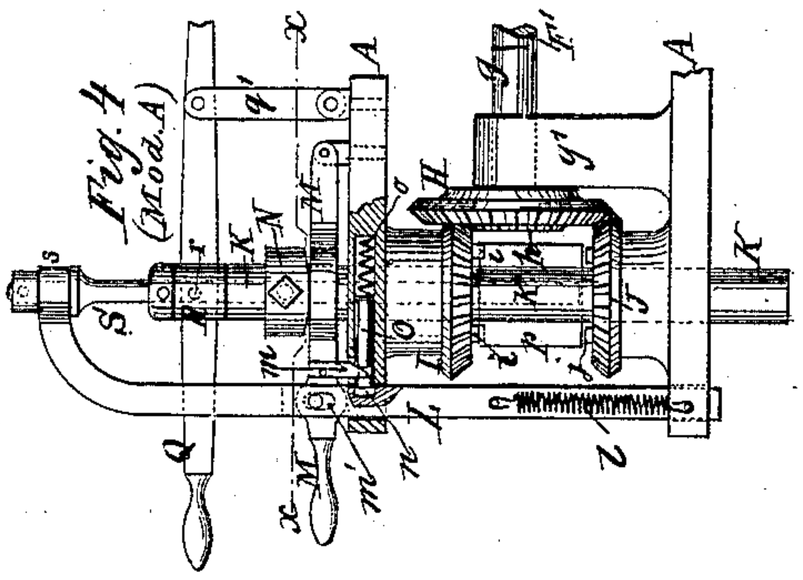
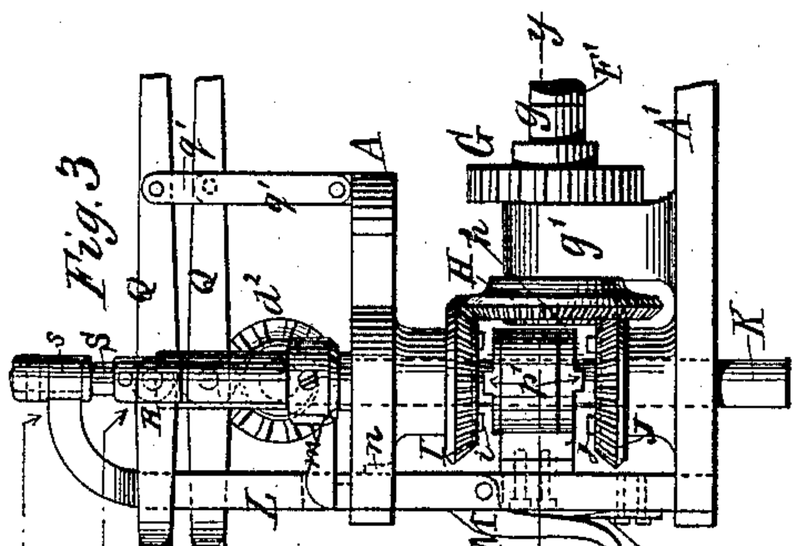
(No Model.) 2 Sheets—Sheet 1.

