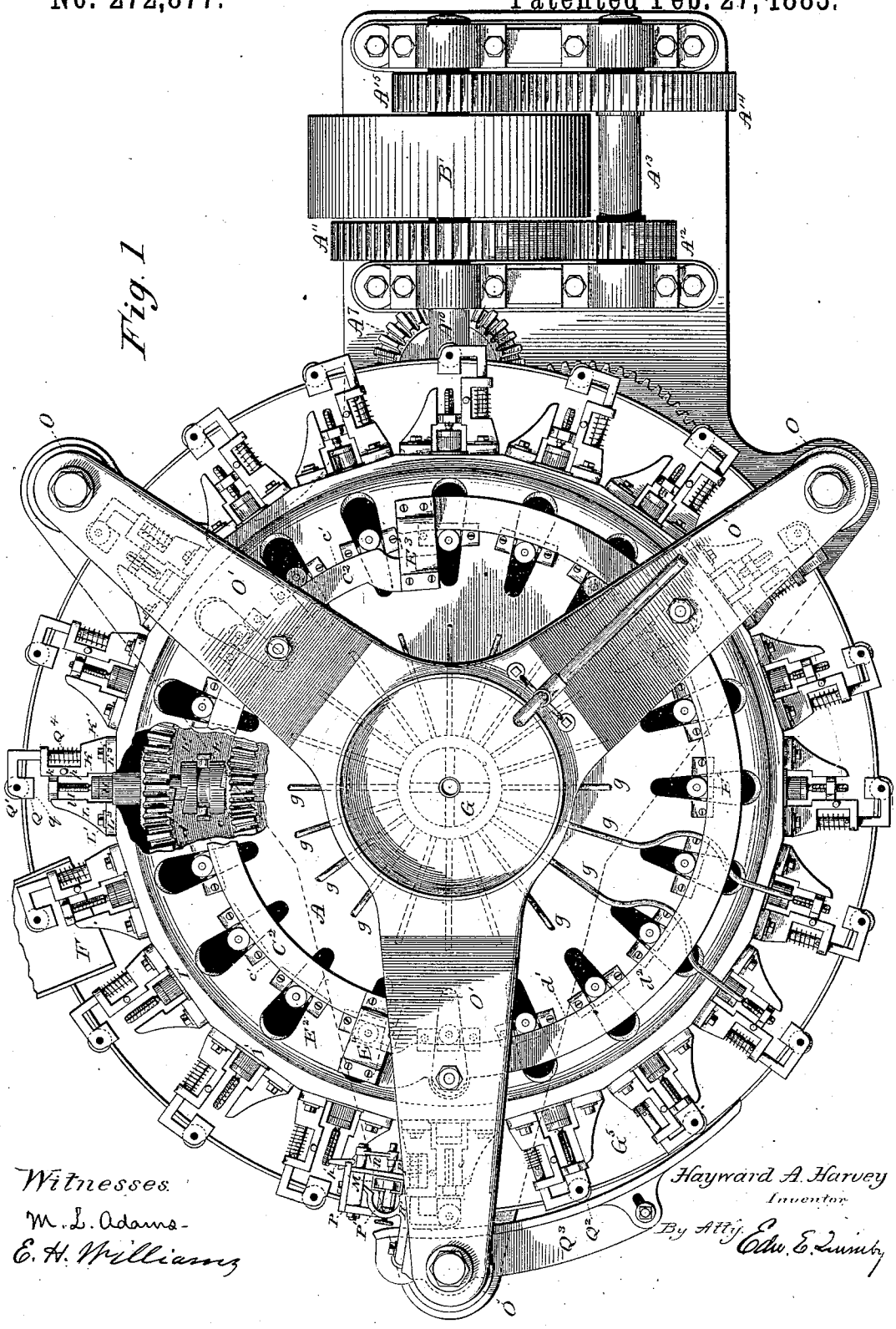
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AUTOMATIC NUT TAPPING MACHINE.

No. 272,877. Patented Feb. 27, 1883.

