(No Model.) 2 Sheets—Sheet 1.

W. E. WARD.

NUT TAPPING MACHINE.

No. 341,972. Patented May 18, 1886.

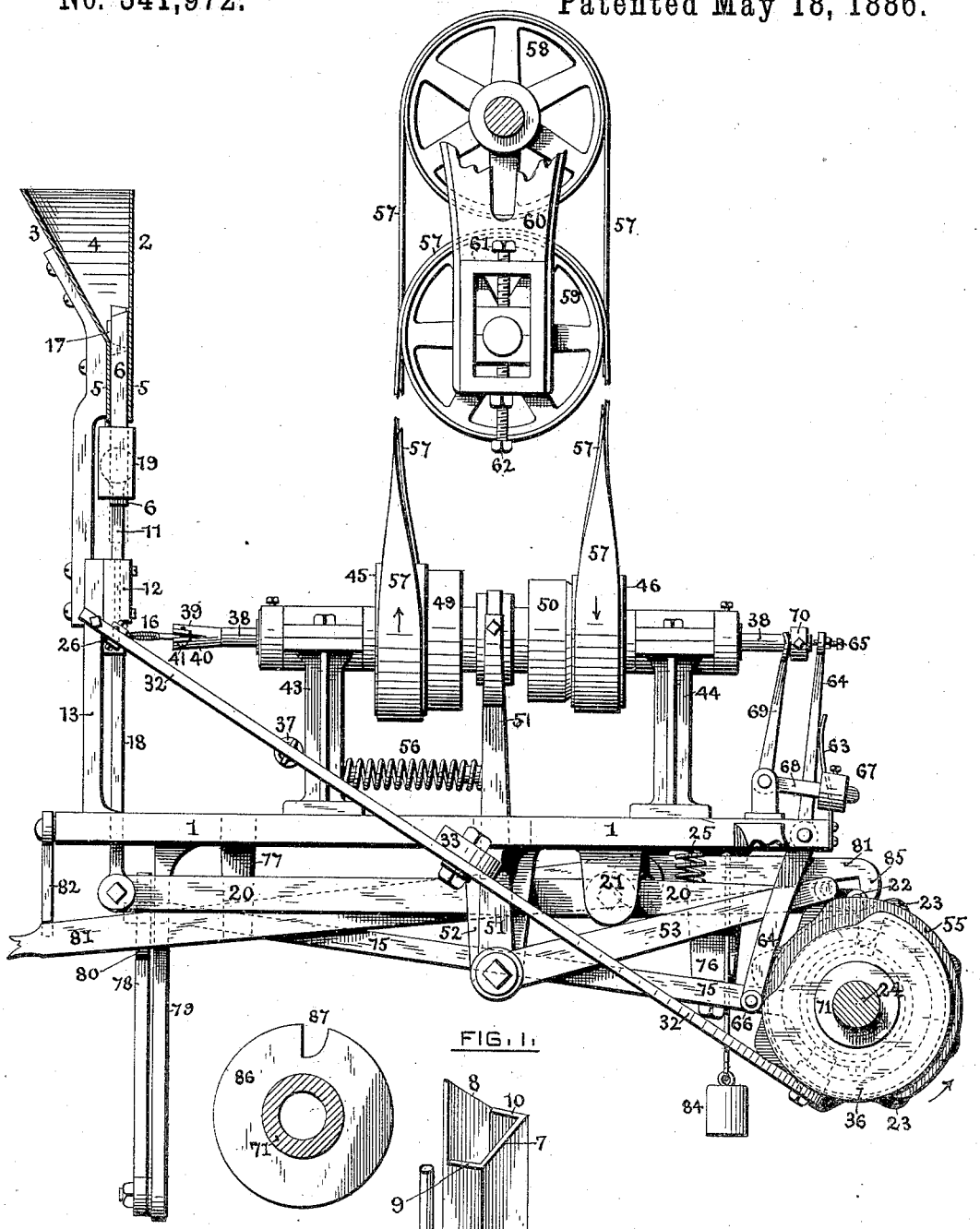

FIG. 1.

