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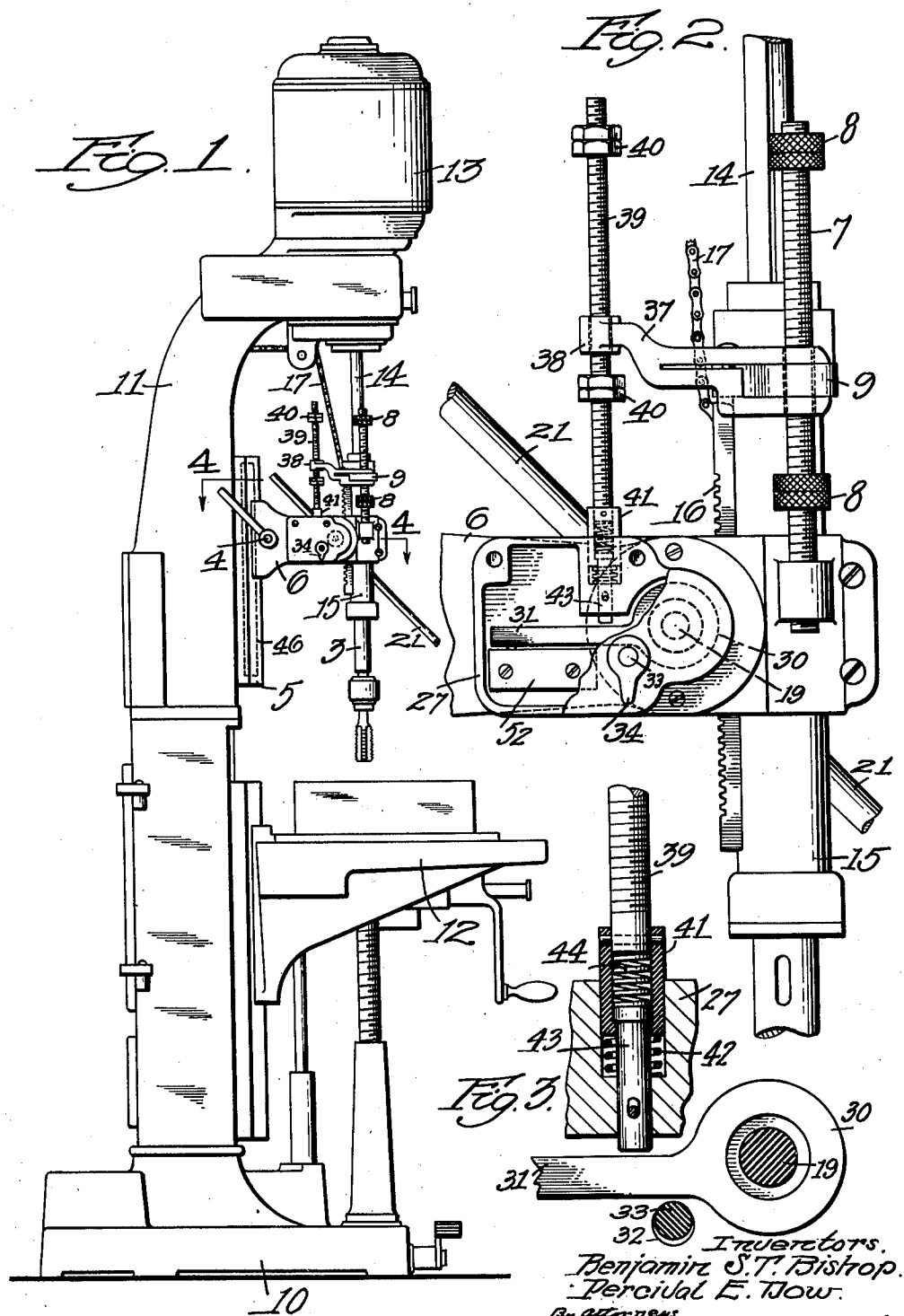
B. S. T. BISHOP ET AL