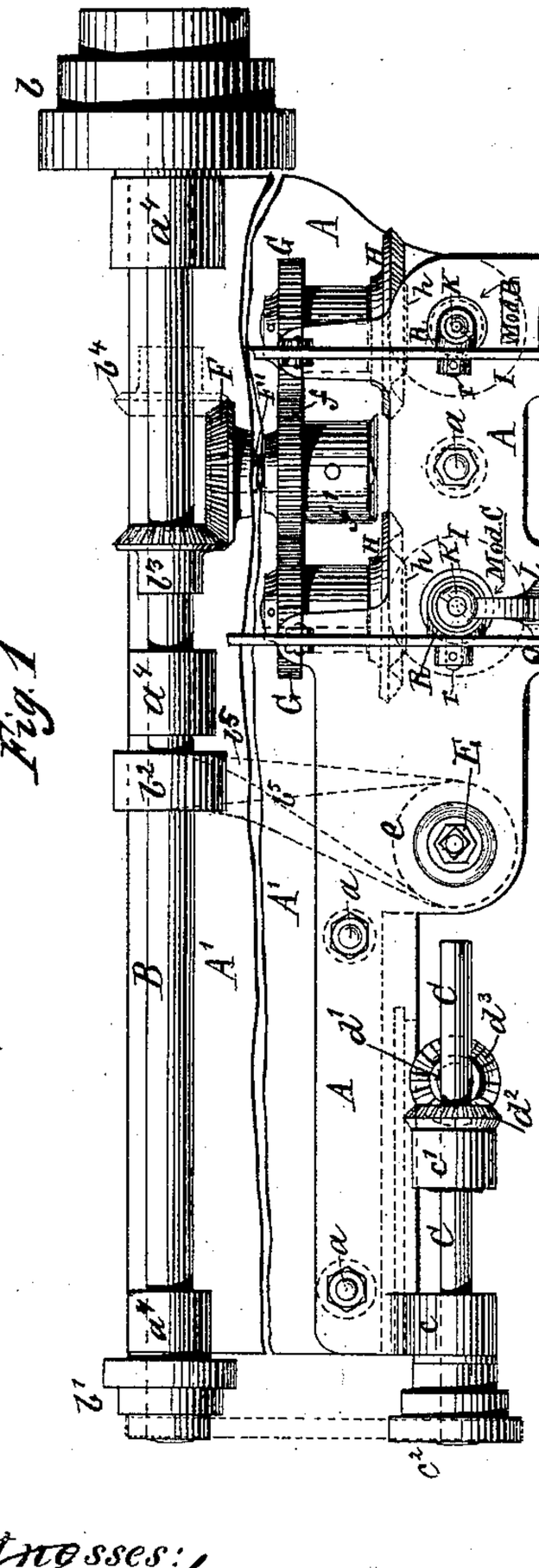
E. N. ANDREWS.

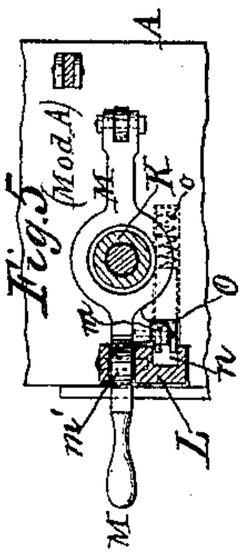
THREAD CUTTING AND DRILLING MACHINE.

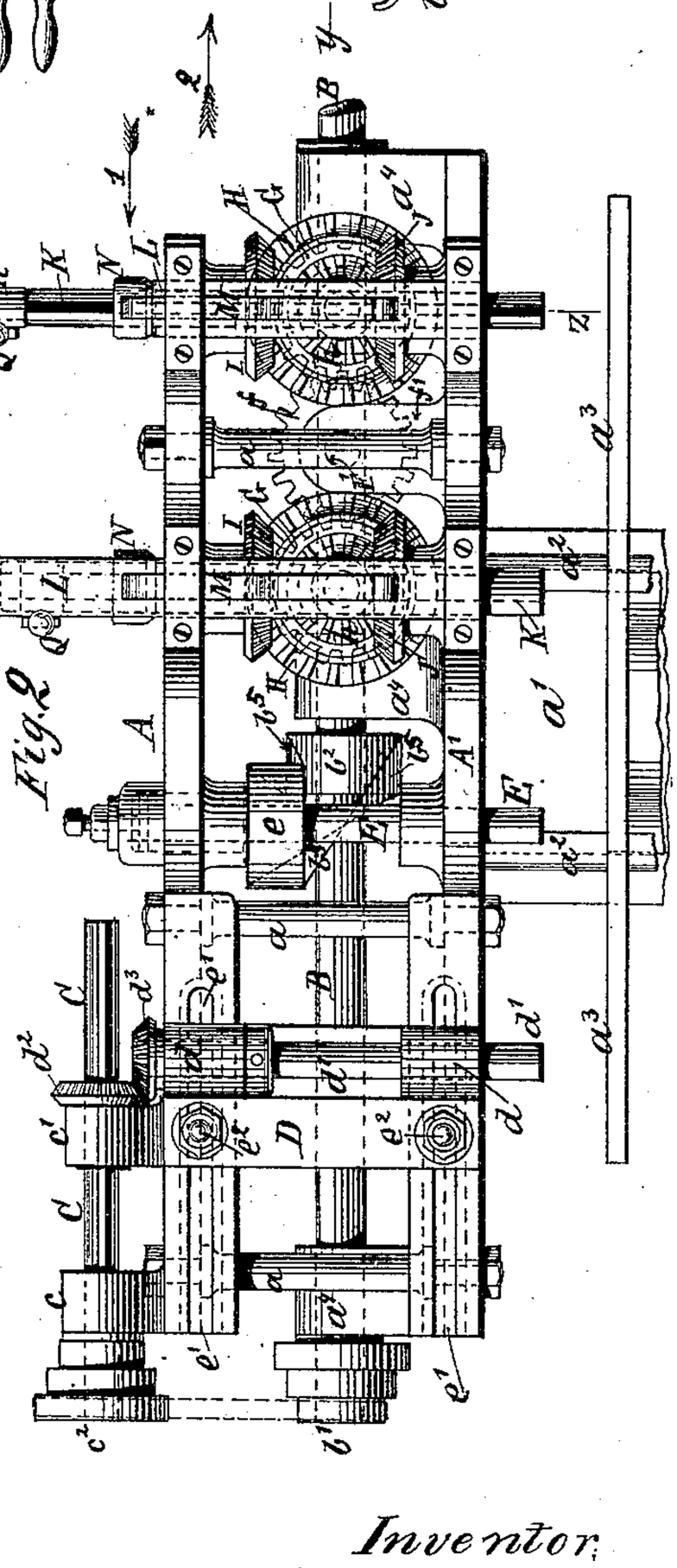
No. 427,948. Patented May 13, 1890.