FIG. 10

FIG. 2.

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(No Model.) 2 Sheets—Sheet 2.

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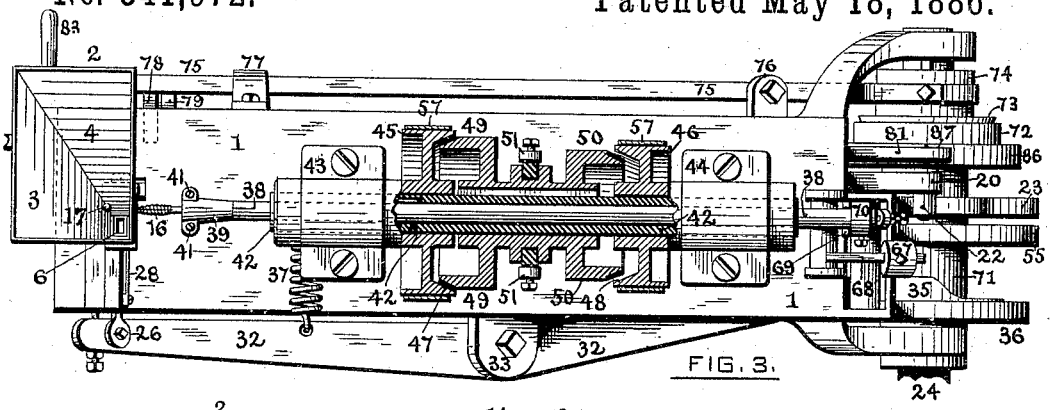

FIG. 3.

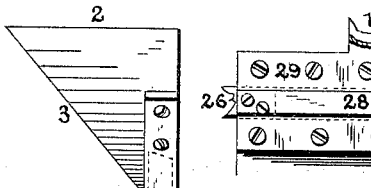

FIG. 6.

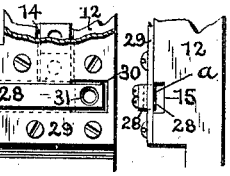

FIG. 7.

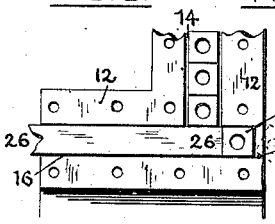

FIG. 8.

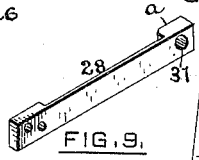

FIG. 9.

FIG. 4.

FIG. 5.

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WILLIAM E. WARD, OF PORT CHESTER, NEW YORK.

NUT-TAPPING MACHINE.

SPECIFICATION forming part of Letters Patent No. 341,972, dated May 18, 1886.

Application filed January 18, 1886. Serial No. 188,875. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM E. WARD, a citizen of the United States, residing at Port Chester, county of Westchester and State of New York, have invented certain new and useful Improvements in Machines for Tapping Nuts; and I do hereby declare the following specification, taken in connection with the accompanying drawings forming a part of the same, to be a full, clear, and exact description thereof.

My invention consists, first, in improved means for selecting and feeding the nut-blanks, one by one, from a mass in a hopper, and presenting them singly in succession to be threaded by a screw-tap; and it further embraces a novel combination and arrangement of devices whereby the tap-spindle can be revolved, first, in the direction to tap a blank, and, secondly, in the opposite direction to retire from the threaded blank, by means of a single belt always running in one direction, peculiarly arranged to connect the tap-spindle with the source of motion; and it further embraces improved means for stopping the action of the machine by disconnecting the operative cams from the source of motion, so that the operations of blank feeding and tapping will stop, notwithstanding the driving-shaft continues to revolve.

In the accompanying drawings, Figure 1 represents a side view of a machine embodying the invention. Fig. 2 shows the upper portion of the vertically-reciprocating feed-tube in perspective. Fig. 3 represents a top view of the machine in partial section. Figs. 4 and 5 show end views of the machine from opposite points. Figs. 6, 7, 8, and 9 represent, on an enlarged scale, details of construction relating to feeding the blanks into alignment with the tap. Fig. 10 shows a side view of the stop-disk on the cam-sleeve.