Fig. 1



Witnesses.
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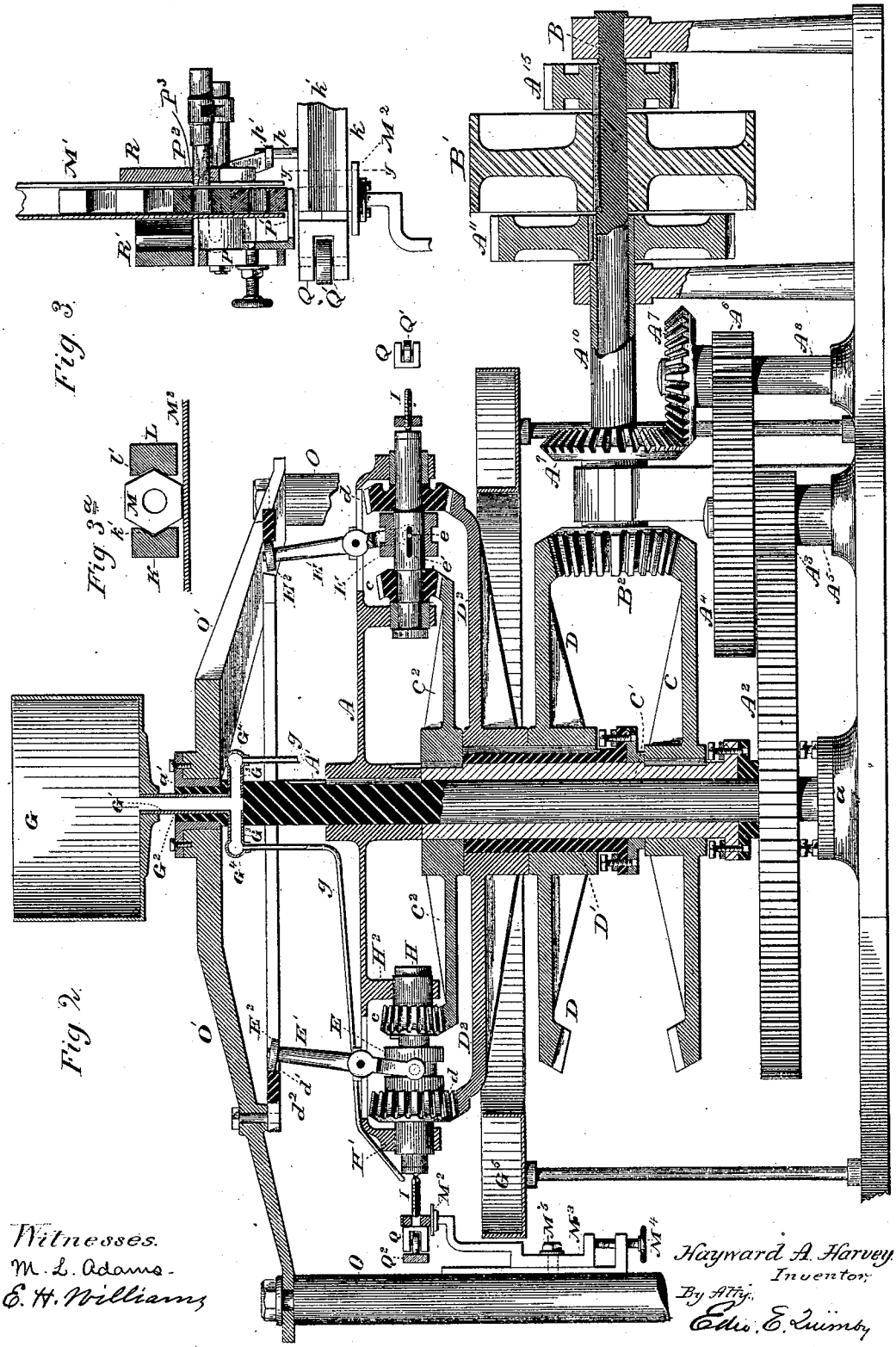
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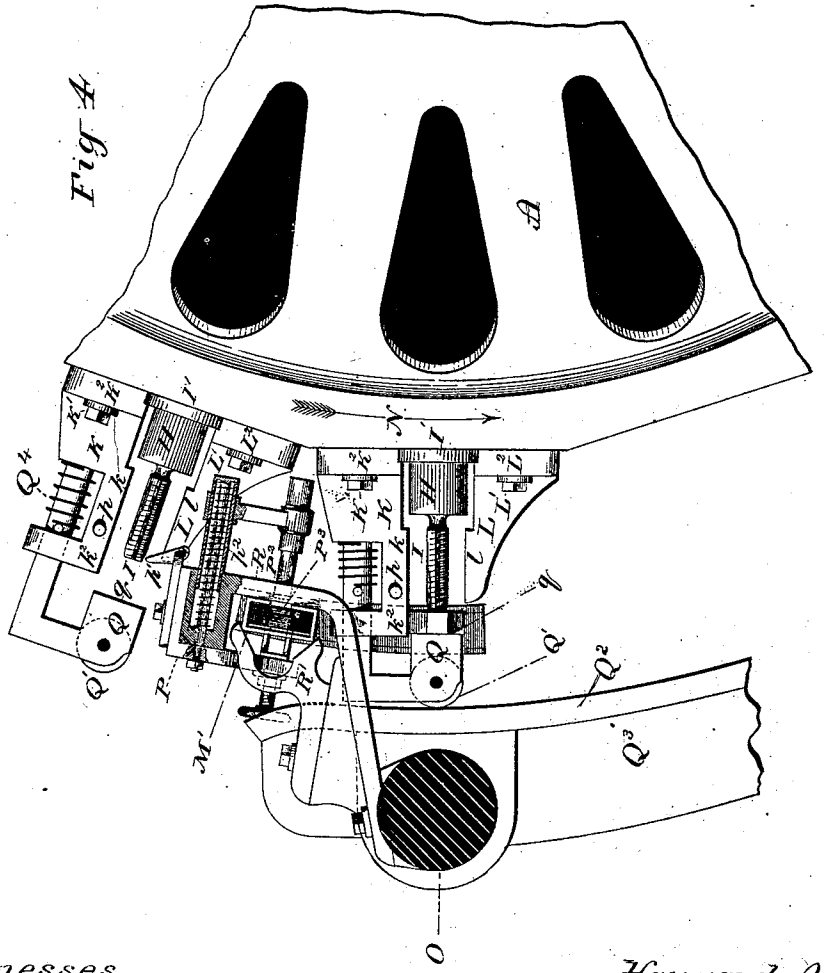
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Fig 4.



