No. 832,221. PATENTED OCT. 2, 1906.

H. A. TUTTLE.

TAPPING MACHINE.

APPLICATION FILED APR. 5, 1905.

Fig. 1.

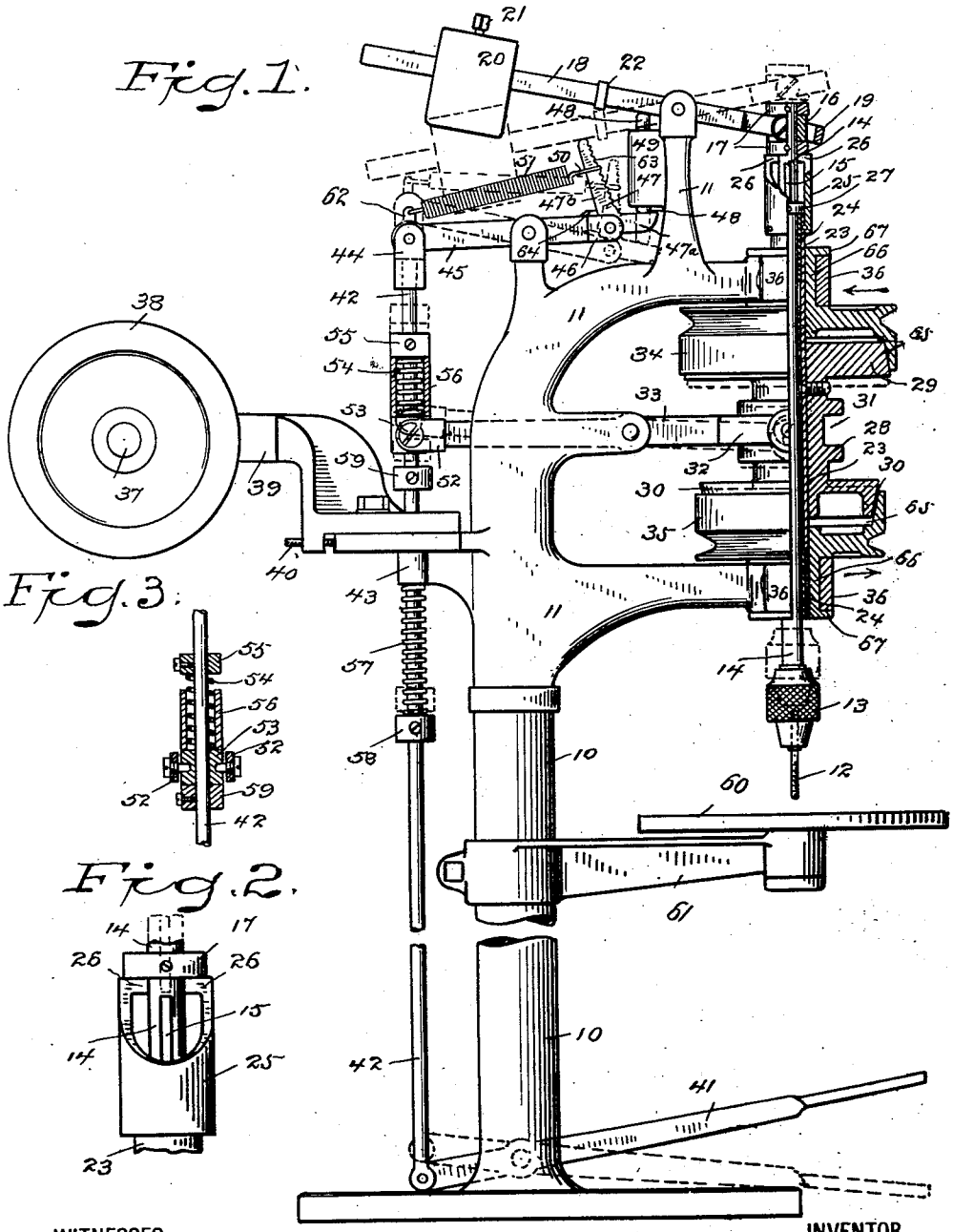


Fig. 3.