1 is the frame of the machine, upon which the various parts are mounted.

2 is a hopper in which the nut blanks are intended to be placed in mass. Two of the sides, 3 4, of this hopper converge to an opening in the bottom of the same, from which a guide-tube, 5, extends downwardly. Reciprocating vertically in this guide-tube is a tube, 6, which serves to convey the nut-blanks from the hopper and to stir the mass of blanks so that they may better enter the tube. The interior size of this tube is sufficient to receive easily one blank at a time edgewise until the tube is filled with a stack of blanks standing one upon another on their edges. It is to be understood that each blank has been already perforated with a central hole.

Preferably, the upper end of the tube 6 is formed as shown in Fig. 2, the side 7 being inclined and the side 8 extending upwardly from the sides 9 and 10, and being inclined in the opposite direction. This form of the end of tube 6 has been found in practice to cause the blanks to enter the tube with more certainty than if the end thereof were square or inclined in one direction only, as the blanks in the hopper lie in various planes. The tube 6 telescopes externally, and is always slip-jointed with a tube, 11, Figs. 1 and 5, which is secured to and projects upwardly from a block, 12, attached to a standard, 13, upon the frame of the machine. The tube 11 connects with a vertical channel-way, 14, Figs. 6 and 8, in the block 12, and said block is also furnished with a horizontal channel-way, 15, which receives the blanks from the channel-way 14, and along which the blanks are fed one by one to a position in alignment with the tap 16, Figs. 1 and 3. This channel-way 15 has an unyielding back wall, which supports the blank to be threaded against the thrust of the tap.

When there are but a few blanks left in the hopper, since there is some liability of such blanks forming an arch or wedging together around the path of the tube 6, I prefer to employ a rod, 17, Figs. 1, 2, 3, and 4, located a little distance from one corner of said tube and reciprocating therewith, to break up any arch that may be formed, and thus allow the remaining blanks to enter the tube 6.

For reciprocating the tube 6 to cause it to stir the mass of blanks in the hopper, and the rod 17 to cause it to break any arch of blanks, a connecting-rod, 18, Figs. 1, 4, and 5, is pivoted at its upper end to a sleeve, 19, surrounding and attached to the tube and rod, and at its lower end is pivoted to a lever, 20. This lever is pivoted to a stud, 21, Fig. 1, on the frame, and preferably bears upon its rear end a roller, 22, which rides upon a cam, 23, mounted upon a sleeve surrounding the shaft 24, which shaft is to be driven from any con-

venient source of power, the said roller being held in constant engagement with the cam by a spring, 25. As shown in Fig. 1, the cam 23 has a wave-line contour, so that as it revolves an up-and-down motion is communicated to the tube 6 and rod 17.

The blanks pass from the hopper down the tubes 6 and 11 and form a stack in the channel-way 14, the lowermost blank resting upon a plunger, 26, as shown in Fig. 8. At the proper time this plunger is retracted far enough to allow the lowermost blank to pass into the horizontal channel-way 15, and is then advanced to push said blank 27 along said way into the position shown in Fig. 8, where it will be in alignment with the tap, the plunger cutting off and supporting the remainder of the stack, as shown in said figure.

The better to retain the blank to be threaded in proper alignment with the tap, I prefer to employ a flat or leaf spring, 28, which is shown in Figs. 3, 6, and 7, and also in perspective at Fig. 9. This spring is fastened at one end by means of screws to a face-plate, 29, Figs. 6 and 7, which covers the whole front of the block 12, and is secured thereto by screws. In this face-plate is a rectangular opening, 30, Fig. 6, into which enters the offset end *a* of the spring 28, Figs. 7 and 9. When each blank in succession has been brought into proper alignment with the tap, as indicated at Fig. 8, the rear flat face of the offset of the spring 28 will press the blank against the unyielding back wall of the channel way 15 and hold the blank against displacement. As shown in Figs. 6 and 9, the free end of this spring is furnished with a hole, 31, to allow the tap to pass through it in the operation of threading the blank.