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UNITED STATES PATENT OFFICE.

HAYWARD A. HARVEY, OF ORANGE, NEW JERSEY.

AUTOMATIC NUT-TAPPING MACHINE.

SPECIFICATION forming part of Letters Patent No. 272,877, dated February 27, 1883.

Application filed August 11, 1882. (No model.)

To all whom it may concern:

Be it known that I, HAYWARD A. HARVEY, of Orange, New Jersey, have invented a certain Improvement in Automatic Nut-Tapping Machines, of which the following is a specification.

It is the object of my improvement to economically effect the feeding of nut-blanks to tapping mechanism, and to tap the blanks, release them from the taps, and discharge them from the machine wholly by automatic means. To this end I have devised a multiple-nut tapper in which a single feed mechanism adapted to present successively each one of a series of nuts in position to be operated upon is combined with a revolving head containing a number of radially-arranged taps, to which are imparted constant bodily rotation around a common center by the rotation of the head which supports them, and rotation upon their longitudinal axes, first in one direction to enable them to tap nut-blanks supplied to them, and then in the opposite direction to release them from the tapped nuts. To effect the engagement of the nut-blanks by the taps, I provide, in connection with each tap, an arm projecting radially outward from the head which carries the taps, which arm, in the course of its rotation, sweeps out the lowermost one of a column of nut-blanks superposed upon their sides and contained in a vertical tube. The collision of the sweeping-arm with the lowermost nut-blank is effected at the instant when the tap to which the arm belongs is in alignment with the hole in the nut-blank. The nut-blank, having been swept out from under the column, is thereafter pushed toward the tap by a pusher supported upon the sweeping-arm and having the capacity of movement in a path which is radial in relation to the tapping-head. Immediately after the nut has been caught by the sweeping-arm a friction-roller in the outer end of the pusher is brought into contact with a stationary eccentric guide-wall, by which, as the head rotates, the pusher is forced inward, and, being thus brought into collision with the side of the nut-blank, forces the blank upon the end of the revolving tap, which is thereby made to completely engage the nut-blank and cut the screw-thread therein. The nut-blank is prevented from turning under the influence of the revolving tap by the collision of one of its sides with the side of the sweeping-arm and the collision of the opposite one of its sides with the side of a shorter arm bolted to the head, and presenting a bearing parallel with the axis of the tap and with the side of the sweeping-arm. By means of a suitable change-gearing the taps are made to rotate upon their own axes in one direction during one half of their orbital motion and in an opposite direction during the other half of their orbital motion. The feeding mechanism is kept constantly in operation, there being no necessity to delay the feeding until the nut-blank has been tapped and the tap withdrawn from the nut, because as soon as each nut-blank is delivered it is carried outward with the tap which is to operate upon it, and is operated upon and discharged before the tap has fully completed its orbital revolution.