Fig. 2.

WITNESSES:

H. A. Lamb

S. W. Atherton

INVENTOR

Henry A. Tuttle

BY

A. Wilbooster

ATTORNEY

UNITED STATES PATENT OFFICE.

HENRY A. TUTTLE, OF SOUTH NORWALK, CONNECTICUT, ASSIGNOR TO H. A. TUTTLE MANUFACTURING COMPANY, OF SOUTH NORWALK, CONNECTICUT, A CORPORATION OF DELAWARE.

TAPPING-MACHINE.

No. 832,221. Specification of Letters Patent. Patented Oct. 2, 1906.

Application filed April 5, 1905. Serial No. 254,029.

To all whom it may concern:

Be it known that I, HENRY A. TUTTLE, a citizen of the United States, residing at South Norwalk, county of Fairfield, State of Connecticut, have invented a new and useful Tapping-Machine, of which the following is a specification.

This invention relates to certain improvements in tapping-machines.

It is one of the objects of the invention to produce a tapping-machine in which the tap shall be normally down and shall be raised for the insertion of work by pressure upon a foot or hand lever.

A further object of the invention is to produce a tapping-machine in which the feed of the tap shall be produced by spring instead of by positive pressure applied by foot or hand power.

A further object of the invention is to produce a tapping-machine having means for regulating the spring-pressure exerted upon the tap while in use.

With these and other objects in view the invention consists in certain constructions and in certain parts, improvements, and combinations, which will be hereinafter described and then specifically pointed out in the claims hereunto appended.

In the accompanying drawings, forming a part of this specification, and in which the several parts are indicated by reference characters, Figure 1 is an elevation, partly in vertical section, illustrating the construction and operation of my novel machine, the normal or inoperative position of the parts being indicated in full lines and the position of the parts when the tap is starting to thread a hole being indicated by dotted lines; Fig. 2, an enlarged detail view illustrating the connection of the sleeve with the spindle; and Fig. 3 is a detail sectional view of the yoke and block at the outer end of the clutch-lever, showing the operating-rod at the raised position.

The machine illustrated in the drawings is a large-sized machine adapted to stand on the floor and is operated by a foot-lever. Bench tapping-machines made in accordance with my present invention differ only in that they are made to stand upon a bench and may be operated either by a hand-lever or a foot-lever.

10 denotes the standard, and 11 a frame supported thereby, which may be of any ordinary or preferred style or design.

12 denotes the tap, which is carried by a chuck 13 at the lower end of a sipndle 14. Near the upper end of the spindle is a key 15, which extends outward from both sides of the spindle, one end only of the key being shown in the drawings.

16 denotes a block in which the spindle rotates and has slight lateral movement and which lies between two collars 17, which are rigidly secured to the spindle.

18 denotes the controlling-lever, which is fulcrumed upon the frame and is provided at its inner end with a yoke 19, which incloses block 16 and to which said block is pivoted, so that the spindle and tap may be raised and lowered by oscillation of the controlling-lever while the spindle is rotating.

20 denotes a weight which is adapted to slide on the outer end of the lever and is locked at any desired adjustment by a set-screw 21.

22 denotes a collar which may be cast on or rigidly secured to the lever and limits the possible inward movement of the weight.

23 denotes a driving-sleeve in which the spindle is free, bushings 24 being preferably provided at the upper and lower ends of the sleeve to serve as bearings for the spindle.

25 denotes a barrel which is rigidly secured to the upper end of the sleeve, within which the key may rotate freely and which is provided at its upper end with inwardly-extending lugs 26, the opposite sides of which are adapted to engage the key as it may be required to drive or reverse the spindle, as will be more fully explained.