In order that a reciprocating movement may be given to the plunger 26 to bring the blanks into proper alignment with the tap, it is pivoted at its outer end to a lever, 32, which is pivoted to a stud, 33, projecting from the frame of the machine. The lever 32 bears upon its lower end a roller, 34, Fig. 5, which engages a cam, 35, located upon one side of a cam, 36, as shown in Figs. 3 and 5. The cam 35 acts to retract the plunger, and a spring, 37, attached to the lever 32 and to the frame of the machine, causes the plunger to advance when the contour of the cam 35 allows.

I will now describe the combination and arrangement of devices whereby the tap spindle is made to revolve in alternately opposite directions by means of a single driving-belt always running in the same direction. The tap 16, Figs. 1 and 3, is secured in the forward end of a spindle, 38, in any preferred manner, as by spring-jaws 39 and 40, which may be closed upon the tap-shank by screws 41. This spindle passes through a hollow shaft, 42, Fig. 3, which is mounted to revolve in suitable bearings in the standards 43 and 44, and the spindle is splined or feathered to said shaft in any preferred manner, so as to revolve therewith and have a longitudinal motion therein. The shaft 42 is provided with two pulleys, 45 and 46, loosely mounted thereon, and having friction-clutch faces 47 and 48, respectively. Splined to the shaft 42 between these pulleys is a double-headed friction-clutch, 49 50, adapted to engage, respectively, with the clutch-faces 47 and 48 on the pulleys, and the central portion of this clutch is forked by the upper end of one arm, 51, of a bell-crank lever, Figs. 1 and 3. This lever is pivoted to a stud, 52, Fig. 1, projecting downwardly from the frame of the machine, and the outer end of its other arm, 53, is provided with a roller, 54, Figs. 4 and 5, which engages a cam, 55, engagement between said roller and cam being maintained by a spring, 56, Fig. 1, which bears against the bell-crank arm 51 and the standard 43. The cam 55 operates to move the clutch member 49 into engagement with the clutch-face 47 on the pulley 45, thereby disengaging the clutch member 50 from the pulley 46, and the spring 56 moves the clutch in the opposite direction and brings its member 50 into engagement with the clutch-face 48 on the pulley 46, thereby disengaging the clutch member 49 from the pulley 45. The pulleys 45 and 46 are revolved in opposite directions on the shaft 42, as hereinafter explained, and as the clutch 49 50 is splined to the shaft 42, said shaft will be revolved in one direction when the clutch member 49 is in engagement with the pulley 45, and in the opposite direction when the clutch member 50 is in engagement with the pulley 46. At no time are the clutch members 49 and 50 in engagement simultaneously with the pulleys 45 46.

For revolving the pulleys 45 and 46 in opposite directions, I employ a continuous belt, 57, Figs. 1 and 5, which passes over the said pulleys and also over pulleys 58 and 59, Fig. 1. The pulley 58 is secured to a counter or driving shaft located in any convenient position. The pulley 59 may be mounted in a hanger, 60, and means—such as screws 61 62—are preferably provided for raising and lowering the pulley to keep the belt tight at all times. The pulley 58 is preferably located in a vertical plane passing substantially through the rear faces of the pulleys 45 46, and the pulley 59 in a plane passing substantially through the front faces of said pulleys—that is, the pulleys 58 and 59 are in different vertical planes—so that the belt 57 may pass from the pulley 58 down to the rear face of the pulley 45, thence around the same and up over the pulley 59, then down to the front face of the pulley 46, thence around the same and back to the pulley 58. By preference, the pulley 46 is made smaller in diameter than the pulley 45, in order that the rearward movement of the tap-spindle shall be more speedy than its forward movement.