The accompanying drawings, illustrating a nut-tapping machine embodying my improvements, are as follows:

Figure 1 is a top view. Fig. 2 is a central vertical section with some of the parts shown in elevation. Fig. 3 is a vertical section of the feeding mechanism. Fig. 3ª is a cross-section taken through the line *y y* in Fig. 3, showing the table upon which the nut-blank is deposited from the magazine, and the side arms which prevent the blank from turning while it is being acted upon by the tap. Fig. 4 is a top view of the feeding mechanism and contiguous portions of the machine.

The drawings illustrating my invention represent a revolving head, A, mounted upon the upper part of a vertical shaft, A′, to the lower part of which there is affixed the cog-wheel A^2, which is rotated by power transmitted through the train of gearing consisting of the pinions A^3 and A^4, keyed to the vertical counter-shaft A^5 and the pinion A^6, and miter-wheel A^7, keyed to the vertical shaft A^8, the miter-wheel A^7 being driven by the miter-wheel A^9, keyed to one end of the hollow horizontal shaft A^{10}, to the other end of which there is affixed the pinion A^{11}, meshing into the smaller pinion A^{12}, affixed to the counter-shaft A^{13}, which has affixed to it the larger pinion A^{14}, driven by the smaller pinion A^{15}, keyed to the driving-shaft B, provided with the driving-pul-

ley B′. The driving-shaft B extends through the hollow shaft A^{10} and carries upon its inner end the bevel-pinion B^2 for driving in opposite directions respectively the bevel-wheels C and D. The bevel-wheel C is keyed to the lower part of the vertical hollow shaft C′, the upper end of which carries the bevel-wheel C^2. The bevel-wheel D is keyed to the lower part of the hollow vertical shaft D′, the upper end of which carries the bevel-wheel D^2. The vertical shaft A′ is inserted through the hollow shaft C′, and affords the bearing therefor, while the hollow shaft C′ is inserted through the hollow shaft D′, affording the bearing for that. By this organization of gearing it will be seen that the revolving head A and the bevel-wheels C^2 and D^2 have a common axis of rotation, and that the bevel-wheel D^2 is rotated in the same direction as the revolving head A, but at a greater speed, while the bevel-wheel C^2 is rotated in the opposite direction. The revolving head A carries a series of radially-arranged tap-arbors, upon each of which are two loose bevel-wheels, *c* and *d*. Between the two bevel-wheels *c* and *d*, upon a part of the tap-arbor which is of enlarged diameter, is the sliding clutch-sleeve E, provided with the usual key or pin, *e*, extending transversely through the longitudinal slot *e′*, formed in the tap-arbor.

The usual forked lever, E′, is provided for shifting the clutch-sleeve E and holding it in engagement with the bevel-wheels *c* and *d*, alternately, the engagement with the bevel-wheel *d* being for the purpose of rotating the tap in the proper direction to enable it to cut the thread in the nut-blank, and the engagement with the bevel-wheel *c* being for the purpose of rotating the tap in the opposite direction to unscrew the finished nut.

The upper end of the forked lever E′ is provided with the friction-roller E^2. During the cutting operation the friction-roller E^2 rolls along the concave face *d′* of the stationary guide-rail d^2, which has the effect of holding the upper end of the clutch-lever inclined toward the middle of the revolving head A, during that part of the orbital motion of the tap-arbor during which the tap is employed in cutting the thread.

From the concave face *d′* of the stationary guide-rail d^2 the friction-roller E^2 is conducted by the switch E^3 outward, and made to travel upon the convex face *c′* of the stationary rail c^2, which serves to rock the upper end of the clutch-lever E′ radially outward and hold the clutch E in engagement with the bevel-wheel *c*, thereby rotating the tap in the opposite direction and causing the finished nut to unscrew itself. The reverse movement of the tap-arbor continues until the friction-roller E^2 at the upper end of the clutch-lever is brought around the switch E^4, previous to which the finished nut has been fully unscrewed from the tap and has thus been allowed to drop by its own gravity into a chute, F, for conducting it to any convenient receptacle. By the switch E^4 the friction-roller E^2 is reconducted to the concave surface *d′* of the stationary guide-rail d^2, by which means the clutch-sleeve E is again brought into engagement with the bevel-wheel *d*, and the tap is thereby rotated in the proper direction to enable it to repeat the cutting operation upon another nut-blank, the timely presentation of which in proper position to be operated upon is effected by the feed mechanism.