Just below the key is a stop-collar 27, rigidly secured to the spindle, which is adapted to engage the upper end of the sleeve to limit the downward movement of the spindle and tap and to engage lugs 26 on the barrel to limit the upward movement of said parts. It should be understood that in the full-line position in the drawings the tap is at what I have termed its "normal" or "inoperative" position, the spindle and tap being stationary, as after the completion of the threading of a hole or before the tap has been raised to place a piece of work in position to be operated upon.

28 denotes a clutch-sleeve which is rigidly secured to the driving-sleeve and carries an upper friction-cone 29 and a lower friction-cone 30. This clutch-sleeve is provided with a groove 31, which is engaged by rollers (see dotted lines, Fig. 1) carried by a yoke 32 at the inner end of a clutch-lever 33, which is fulcrumed on the frame.

34 and 35 denote, respectively, upper and lower clutch-pulleys which are provided with hubs 66, through which the driving-sleeve passes freely and which are journaled in upper and lower boxes 36 on the frame. The outer ends of these hubs are provided with flanges 67, which engage the outer faces of the respective upper and lower boxes. The upper and lower clutch-pulleys are provided in their inner faces with tapering recesses 65, which are adapted to be engaged, respectively, by the upper and lower friction-cones 29 and 30.

The driving-sleeve, clutch-sleeve, and friction-cones have a longitudinal movement of an eighth of an inch, more or less. The clutch pulleys are driven in opposite directions, as indicated by arrows, in any suitable manner, as by means of an endless belt (not shown) passing over said pulleys and over pulleys (not shown) on a shaft 37, which also carries a belt-pulley 38, over which a driving-belt (not shown) passes from a main or counter shaft. Shaft 37 is journaled on a bracket 39, which is secured to the frame and is adjustable thereon by means of a set-screw 40 as a means of tightening the clutch-pulley belt.

41 denotes an operating-lever, in the present instance a foot-lever, which is fulcrumed in the standard, and 42 an operating-rod one end of which is pivoted to the lever which extends through a guide 43 on the frame and the upper end of which is provided with a yoke 44, in which the outer end of a pressure-lever 45 is pivoted. This pressure-lever is fulcrumed on the frame and is provided at its inner end with a yoke 46, in which a bell-crank lever 47 is pivoted.

48 denotes a plunger which slides vertically in a guide 49 on the frame. The upper end of this plunger engages the under side of controlling-lever 18, and its lower end engages the lower arm of the bell-crank lever, which is specifically indicated by 47^a. The upper arm of the bell-crank lever, which is specifically indicated by 47^b, is provided on its inner face with notches 63, either of which is adapted to be engaged by a loop 50 at the inner end of a spring 51, which I term the "intermediate" spring, the outer end of which is connected to a lug 62 at the outer end of the pressure-lever.

64 denotes a stop on the pressure-lever to limit the backward movement of the bell-crank lever.

57 denotes a spring surrounding the operating-rod, the ends of which bear, respectively, against guide 43 on the frame and a collar 58, rigidly secured to the operating-rod. This spring acts to return the operating-rod and operating-lever to their normal position and by means of the pressure-lever, intermediate spring, bell-crank lever, and plunger to raise the outer end of the controlling-lever, lowering the inner end and moving the spindle and tap downward.

The outer end of clutch-lever 33 is provided with a yoke 52, in which is pivoted a block 53, through which the operating-rod slides freely.

54 denotes a coil-spring through which the rod passes and the ends of which bear, respectively, against block 53 and a collar 55, rigidly secured to the operating-rod.

56 denotes a loose sleeve which rests upon block 53, incloses spring 54, and is adapted to be engaged by collar 55 on the operating-rod when the latter is moved downward.

59 denotes a collar rigidly secured to the operating-rod below block 53 and adapted to engage said block when the operating-rod is moved upward. (See Fig. 3.)