A forward movement is given to the tap-spindle 38 by a spring, 63, Figs. 1 and 5. This spring is secured to the frame of the machine, and bears upon the upper portion of

a pivoted lever, 64, which is preferably provided at its upper end with a screw, 65, for properly adjusting the time of the movement of the spindle. The lower end of the lever 64 bears a roller, 66, Fig. 1, which engages the cam 36. When a nut-blank has been partially threaded, this cam acts to move the upper end of the lever 64 rearwardly into its normal position. (Shown in Fig. 1.) The return of the tap-spindle to its rearward position after it has been retracted by its own revolution to clear the threaded blank is effected by a weight, 67, located upon one arm, 68, of a bell-crank lever, the upper end of the other arm, 69, of which forks the said spindle and bears against a collar, 70, secured thereto, as shown in Figs. 1 and 3.

The operation of the machine is as follows: Let it be supposed that the various parts are in the positions shown in Fig. 1, the tap spindle being about to move forward; that by the action of the cam 23 the tube 6 has been reciprocated, and thereby caused some of the blanks which were in the hopper 2 to pass down into the channel-way 14, and that by the action of the spring 37 the plunger 26 has moved the lowermost blank of the stack along the channel-way 15 into the position shown in Fig. 8, where it is held by the frictional engagement of the spring 28. The spring 63 now acts through the lever 64 (the contour of the cam 36 allowing) to advance the tap-spindle so as to bring the tap 16 into engagement with the blank by a yielding pressure. The clutch member 49 being in engagement with the pulley 45, the tap is revolved in the proper direction to thread the blank, which it commences to do under the action of the spring 63. At any convenient time after the tap, by its lead on the blank, is enabled to continue the threading, the cam 36 moves the upper end of the lever 64 rearwardly into normal position in readiness to again perform its office. The tap having completed the threading of the blank, the spring 56 moves the clutch member 50 into engagement with the pulley 46, (the contour of the cam 55 allowing,) and a reverse revolution is given to the tap-spindle, which is retracted by the engagement of the tap with the threaded blank until the tap is clear of the same, when the weight 67, through the lever 68 69, returns the spindle to its rearward position. During the retreat of tap spindle the plunger 26 has been retracted by the cam 35 and another blank has passed into the channel-way 15. So soon as the tap is clear of the threaded blank the plunger is moved forward by the yielding pressure of the spring 37, which pushes the new blank into place, and at the same time moves the threaded blank along the channel 15, so it can drop therefrom, as shown by dotted lines in Fig. 8. The cam 55 now acts upon the bell-crank lever 51 53 to disengage the clutch member 50 from the pulley 46 and bring the clutch member 49 into engagement with the pulley 45, and thereby reverse the revolution of the tap, which is again moved forward to thread the new blank, and the operations above described are repeated.

For conveniently bringing the operative parts of the machine to rest, I prefer to employ mechanism which will automatically secure the result by the simple movement of a latch by the workman. For this purpose all the operative cams are secured upon a hollow sleeve, 71, Figs. 3, 4, and 5, and this sleeve is itself mounted loosely upon the shaft 24. When the shaft 24 revolves, the sleeve with its cams attached will revolve also, provided the sleeve has been locked to the shaft; but if the sleeve is not so locked the shaft may revolve, but the sleeve will remain still. The means by which the cam-sleeve 71 can be connected with or disconnected from the shaft 24 at pleasure are the two members 72 73, Figs. 3 and 5, of a friction-clutch. The member 72 of this clutch is secured to the sleeve 71, and its fellow, 73, is mounted upon a hub or sleeve, 74, which is splined to the shaft 24, so as to rotate therewith and slide thereon. The acting faces of this clutch are put into or out of mutual engagement by means of a lever, 75, Figs. 1, 3, and 4, which is pivoted to a stud, 76, Fig. 3, projecting from the frame of the machine. The rear end of this lever forks the hub 74, and near its forward end is a spring, 77, which holds said end of the lever in contact with the back edge of an arm, 78, as shown in Fig. 4. This arm 78 is pivoted at its lower end to a stud, 79, Fig. 1, and has upon its upper end an inclined face, 80, Fig. 4, which is held in engagement with a lever, 81, by the influence of the spring 77. When the machine is in operation and the cam-sleeve 71 is revolving, the lever 81 is held in the position shown in Figs. 1 and 4 by a latch, 82. This latch is provided with a handle, 83, Fig. 4, by means of which the said lever can be unlatched at pleasure, whereupon the forward end of the lever will rise through the influence of the weight 84, which is suspended thereon, as shown in Fig. 1. This movement of the lever will cause a dog, 85, on the rear end of said lever to descend into contact with a disk, 86, Figs. 3, 5, and 10, secured to the sleeve 71, in which disk is cut a notch, 87, Fig. 10. Into this notch the dog will enter, under the influence of the weight 84, so soon as permitted to do so by the revolution of the disk, and thereby stop the rotation of the cam-sleeve 71. This movement of the lever to a position which blocks the rotation of the cam-sleeve 71 necessarily causes the front end of the lever to rise farther upward, and thereupon the arm 78 will move inward, together with the forward end of the clutch-lever 75, under the influence of the spring 77, and the clutch 72 73 will be opened. Thus the blocking of the cam-sleeve and the opening of the clutch are practically simultaneous. To put the cam-sleeve again into rotation it is only necessary to depress the forward end of the lever 81. In doing so the upper end of the arm 78 will be

