, and they are tapped in the same manner as those on the other end of the machine. As soon as the rods on the right-hand end have been released by the lever m' the bolt p is withdrawn from disk o and bolt o^2 forced to rotate the disk a quarter-turn. This brings the rod which was tapped by the smaller tap into position to be tapped by the larger tap and carries an untapped rod into position to be tapped by the smaller tap, while the rod which was finished by the larger tap is carried clear of the shoe m and allowed to drop from the seat in the holding-disk to the inclined chute (shown in dotted lines in Fig. 8) leading to a suitable receptacle for the finished articles. Thus when the tapping is finished on the left side of the machine the new work is in position to be tapped on the right side, and the reversal of motions again takes place in the same manner as before described. In case the taps stick at any stage of the cutting, as sometimes happens in tapping-machines, the clutch e^9 will open and allow the feeding devices to stop, thus preventing the breaking of the taps. Before the clutch opens, however, the pins d^4 yield slightly to compensate for slight increases of friction, and it is only when extraordinary friction is created that the clutch opens.

It will be seen that the machine is entirely automatic, it being only necessary to keep the chute i i' supplied with the articles to be tapped.

A suitable lubricant, such as oil or soap-suds, will be directed against the taps during the cutting operation by any suitable means.

When pins or rods of different lengths are to be tapped, the size of the chute and the position of the back-stop k^3 are adjusted in the manner hereinbefore described.

Having described my invention, I claim—

1. In a tapping-machine, the combination of two taps, two corresponding movable seats for the work, feed-hoppers adapted to deliver the work to the seats, two clamps coöperating with the respective seats to hold the work therein, means for alternately bringing the seats into coöperative position with the taps and means for alternately operating the clamps, substantially as described.

2. In a tapping-machine, the combination of a plurality of tap-carrying shafts, a work-holder coöperating with all of said shafts, an arm adapted to engage all of the shafts to feed them forward and independently-yielding connections between said arm and each shaft, substantially as described.

3. In a tapping-machine, the combination of two rotary and reciprocatory shafts, taps carried at each end of each shaft, a single wheel engaging and rotating both shafts, two reciprocating arms each adapted to engage both shafts to reciprocate them and two work-holders coöperating with the taps at each end of the two shafts, substantially as described.

4. In a tapping-machine for tapping holes in the ends of short rods or pins, a work-holder consisting of two disks having seats in their peripheries for the rods or pins, a chute arranged to deliver the rods or pins into the seats one by one, means for rotating the disks step by step to bring the rods or pins into position to be tapped, a clamp adapted to hold two pins at once in their respective seats, and two taps adapted to act simultaneously upon the two clamped rods or pins, substantially as described.

5. In a tapping-machine, the combination of a rotary holder for the work, a plurality of seats in the holder for the work, a single clamp

adapted to engage the work in two of the seats at once, two taps acting simultaneously upon the clamped work, a disk on the same axis with the holder and having notches in its periphery, means for rotating the disk step by step and means for locking the disk after each movement, substantially as described.

6. In a tapping-machine, the combination of two holders for the work, two clamps adapted to lock the work in the respective holders, an oscillating shaft simultaneously actuating both clamps, releasing one and locking the other and two taps acting alternately upon the work in the two holders, substantially as described.

In witness whereof I subscribe my signature in presence of two witnesses.

ROLLIN CARROLL LEWIS.

Witnesses:
WILLIAM H. BERTINE,
WILLARD H. ROOSA.