The function of intermediate spring 51 and the bell-crank lever and plunger is to modify the action of spring 57 and provide an adjustable starting pressure for the spindle and tap. Without the intermediate spring, bell-crank lever, and plunger the full power of spring 57 would be exerted at all times to force the spindle downward. The interposition of spring 51, however, between the operating-rod and the controlling-lever relieves the spindle and tap from the full power of spring 57 and enables the operator to reduce the starting pressure upon the spindle and tap, if desired, to just enough to overcome the power of the weight, the weight being in practice so adjusted as to slightly more than counterbalance the spindle, chuck, and tap. When the spindle and tap are raised by the operating-rod, it is against the power of spring 57, which acts to return the operating-rod to its normal position the instant the pressure is relieved, and if no work has been placed under the tap the spindle and tap will drop to the full-line position. If work has been placed under the tap, however, although spring 57 will force the operating-rod down, as before, which will tilt the pressure-lever, the intermediate spring will yield and permit arm 47^a, which bears against the plunger, to tilt downward as the inner end of the pressure-lever is raised, thus relieving the pressure of the plunger on the controlling-lever. The work to be operated upon is placed upon a table 60, shown as swiveled in a bracket 61, which is adjustably secured to the standard.

The operation is as follows: The amount of vertical movement of the spindle and tap is of course definitely determined by the engagement of stop-collar 27 on the spindle with the upper end of the driving-sleeve and

with lugs 26 on the barrel at the extremes of movement of the spindle. This movement is in practice an inch, more or less. The table is so adjusted vertically as to cause the tap to complete the threading of a hole to the required depth at the extreme of the downward movement of the tap—that is, when stop-collar 27 on the spindle engages the upper end of the driving-sleeve and the key passes out of engagement with the lugs on the barrel. When the table has been adjusted to the required height, the tap is raised to the limit of its upward movement by pressure upon the operating-lever and held there by the lever while the work is being placed in position. The tap is then lowered into alinement with a hole in the work by relieving the pressure on the operating-lever, and when the tap is centered in the hole the pressure upon the operating-lever is removed. The tap is started into the work by the modified pressure of spring 57 acting, through the operating-rod, pressure-lever, bell-crank lever, intermediate spring, and plunger, upon the controlling-lever, the intermediate spring yielding and preventing undue pressure on the spindle and tap. Suppose, for example, that the tap when it moves downward does not center with a hole in the work. Spring 51 will yield and prevent breaking of the tap. When a large tap is used, less reduction of the pressure of spring 57 is required; but when a small tap is used loop 50 on spring 51 is shifted well down on arm 47^b of the bell-crank lever, thereby greatly relieving the pressure of spring 57 upon the spindle and tap. At the completion of the threading of a hole the tap will stop through the disengagement of the key from lugs 26 on the barrel, as shown in full lines in the drawings. The raising of the tap for the insertion of a piece of work or its withdrawal from a threaded hole is effected by pressure upon the operating-lever against the power of spring 57, which will return the operating-rod and the lever to the normal position as soon as the pressure is removed. Upper clutch-pulley 34 is the driving-pulley and lower clutch-pulley 35 the reversing or withdrawing pulley. Suppose that a hole has been threaded and the parts are in the full-line position shown in the drawings. The upper friction-cone will still be in engagement with the upper clutch-pulley and the driving-sleeve will still be driven forward thereby, but the spindle and tap will be stationary, owing to the fact that key 15 will have moved downward out of engagement with the lugs 26 on the barrel by which it has been driven. When the upward movement of the operating-rod commences through pressure upon the operating-lever, spring 54 will still act, through its engagement with block 53, carried by the yoke at the outer end of the clutch-lever, to retain the upper friction-cone in engagement with the upper clutch-pulley, the operating-rod sliding freely through block 53 and spring 54 expanding as collar 55 moves upward with the rod. This engagement of the upper friction-cone with the upper clutch-pulley will continue until collar 59 on the operating-rod engages block 53 and oscillates the clutch-lever, which will then be moved by said collar from the position shown in full lines in the drawings to the position shown in dotted lines. The effect of this movement will be to disengage the upper friction-cone from the upper clutch-pulley and to move the lower friction-cone 30 into engagement with the lower clutch-pulley 35 and also to move the driving-sleeve to which the clutch-sleeve is rigidly secured and the barrel downward, which will place lugs 26 on the barrel in position to engage the key. The shifting of the clutch will impart reverse movement to the driving-sleeve, which, through the engagement of lugs 26 with the key, will reverse the spindle and reverse and withdraw the tap. The function of the construction just described, which prevents the shifting of the clutch until after the spindle has commenced to move upward, is to insure that the reverse movement of the driving-sleeve will not commence until the lugs on the barrel have passed below the upper end of the key, thus avoiding the possibility of the lugs and key making an end-to-end engagement.