swung backward, and the wedge action of said end will force in the same direction the forward end of the clutch-lever 75 against the resistance of the spring 77 and cause the clutch to be closed. The latch 82 now comes into place, as shown in Fig. 4, to lock the lever 81 in the position shown in Figs. 1 and 4.

One particular advantage that will result from the means above described of bringing to a state of rest the operative cams will be that a series of nut-tapping machines can be arranged side by side and have one driving-shaft, 24, for the respective cam-sleeves of the machines common to all, and driven by a single pulley and belt, whereby the stoppage of any one or more of the machines in the series will not necessitate stopping the common driving-shaft, and thereby the whole series of machines.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination, substantially as hereinbefore set forth, of a hopper adapted to contain a loose mass of blanks, a tube adapted to receive the blanks edgewise, one by one in succession, means, substantially as described, for giving the tube a reciprocating motion in the hopper in a substantially vertical plane, and a conduit for the stack of blanks, slip-jointed with said tube.

2. The combination of a hopper adapted to contain a loose mass of blanks, a tube adapted to receive the blanks edgewise one by one in succession, means, substantially as described, for giving the tube a reciprocating motion in the hopper in a substantially vertical plane, a conduit for the stack of blanks, slip-jointed with said tube, and a reciprocating slide or plunger for removing the lowermost blank of the series to a position in alignment with the screw-tap, substantially as set forth.

3. The combination, with the channel-way in which the transferring slide or plunger for taking off successive blanks from the series is located, the said channel-way having an unyielding back wall to support the blank against the thrust of the tap, of a yielding spring-clamp, 28, for pressing the blank against said wall and holding the blank against displacement, substantially as set forth.

4. The combination, substantially as hereinbefore set forth, of a spindle capable of revolving in suitable bearings, two pulleys mounted to revolve loosely about said spindle, clutch mechanism, substantially as described, adapted to connect said loose pulleys alternately with the tap-spindle, and a continuous belt, arranged, as described, to pass over a driver, thence to one of the loose pulleys, thence to an intermediate idler, thence to the opposite side of the other loose pulley, and thence back to the driver to complete the circuit of the belt, whereby the spindle will be made to revolve in opposite directions alternately by the shifting of the clutch mechanism, while the belt travels continuously in the same direction.

5. The combination, substantially as hereinbefore set forth, of a driving-shaft, a cam-sleeve mounted loosely thereon, and provided with proper operative cams for giving the necessary movements to various parts of the machine, clutch mechanism, substantially as described, for connecting said cam-sleeve with said shaft or disconnecting it therefrom, and mechanism, substantially as described, for operating the clutch mechanism to make or break the connection between the cam-sleeve and the driving-shaft.

6. The combination, substantially as hereinbefore set forth, of a hopper adapted to contain a loose mass of blanks, a tube adapted to receive the blanks edgewise, one by one in succession, a rod, 17, located a slight distance from said tube, as described, and means, substantially as described, for giving the said tube and rod a reciprocating motion in the hopper.

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