The drawings illustrating my invention exhibit a revolving head containing twenty radially-arranged tap-arbors, all of which have an orbital motion as the head in which they are supported rotates, and rotatory motions alternately in opposite directions upon their longitudinal axes, in obedience to the operation of the organization of gearing which has been described. The tap-arbors are alike in their construction and mode of operation, and the description which has been given of one of them applies to all of them.

The taps are all supplied with lubricating-fluid from the reservoir G, supported upon the upper end of the shaft A′. The lower end of the shaft A′ is provided with a bearing in the step *a*, cast upon the base-plate of the machine, and the upper bearing, *a′*, is formed at the junction of the spider-frame O′, the three legs of which are bolted to the three vertical posts O. A hole, G^2, is tapped longitudinally in the upper portion of the shaft A′ to receive the lower end of the discharge-pipe G′, the upper end of which is inserted in the bottom of the reservoir G. Below the bearing *a′* the shaft A′ is perforated transversely in two directions to receive the hollow couplings G^3, by which the lubricating-fluid supplied from the reservoir G is conveyed from the bottom of the vertical hole G^2 to the branch pipes *g g*, from which it is discharged upon the taps, respectively. By this construction the apparatus for oiling the taps is carried around with the revolving head.

An annular pan, G^5, supported underneath the circle of taps, serves to catch the lubricating-fluid which drips from the taps.

The tap-arbors H are provided with horizontal bearings in the annular vertical flanges H′ H^2, cast upon the revolving head A. The taps I are suitably secured in the outer ends of the arbors H. The mechanism for feeding the nut-blanks to the taps is illustrated upon an enlarged scale in Figs. 3 and 4. On reference to Fig. 4, which represents a portion of the revolving head A and two of the taps I, it will be seen that the periphery of the revolving head A is polygonal, and that the end of each tap-arbor projects outwardly from the center of one of the faces I′ of the head.

On either side of the tap-arbor there are two horizontally-projecting arms, K and L, the opposed faces *k* and *l* of which are parallel with each other and with the axis of the tap. These faces are provided respectively with the lon-

necessary rotatory motions to the taps. Thus, in cases where the machine is to be adapted to cut the threads of thin nuts and comparatively few revolutions of the taps are required for the cutting operation, it will be found convenient to provide the tap-arbors with a fixed pinion, and to arrange two stationary half-segments of circular racks, the one having a concave face to engage one side of the fixed pinion on the arbor during one portion of the rotation of the revolving head, and the other having a convex face to engage the other side of the arbor-pinion during another portion of the rotation of the revolving head. In such case the arbors may be made to rotate upon axes parallel to the axis of rotation of the revolving head in which they are supported.

By mounting the head upon a horizontal shaft the feeding operation may be performed substantially in the manner which has been described, the further modification required being the substitution of a concave supporting-table in place of the flat table M^2 shown in the drawings.

I claim as my invention—

1. In a nut-tapping machine, a series of tap-arbors adapted to be rotated upon their longitudinal axes by suitable gearing, and mounted in a revolving head, and a like series of arms, K, each provided with a pusher, Q, in combination with a table, M^2, for supporting a nut-blank in the path of movement of a portion of the arm K, and with the stationary guide Q^3, as and for the purposes set forth.

2. The tube M′ for containing a column of superposed nut-blanks, and the table M^2 for supporting the lowermost nut-blank of such column, in combination with a series of tap-arbors and a like series of arms, K, mounted upon the revolving head of a nut-tapping machine, substantially such as described.

3. The adjustable table M^2 and the adjustable arms K and L, in combination with the revolving taps I, mounted upon the revolving head A.

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Witnesses:
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gitudinal shallow V-grooves l' and k' for preventing the rotation of a hexagonal nut-blank, M, while it is being tapped, by catching two of its opposite corners, as shown in Fig. 3ª.

The bolts K′ and L′, by which the arms K and L are respectively secured to the face of the revolving head A, are inserted through slotted holes formed in the bases K^2 and L^2, so that the latter may be adjusted toward and from the tap for the purpose of adapting the mechanism for tapping nut-blanks of different sizes.