It has already been explained that the weight is so adjusted as to slightly more than counterbalance the weight of the spindle, chuck, and tap and that the starting pressure on the tap is produced by the combined action of spring 57 and intermediate spring 51, through the bell-crank lever, which engages the plunger and forces it against the controlling-lever to raise the outer end of said lever and the weight and move the tap downward. It will be obvious that the leverage, and consequently the pressure upon the plunger and the starting pressure on the tap, will be increased by moving the connection of the spring to arm 47^b of the bell-crank lever away from the pivotal point of said lever on the pressure-lever and that the starting pressure on the tap will be decreased by moving the connection of the spring toward the pivotal point of the bell-crank lever. When the upward movement of the operating-rod commences, as already explained, pressure-lever 45 and the bell-crank lever will be moved from the position shown in full lines in the drawings toward the position shown in dotted lines. As arm 47^a of the bell-crank lever drops downward plunger 48 will follow it, controlling-lever 18 and the weight will drop from the position shown in full lines in the drawings toward the position shown in dotted lines, and the spindle, chuck, and tap will be raised from the position shown

in full lines to the position shown in dotted lines as the tap withdraws from the work. During the withdrawing operation, which takes but an instant, the pressure upon the operating-lever will have been maintained, and when the tap is withdrawn the parts will be at the dotted-line position. The work is then removed from under the tap, the pressure upon the operating-lever may be removed, and the parts will be returned to the normal or full-line position through the action of spring 57. When the pressure that has held the spindle and tap at the raised position is removed and the downward movement of said parts takes place, the operating-rod will slide downward freely through block 53, spring 54, which is relatively weak, being compressed by collar 55, which in the upward movement will have passed upward out of engagement with sleeve 56. This downward movement of the operating-rod will continue without any operative effect on clutch-lever 33 until collar 55 comes into engagement with sleeve 56, which rests on block 53 at the outer end of said lever. As soon as the engagement of this collar with the sleeve takes place the continued downward movement of the operating-rod will oscillate the clutch-lever and shift the clutch which reverses the movement of the driving sleeve—that is, causes it to turn forward or drive. When threading a series of holes, the spindle is, of course, not lowered after it has been withdrawn, but the operator retains the pressure upon the operating-lever, holding the spindle and tap raised, and shifts the work to place the next hole to be threaded under the tap and then lowers the tap into operative position by relieving the pressure upon the operating-lever. As soon as the clutch is shifted the opposite sides of the lugs on the barrel will engage the key and forward rotation will be imparted to the spindle and tap, which will continue until the rotation of the spindle and tap is again stopped by the passing of the key downward out of engagement with lugs 26 at the completion of the threading of a hole. It will be obvious that the operations of tapping holes, withdrawing the tap, shifting the work, and tapping other holes may be performed in very much less time than it takes to describe them.

Having thus described my invention, I claim—

1. In a tapping-machine, the combination with a spindle having a key extending therefrom, a driving-sleeve in which the spindle is free and which carries a barrel having lugs adapted to engage the key when the latter is brought into the path of movement of the lugs to operatively connect the spindle and sleeve, of a weighted controlling-lever carrying a block in which the spindle rotates, the movement of said lever controlling the longitudinal movement of the spindle, and spring-controlled means in opposition to said lever for moving the latter in one direction.