1,970,218

HAND OPERATED, ELECTRIC CONTROLLED, TAPPING DEVICE

Filed March 16, 1934

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

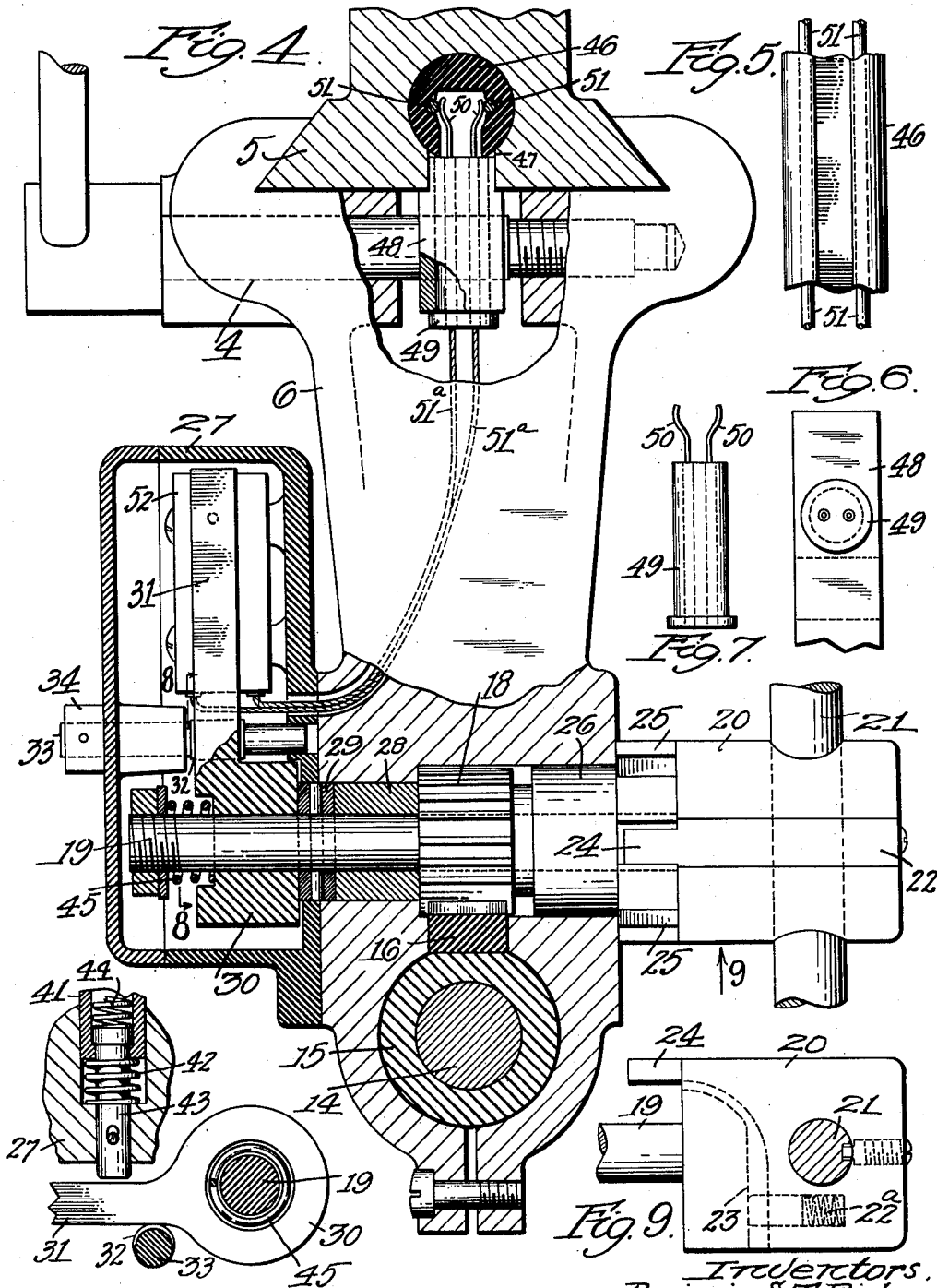


Fig. 8.