The direction of rotation of the revolving head is indicated by the curved arrow N on Fig. 4.

It will be seen that the forward arm, L, does not project from the head quite as far as the tap I, but that the arm K projects considerably beyond the tap.

The nut-blanks resting sidewise one upon another are contained in a vertical tube, M′. The lowermost blank rests upon an adjustable horizontal table, M^2, the object of which is to hold the lowermost blank at such an elevation that the hole in it will be in the same horizontal plane as the taps.

The table M^2 is made vertically adjustable by being mounted upon the vertical slide-piece M^3, provided with the adjusting-screw M^4 and the clamping-bolt M^5. The vertical slide M^3 is supported on one of the vertical posts O, to the upper ends of which the top frame, O′, of the machine is bolted. As the head revolves the arm L and the tap I sweep by without touching the lowermost nut-blank of the column of blanks contained in the tube M′; but the projecting part k^2 of the arm K strikes against the side of the blank and sweeps it out from under the column.

For abundant caution, in order to relieve the lowermost nut-blank when resting upon the table M^2 from the weight of the column of blanks above it, I have provided a device for holding up the superposed blanks, while the lowest one is being dropped upon the table M^2 and being moved away by the arm K. This device consists of a horizontally-reciprocating slide-frame, P, carrying the vertically-adjustable lower stop, P′, which traverses the space immediately beneath the lower end of the tube M′. This plate occupies the position in which it is represented in Fig. 3, when a nut-blank is resting upon the table M^2, and while such blank is being carried along the table M^2 by the projecting part k^2 of the arm K. After the arm K of one tap has moved entirely across the space beneath the tube a vertical pin, p, on the next following arm K is brought into collision with the inclined face of the wedge p', affixed to the slide-carriage P, the resultant effect of which is that the slide-carriage P is pushed horizontally outward, thus removing the lower stop, P′, from the lower end of the tube M′, and permitting the lowest blank of the column of blanks contained in the tube M′ to drop upon the table M^2 in time to be caught by the arm K of the next following tap. Prior to the removal of the lower stop, P′, the column of nut-blanks rests upon the lower stop. Concurrently with such removal the pin P^2, attached to and carried by the slide P, is moved horizontally outward from the head A through an opening, P^3, in the side of the tube M′, into the hole of the nut-blank which is next to the lowest blank. When therefore the lower stop, P′, has been so far removed that the lowest blank can drop upon the table M^2, the remaining blanks in the tube are held up by the pin P^2. When the vertical pin p has, by the motion of the head A, been carried by the wedge p', the slide P is returned to its normal position by the expanding spiral-spring p^2. The lower stop, P′, is thus carried under the lower end of the tube M′ in time to catch the lowest blank, when the column is permitted to descend by the complete withdrawal of the pin P^2.

The engagement of the nut-blank by the tap is effected by the pusher Q, provided with the friction-roller Q′, which at the proper time is brought into collision with and moved along the eccentrically-curved face Q^2 of the stationary guide Q^3, which is suitably supported upon the adjacent post O of the machine. As will be seen on examination of Fig. 4, the face q of the pusher is thus brought into collision with the side of the nut-blank, and as the pusher-roller Q′ travels along the curved face Q^2 of the eccentric guide the blank is forced against the end of the tap I, with a pressure which is continued until the tap has engaged and commenced to cut the thread in the blank. After passing the eccentric guide the pusher is carried back to its normal position by the expanding spiral spring Q^4. As the operation of cutting the thread progresses, the nut-blank moves radially inward toward the head A, and, as before stated, is prevented from turning upon the tap by the collision of two of its corners or sides against the opposite side of the arms K and L.

The gearing is calculated with reference to giving each tap a sufficient number of revolutions, first, in one direction to cut the thread in the nut, and, secondly, in the opposite direction to cause the nut to release itself from the tap before the tap has completed one of its orbital revolutions.

In order to further adapt the machine for operating upon nut-blanks of different sizes, the tube M′ is made movable, and is sustained in position by being clamped against the side of the stationary arm R by the adjustable flaring jaws R′, which bear respectively upon the opposite edges of the outer side of the tube.

By loosening the jaws R′ the tube M′ may be removed and a larger or smaller tube substituted in its place can be clamped in like manner by tightening the jaws R′ upon it.

It will of course be understood that various methods may be employed for imparting the