2. In a tapping-machine, the combination with a spindle having a key extending therefrom and collars rigidly secured thereto, a driving-sleeve in which the spindle is free and which carries a barrel having lugs adapted to engage the key when the latter is brought into the path of movement of the lugs to operatively connect the spindle and sleeve, of a controlling-lever having at its inner end a yoke, a block through which the spindle passes and which is pivoted in the yoke and between the collars, the movement of said lever controlling the longitudinal movement of the spindle, an adjustable weight on the outer end of the lever and spring-controlled means in opposition to said lever for moving the latter in one direction.

3. In a tapping-machine, the combination with a spindle, a driving-sleeve therefor, said spindle being normally free from operative engagement with the driving-sleeve, and means carried by said spindle and driving-sleeve for operatively connecting them to move in unison upon a relative movement thereof, of a weighted controlling-lever for moving said spindle longitudinally to engage and disengage said connecting means, and spring-controlled mechanism in opposition to said lever for moving the latter in one direction.

4. In a tapping-machine, the combination with a spindle and means for imparting forward and reverse movement thereto, of a controlling-lever connected to the spindle and carrying a block through which the spindle passes, a plunger bearing against the controlling-lever, a pressure-lever, a bell-crank lever pivoted on the pressure-lever and having an arm engaging the plunger and a spring engaging the other arm of the bell-crank lever and acting to raise the plunger which tilts the controlling-lever and moves the spindle downward.

5. In a tapping-machine, the combination with a spindle and a controlling-lever for raising and lowering the spindle, of a plunger engaging the controlling-lever, a pressure-lever, a bell-crank lever pivoted on the pressure-lever and having an arm engaging the plunger and a spring engaging the other arm of the bell-crank lever, substantially as described, for the purpose specified.

6. In a tapping-machine, the combination with a spindle and a controlling-lever for raising and lowering the spindle, of a plunger engaging the controlling-lever, a pressure-lever, a bell-crank lever pivoted on the pressure-lever and engaging the plunger and a spring adjustably connected to the bell-crank lever, whereby the pressure on the spindle may be regulated.

7. In a tapping-machine, the combination with a spindle, a controlling-lever for raising

and lowering the spindle and a plunger engaging the controlling-lever, of a pressure-lever, a bell-crank lever pivoted on the pressure-lever and having an arm engaging the plunger, an operating-rod pivoted to the pressure-lever, a spring 57 acting on the operating-rod to retain the spindle in the lowered position and an intermediate spring connected to the bell-crank lever for providing starting pressure.

8. In a tapping-machine, the combination with a spindle, a controlling-lever for raising and lowering the spindle, an operating-rod pivoted to the controlling-lever and a spring 57 acting on the operating-rod to return it to its normal position, of a pressure-lever pivoted to the operating-rod, a bell-crank lever pivoted on the pressure-lever, a plunger engaging the controlling-lever and one arm of the bell-crank lever and a spring 51 acting on the other arm of the bell-crank lever to provide starting pressure on the spindle.

9. In a tapping machine, the combination with a spindle, a driving-sleeve for imparting forward and reverse movement thereto, clutch mechanism and an operating-rod pivoted to the controlling-lever and carrying collars 55 and 59, of connections intermediate the operating-rod and the controlling-lever, a clutch-lever carrying a block through which the operating-rod slides freely, a spring 54 engaging said block and collar 55 and a sleeve inclosing said spring, said collar 59 acting to engage the block and operate the clutch-lever when the operating-rod is moved upward, and collar 55 engaging the sleeve to operate the clutch-lever when the operating-rod is moved downward.