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(No Model.) 2 Sheets—Sheet 2.

E. N. ANDREWS.

THREAD CUTTING AND DRILLING MACHINE.

No. 427,948. Patented May 13, 1890.

Fig. 6 (Mod. B)

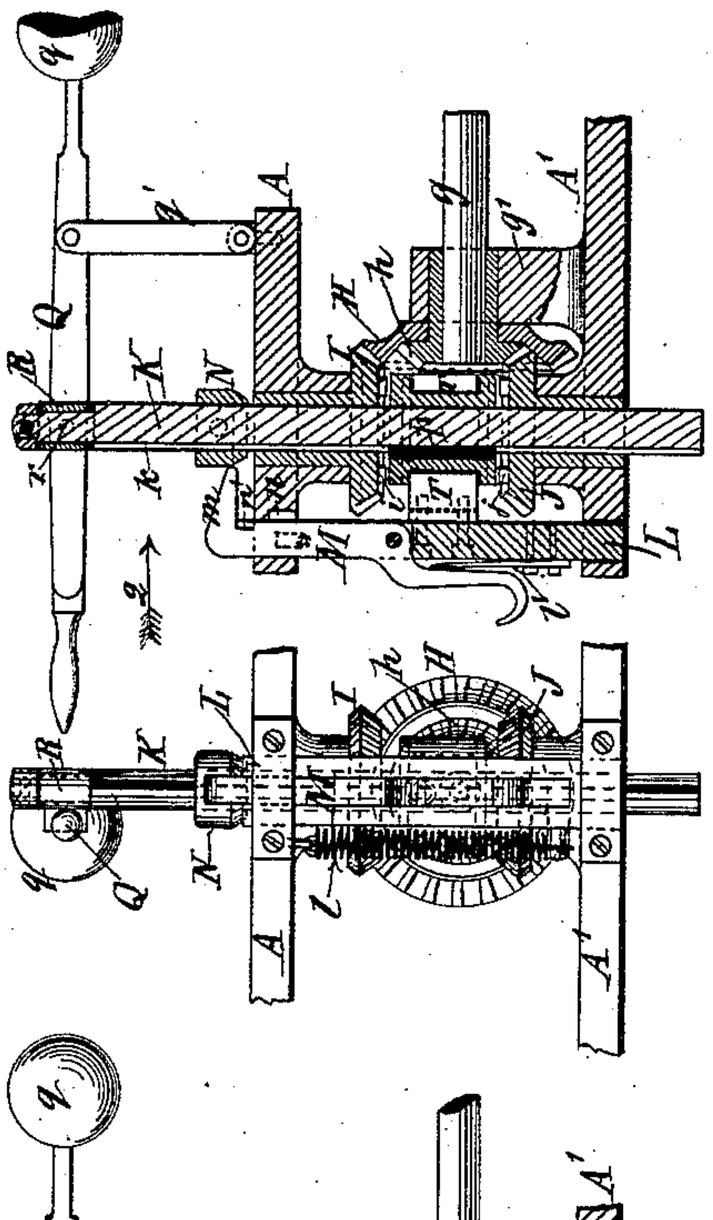


Fig. 8