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Indorsements
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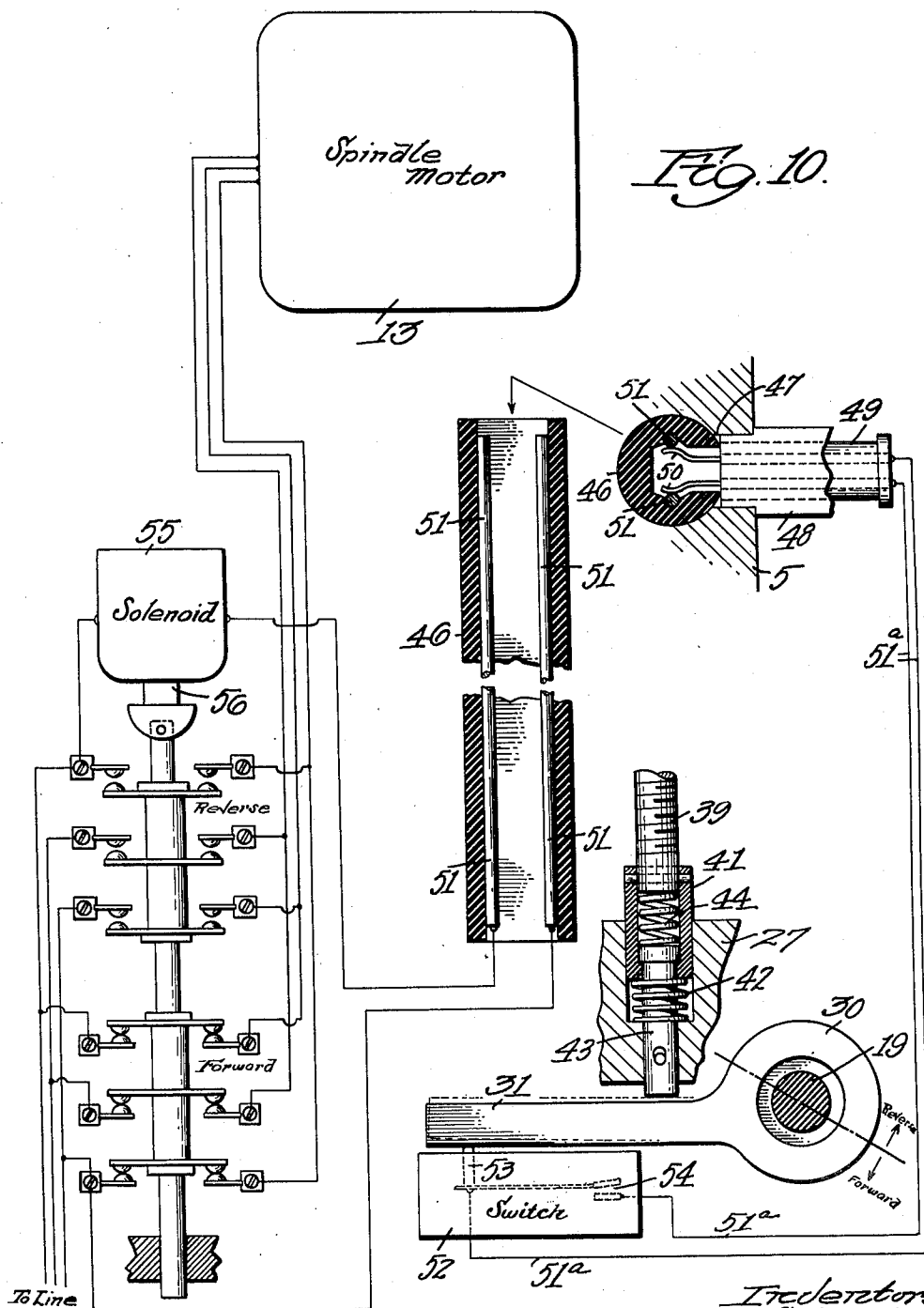
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HAND OPERATED, ELECTRIC CONTROLLED, TAPPING DEVICE

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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

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HAND-OPERATED, ELECTRIC CONTROLLED,
TAPPING DEVICEBenjamin S. T. Bishop, Shrewsbury, and Percival
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10 Claims. (Cl. 10—136)

REISSUED

The principal object of this invention is to provide a reversing mechanism for a tapping device which will be very sensitive.

Other objects of the invention are to provide a simple and at the same time sensitive means for transmitting the motion of a hand-operated lever in such a way as to reverse the motor by an electric control and to provide that control in a simple, sensitive and effective form.

Other objects and advantages of the invention will appear hereinafter.