10. In a tapping-machine, the combination with a spindle, means for imparting forward and reverse movement thereto, a controlling-lever for raising and lowering the spindle, a pressure-lever and an operating-rod pivoted to one end of the pressure-lever, of a bell-crank lever pivoted to the other end of the pressure-lever, a plunger engaging one arm of the bell-crank-lever and bearing on the controlling-lever, a spring 51 connected to the other arm of the bell-crank lever and to the pressure-lever and a spring 57 acting on the operating-rod to return it to its normal position.

11. In a tapping-machine, the combination with a spindle, means for imparting forward and reverse movement thereto, a controlling-lever for raising and lowering the spindle, a pressure-lever and an operating-rod pivoted to one end of the pressure-lever, of a spring 57 acting to return the operating-rod to its normal position and adjustable spring-controlled mechanism intermediate the pressure-lever and the controlling-lever, whereby the action of spring 57 on the controlling-lever is modified.

12. In a tapping-machine, the combination with the spindle, the controlling-lever therefor, and a pressure-lever adapted to apply pressure on said controlling-lever, said pressure-lever being movable into and out of a normal position, of means for moving said pressure-lever out of its normal position, a spring 57 acting to return the pressure-lever to its normal position and an intermediate spring and connections interposed between the controlling and pressure levers whereby the action of spring 57 on the controlling-lever is modified.

13. In a tapping-machine, the combination with the spindle, the controlling-lever, and the pressure-lever, of a bell-crank lever pivoted on the pressure-lever, a plunger engaged by one arm of the bell-crank lever and bearing against the controlling-lever and an intermediate spring adjustably connected to the other arm of the bell-crank lever, substantially as described, for the purpose specified.

14. In a tapping-machine, the combination with the spindle, the driving-sleeve, the controlling-lever, the pressure-lever and spring-controlled connections intermediate the pressure-lever and the controlling-lever, of an operating-rod pivoted to the pressure-lever and having a collar 55, a block through which the operating-rod slides, clutch mechanism for imparting forward and reverse movement to the driving-sleeve, a clutch-lever pivoted to the block, a spring bearing on collar 55 and on the block and a sleeve inclosing the spring and resting on the block, said spring acting to retain the clutch mechanism in the driving position until the collar in the downward movement of the operating-rod engages the sleeve and forces said sleeve, the block and clutch-lever downward to reverse the clutch.

15. In a tapping-machine, the combination with the driving-sleeve, clutch mechanism for imparting forward and reverse movement thereto, a clutch-lever and an operating-rod having a collar 55, of a block through which the operating-rod slides and which is pivoted to the clutch-lever, a spring bearing on said block and against the collar and a sleeve resting on the block which is adapted to be engaged by the collar in the downward movement of the operating-rod to tilt the clutch-lever and reverse the clutch.

16. In a tapping-machine, the combination with the spindle, the driving-sleeve, the controlling-lever, the pressure-lever and spring-controlled connections intermediate the pressure-lever and the controlling-lever, of an operating-rod pivoted to the pressure-lever and having collars 55 and 59, a block through which the operating-rod slides, clutch mechanism for imparting forward and reverse movement to the driving-sleeve, a clutch-lever pivoted to the block and a spring bearing on collar 55 and on the block,

said spring acting to retain the clutch mechanism in the reversing position until collar 59 in the upward movement of the operating-rod engages the block and tilts the clutch-lever to reverse the clutch and impart forward movement to the driving-sleeve.

17. In a tapping-machine, the combination with a driving-sleeve, clutch mechanism for imparting forward and reverse movement thereto, a clutch-lever and an operating-rod having collars 55 and 59, of a block through which the operating-rod slides and which is pivoted to the clutch-lever and a spring bearing on said block and against collar 55, said spring acting to retain the clutch mechanism in the reversing position until collar 59 in the upward movement of the operating-rod engages the block and tilts the clutch-lever.

In testimony whereof I affix my signature in presence of two witnesses.

HENRY A. TUTTLE.

Witnesses:
A. M. WOOSTER,
S. W. ATHERTON.