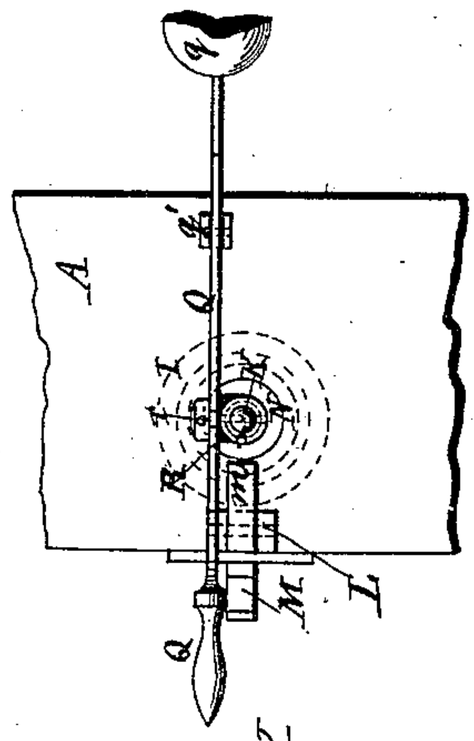


Fig. 7 (Mod. B)

Fig. 9

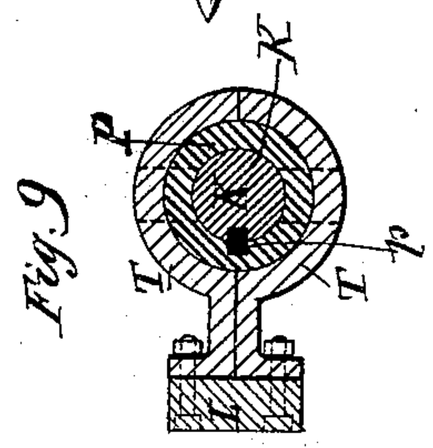


Fig. 12 (Mod. D)

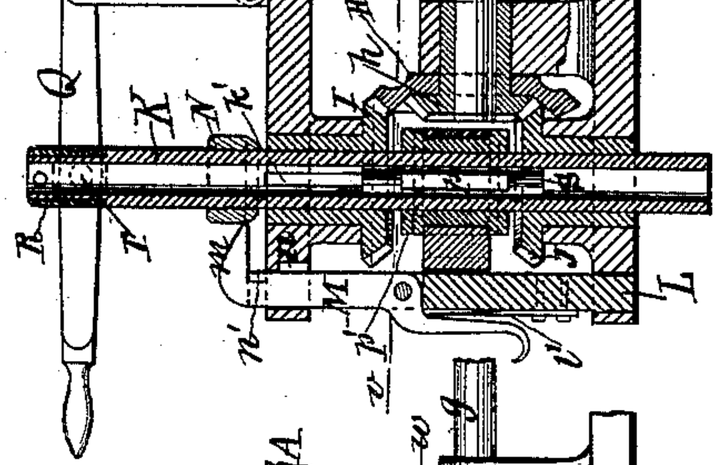


Fig. 10 (Mod. C)

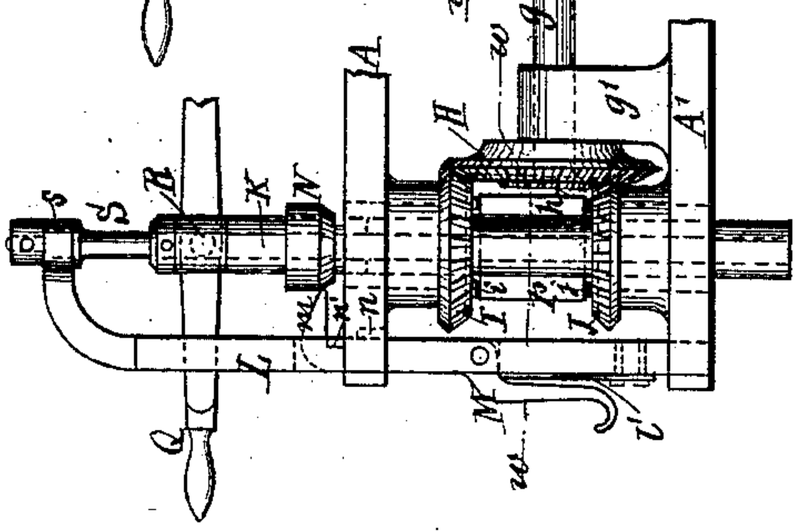


Fig. 13.