Reference is to be had to the accompanying drawings, in which

Fig. 1 is a side view of a drill and tapping machine provided with a preferred form of our invention;

Fig. 2 is a similar view on enlarged scale with parts cut away to show interior construction of the sliding head;

Fig. 3 is a sectional view of the switch connecting device shown in Fig. 2;

Fig. 4 is a horizontal sectional view on the line 4—4 of Fig. 1;

Fig. 5 is a front elevation of a pair of trolley wires shown in Fig. 4;

Fig. 6 is an end view of the filler block;

Fig. 7 is a plan of the brush holder;

Fig. 8 is a view similar to Fig. 3 with the parts in a different position;

Fig. 9 is an elevation looking in the direction of the arrow 9 in Fig. 4, and

Fig. 10 is a diagrammatic wiring diagram showing the connecting parts in position.

The invention, as shown, is applied to an ordinary drilling and tapping machine having a base 10, gooseneck 11 and adjustable work support 12. This drill, as usual, is provided with a motor 13 for driving a spindle 14 which passes through a quill 15. The spindle drives a tap holder 3. The quill is supported in a sliding head 6. The sliding head 6 is mounted to slide on vertical ways 5 rigidly mounted on the gooseneck. The quill is slidable in the head 6 and is provided with a rack 16 and a chain 17 for connection with a weight which is not shown but located inside the frame. Meshing with the rack is a pinion 18 loose on a cross head stud 19. On this stud is fixed a hub 20 having radial operating arms 21 which constitute the means by which the quill is fed by hand.

On the stud 19 is a bushing 28 filling the space between the gear and a collar 29 beyond which is the hub 30 of a switch finger 31. When the machine is used for drilling, this switch finger rests on a cam 32 which is fixed on a shaft 33 pro-

vided with a handle 34 for operating it. This handle is located outside the head 6 in which these parts are housed. The handle can be turned to lower the cam so that the switch finger can operate for tapping.

The sliding head is fixed in adjusted position for drilling by a binding screw 4. The sliding head is provided with a fixed screw 7 having adjustable stop nuts 8 at both ends and passing freely through a hole in a projection 9 which is mounted on the quill and constitutes a stopping and reversing device for use in drilling and which is old in the art.

The parts so far described are the usual parts, or substitutes for them, used for a drilling machine or for a tapping machine or both. In this case a latch 22 is keyed on the operating arms 21 and is pushed down into latching position by a spring 22^a bearing against a surface 23 on a hub 20 itself. This latch has a projection 24 which extends between teeth 25 cut on a collar 26 integral with the pinion 18, so the hub 20 can be turned to raise and lower the quill. It will be noticed that this projection 24 of the latch is considerably narrower than the spaces between the teeth to allow for play.

Carried by a knockout lever 37, embracing the projection 9 and moving with it and with the quill, is a hub 38 having a smooth perforation for receiving another screw 39 of a similar character to the screw 7, and constituting a knockout rod. This rod has adjustable lock nuts 40 for the same purpose as the nuts 8 but the upper nuts are only limiting stops. At its lower end it is fixed to a bushing 41 which is spring-pressed by a spring 42. This bushing is arranged to slide in an opening in casing 27 carried by the sliding head 6. In the casing is a plunger 43 which is separated from the knockout rod 39 by a spring 44 in the bushing. When the quill moves downwardly until the hub 38 engages the lower nut 40 the knockout rod will, of course, be forced down and will force down the plunger 43 against the switch finger 31, if released as shown in Fig. 3. This is not a positive movement but is cushioned by the springs but it turns the switch finger. A spring 45 surrounds the cross head stud 19 and holds the hub 30 against the collar 29 to provide friction.

The gooseneck is provided with a vertical groove between the ways 5 and within this groove is located a cylinder 46 of insulating material. This cylinder is embedded in the gooseneck and communicates with the front of the ways by a vertical slot 47 into which projects a filler block 48 loose on the binding screw 4 for holding the

sliding head in position on the ways. The filler block is provided with a brush holder 49. This brush holder carries a pair of brushes 50 which engage a pair of trolley wires 51 partially embedded in the "Bakelite" or "Textolite" but having an exposed surface. These two trolley wires are insulated from each other and each of the brushes 50 engages one of them. These brushes are individually connected by wires 51^a with the switch 52. This switch has a plunger 53, which is forced down by the switch finger above mentioned to close the switch 54 and connect this circuit.