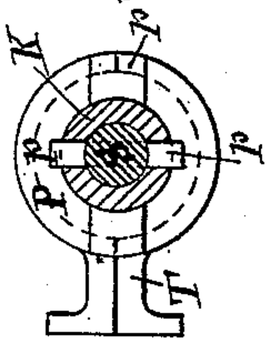
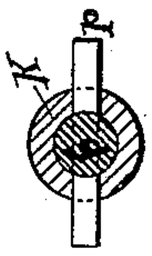


Fig. 11



Witnesses:
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F. M. Sprouman

Inventor
Edward N. Andrews
by A. W. Almqvist
Attorney

UNITED STATES PATENT OFFICE.

EDWARD N. ANDREWS, OF NEW YORK, N. Y.

THREAD-CUTTING AND DRILLING MACHINE.

SPECIFICATION forming part of Letters Patent No. 427,948, dated May 13, 1890.

Application filed October 3, 1887. Serial No. 251,344. (No model.)

To all whom it may concern:

Be it known that I, EDWARD N. ANDREWS, a citizen of the United States, and a resident of New York, in the county and State of New York, have invented new and useful Improvements in Thread-Cutting and Drilling Machines, of which the following is a specification.

My invention relates to machines for drilling and tapping holes and cutting screw-threads, and has for its object to obviate disadvantages of similar machines as heretofore made and to effect all the advantages obtained by the screw-threading machine patented to me April 28, 1885, No. 316,720, without entailing the expense necessary for that construction.

The invention will be hereinafter described with reference to the accompanying two sheets of drawings, in which—

Figure 1 represents a plan view of my improved thread-cutting and drilling machine, the frame being broken out to reduce the width for gaining space on the drawing. Fig. 2 is a front elevation of the same. Fig. 3 is an end elevation of the same seen in the direction indicated by arrow 1 of Fig. 2. Fig. 4 is an end elevation, partly broken out, of the most preferred modification (marked "Mod. A") of the thread-cutting machine. Fig. 5 is a detail horizontal section of the same, taken on the line $x\ x$ of Fig. 4. Fig. 6 is a vertical section on the line $z\ z$ of Fig. 2 of one modification (marked "Mod. B") of the thread-cutting machine. Fig. 7 is a front elevation of the same, or as seen in direction of arrow 2 of Figs. 3 and 6. Fig. 8 is a plan view of Fig. 6. Fig. 9 is a detail section of the clutching device, taken on the line $y\ y$ of Fig. 3. Fig. 10 is an end elevation of another modification (marked "Mod. C") of the thread-cutting machine. Fig. 11 is a detail section of the same, taken on the line $w\ w$ of Fig. 10, showing a modification of the clutching device. Fig. 12 is a vertical section, seen as in Fig. 6, of another modification (marked "Mod. D") of the thread-cutting machine. Fig. 13 is a detail section of the same on the line $v\ v$ of Fig. 12, showing another modification of the clutching device.

Like letters of reference indicate corresponding parts in the several figures.

The machine-frame consists of an upper and a lower cast-iron plate A A′, respectively, secured together at suitable intervals by posts a. This frame is supported on a column a', having ways a^2, in which is guided a sliding table a^3, on which the work to be operated upon is placed. This table should be nearly counterbalanced so as to remain normally in its lowest position until raised, as required, to feed the work against the drills in the usual manner when the drill-spindles are operated in the usual manner when drilling holes.

On the lower frame-plate A′ are bearings a^4 for the horizontal main shaft B, which is driven by belt on cone-pulleys b and transmits motion by cone-pulleys b' and belt to cone-pulleys c^2, keyed on a splined counter-shaft C. This revolves in a bearing c, stationary upon the frame-plate A, and another bearing c', which is mounted on a plate D, adjustable horizontally and securable in position by bolts e^2 in horizontal grooves e' in the frame-plates A A′, said grooves having undercut edges adapted to fit and receive the correspondingly-shaped heads of the bolts e^2. (See Fig. 2.)

The plate D carries vertical bearings d for the drill-spindle d', whose upper end is geared to the counter-shaft C by miter-gears d^3 d^2, the former being fixed upon the spindle and the latter splined to slide on the shaft C, which its hub surrounds while revolving in the bearing c'.

E is a non-adjustable drill-spindle mounted in stationary bearings in the frame and is provided with a pulley e, by which and a quarter-turned belt b^5 it receives motion directly from a pulley b^2 on the main shaft B. When several holes are to be bored at equal distances apart, it is only necessary to adjust the distance of the spindle d' relatively to the spindle E, and by making the shaft C long enough it may be used to run several adjustable spindles, such as d', to simultaneously bore holes at different distances apart.

K are the thread-cutting or tapping spindles, two of which are run from each bevel-wheel, such as b^3, Fig. 1, on the main shaft B. The motion may be changed from right to left, or vice versa, by shifting the wheel b^3 to the position b^4, (shown in dotted lines in

Fig. 1,) or vice versa. The wheel b^3 gears with a bevel-wheel F upon a shaft F′, revolving in a bearing f' upon the lower frame-plate A′. Upon the shaft F′ is also secured a spur-wheel f, which meshes at opposite sides with two similar wheels G upon shafts g in bearings g'. Each shaft g carries two bevel-wheels H h of different sizes, (for slow motion in tapping and fast motion in unscrewing the tap, as in my patent above referred to,) which mesh with and revolve in opposite directions two bevel-wheels I J, which are provided with clutch-jogs i j and revolve in vertical bearings in the frame-plates A A′ and are loose upon the threading-spindle K. The spindle K is free to slide vertically to any depth regulated by an adjustable collar N upon the spindle, which collar when the proper depth has been reached disengages a stop and releases a set-spring, which shifts the clutch and reverses the motion, thus unscrewing the tap. A hand-lever Q, pivoted at r to a sleeve R, swiveled upon the spindle K, and which lever is fulcrumed by a pivotal link q' to the upper frame-plate A, and is used to depress the spindle to enter and start the tap in the hole to be threaded, and the weight of the spindle is counterbalanced by a weight q upon the off end of the hand-lever Q. The spindle K is either solid and provided with a spline k, Figs. 9 and 6, by which it slides on a key p, secured to a clutch-sleeve P, surrounding the spindle, or the spindle is tubular and provided with long slots k' through diametrically-opposite sides, as in Figs. 10, 11, 12, and 13, the key p passing through the said slots and into opposite sides of the clutch-sleeve P, while being rigidly secured in a diametrical slot in a rod S within the hollow spindle, as in Figs. 12, 4, and 10. The clutch is carried by a reversing-bar L, which is sliding in the frame parallel with the spindle, the connection being made either by a bearing in two halves surrounding the sleeve P and bolted to the bar L, as in Figs. 6 and 12, or by making the short inner rod S, Fig. 12, long enough to project above the hollow spindle and swiveling its upper end to an overhanging upward prolongation of the bar L, as in Figs. 4 and 10. A lever M, provided with a dog m to engage the collar N and with a catch n' to engage a keeper n in the frame-plate A, is pivoted in a slot in the bar L and kept by a spring l' upon the bar normally pressed toward the keeper n, (see modifications B C D,) and a spiral spring l, Fig. 7, attached with its lower end to a pin upon the bar L and with its upper end to the frame-plate A, raises the bar L (when the collar N has descended with the spindle far enough to push aside the dog m, and thereby disengage the lever M from the keeper n) and shifts the clutch attached to the bar from the lower wheel J to the upper wheel I, thus reversing the motion and withdrawing the tap from the threaded hole. It will be noticed that in the just-described reversing device the clutch is raised solely by the force of the spring l. This works well for small taps—say not over one-half inch; but for larger taps the friction between the key p and the spindle is so great as to make the spring l wholly inoperative. For all larger sizes, therefore, I use the preferred modification A, (shown in Figs. 4 and 5,) in which on the downward movement the spindle is run from the upper wheel I and the clutch in reversing is drawn out of contact with the jogs i on said wheel by the power which runs the spindle and by the whole strength of the threads on the tap, and, on being thus released and all friction removed from the key p, is thrown by the spring l down into position to be engaged by the jogs j on the lower wheel J. For this purpose the lever M (see Figs. 4 and 5) is fulcrumed to the frame-plate A and has a perforated enlargement by which it loosely surrounds the spindle K and works with its handle end in a slot in the bar L, (or a slot in the lever M works on a pin in bar L,) so as to allow of a play at m' between them sufficient to raise the beveled end of the dog m (attached to the lever M) from the correspondingly-beveled end of a bolt or catch O, which latter slides in a socket in the frame-plate A and is held by a spiral spring o normally outward to engage the keeper n, this being in the bar L instead of in the frame, as before shown. The spring l is attached to the lower frame-plate A′ instead of to the upper. The end of the bolt O is slotted to receive the dog m, as shown in Fig. 5. The bar L being locked upon the bolt O, the lever M raised to only bring the dog m out of contact with the bolt, and the collar N set to give the proper depth, and the tap being entered into the hole to be threaded, the collar N will at the proper moment depress the lever M and cause the dog m to disengage the bolt O from the bar L, thus setting the spring l free to pull down the bar L, rod S, and clutch-key p, attached to the latter rod, into contact with the lower jogs j just as soon as the downward-moving threading-tap has drawn the clutch away from the upper jogs i; but for this modification it is not important to include the setting-catch and tripping-dog for bar L, nor the collar on the spindle in all cases, because when the bar L is raised by lever M and temporarily held by hand until the tap is entered in the work the friction of the clutch on the jogs of the upper wheel instantly occurs, (the spindle being in motion,) and, overpowering the spring l, serves as well to hold the shifting-bar L in check as the setting devices do. Still it is preferred to use them in this modification to hold the clutch out of the lower wheel at times when the work is of such a nature that care and time are required in adjusting the work to the tap and it becomes necessary for the attendant to release his hold of lever M meanwhile. Neither is it important to employ the collar on the tapping-spindle when the catch and the tripping-dog on the lever M are employed, because at any time after

entering the tap in the work and before the spindle takes effect on the clutch the attendant may at his leisure and while waiting the rise of tap trip the bar by the lever M.

In Figs. 3 and 13 a jog p' upon the clutch-sleeve engages the jogs on the wheels I J; but in the modifications shown in Figs. 4, 10, and 11 the clutch-sleeve is not needed, the key p engaging the jogs $i\,j$ directly.

I claim—

1. Two spindles geared with the driving-shaft through shafts $g\,g$, spur-wheel train f G G, and shaft F′, and the single pair of bevel-wheels b^3 F, substantially as described.

2. The combination, with the longitudinally-movable tapping-spindle having oppositely-driven wheels and an intermediate clutch mounted thereon, of a shifting-bar connected to the clutch and normally operated to engage the same with one of the wheels, a shifting-bar catch by which the clutch is retained in engagement with the other wheel, a collar secured to the tapping-spindle, and a catch-tripping device arranged in the path of longitudinal movement of the collar, substantially as described.

3. The combination, with the longitudinally-movable tapping-spindle having oppositely-driven wheels and an intermediate clutch mounted thereon and connecting with the upper wheel for advancing the tap in the work and for disconnecting the clutch by the advance of the tap in the work, of the clutch-shifting bar and spring normally tending and when relieved of the friction of the clutch operative to engage said clutch with the lower wheel to reverse the tap, substantially as described..

4. The combination, with the longitudinally-movable tapping-spindle having oppositely-driven wheels and an intermediate clutch mounted thereon, of a clutch-shifting bar, a spring connected thereto tending to press the clutch in engagement with one of the wheels, a shifting-bar catch by which the clutch may be retained in engagement with the other wheel, a collar on the tapping-spindle, and a catch-tripping device arranged in the path of longitudinal movement of said collar, substantially as described.

5. The combination, with the longitudinally-movable tapping-spindle having oppositely-driven wheels and an intermediate clutch mounted thereon and connecting with the upper wheel for advancing the tap in the work and for disconnecting the clutch by the advance of the tap in the work, of the clutch-shifting bar and spring, setting-catch, and tripping lever and dog, said spring normally tending and when relieved of the friction of the clutch operative to engage said clutch with the lower wheel to reverse the tap, substantially as described.

6. The combination, with the longitudinally-movable tapping-spindle having oppositely-driven wheels and an intermediate clutch mounted thereon and connecting with the upper wheel for advancing the tap in the work and for disconnecting the clutch by the advance of the tap in the work, of the clutch-shifting bar and spring, setting-catch, tripping lever and dog, and the collar on the tapping-spindle, said spring normally tending and when relieved of the friction of the clutch operative to engage said clutch with the lower wheel to reverse the tap, substantially as described.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 29th day of September, 1887.

EDWARD N. ANDREWS.

Witnesses:
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R. ALTHAUS.