The two trolley wires 51 are connected with a solenoid 55 according to the diagram of Fig. 10 so that this completes the circuit and the solenoid is energized. The solenoid circuit is illustrated in Fig. 10 in a well known way to show the running of the three phase motor forward or in reverse, according to the circumstances. The solenoid 55 connects one of the trolley wires, either through the reverse or the forward switches with the motor in accordance with the position of the plunger 56 of the solenoid. In other words, when the solenoid is energized, the motor is reversed and when it is deenergized the motor will run in a forward direction owing to the descent of the solenoid plunger in this case by the action of gravity.

In the operation of tapping, the operator may let go of the lever 21 after the tap is in the hole. The tap, of course, will feed itself down at a predetermined rate. The lower nuts 40 are so set that when the hole is nearly tapped the hub 38 will engage them. This pushes the knockout rod down during the rest of the downward feed of the tap in the hole and pushes down the rod 43 to depress the switch finger 31. This closes the switch and connects up the circuits through the brush holder and the trolley wires to the solenoid 55. The result of this is the raising of the plunger 56 and the reversal of the motor, as will be seen clearly in the diagrammatic view in Fig. 10.

The tap, by the reverse rotation, will thread itself out of the hole and almost immediately the plunger 43 will rise. However, on account of the pressure of the spring 45 against the hub of the switch finger and the friction of the hub against the collar 29, which is now rotating reversely, the switch finger is held down. Thus the switch remains closed so that the motor will not again change its direction so long as the tap is in the hole. When the tap gets out of the hole the switch finger may rise and open the circuit. If the motor now starts to rotate in a forward direction, that is immaterial. Of course, if the operator moves the operating arm 21 he can cause the reversal of the motor at any time.

It will be seen that this constitutes a very sensitive arrangement for reversing the spindle when tapping and that it is ordinarily not intended to use it for drilling because no such sensitive arrangement is necessary for that purpose.

Having thus described our invention and the advantages thereof, we do not wish to be limited to the details herein disclosed, otherwise than as set forth in the claims but what we claim is:—

1. In a tapping machine, the combination with a reciprocable spindle for supporting a tap and a reversible motor for rotating the spindle, of a solenoid having means for reversing the motor, a sliding head, a pair of wires insulated from each other, said wires being connected with the solenoid, a pair of brushes carried by the sliding head, each in contact with one of said wires, a

switch for electrically connecting said brushes, a switch finger for closing the switch, and means whereby, when the spindle descends, the switch finger will be operated to close the switch.

2. In a tapping machine, the combination with a reciprocable spindle for carrying a tool, a reversible motor for rotating the spindle, and a solenoid connected with the motor, of a pair of wires separated and insulated from each other, a pair of brush fingers, each in contact with one of said wires, a normally open switch for connecting said wires, means for connecting said wires with the opposite poles of the solenoid, a rod mounted to be capable of moving vertically, means movable vertically with the spindle for actuating said rod, and means by which the descent of the rod will close the switch, said solenoid being arranged normally to feed power to the motor to rotate it forwardly when the solenoid is deenergized and for connecting the motor to reverse it when the solenoid is energized.

3. In a tapping machine, the combination with a reciprocable spindle for carrying a tool, a reversible motor for rotating the spindle, and a solenoid connected with the motor, of a pair of wires separated and insulated from each other, a pair of brush fingers, each in contact with one of said wires, means for connecting said wires with the opposite poles of the solenoids, a normally open switch for connecting said wires, a rod mounted to be capable of moving vertically, means movable vertically with the spindle for actuating said rod, a plunger, cushioning means for connecting the plunger with the rod, whereby the descent of the rod will push the plunger down, and means by which the descent of the plunger will close the switch, said solenoid being arranged normally to feed power to the motor to rotate it forwardly when the solenoid is deenergized and for connecting the motor to reverse it when the solenoid is energized.

4. In a tapping machine, the combination with a reciprocable spindle for holding a tapping tool and a reversible motor for rotating the spindle, of a slidable head, ways on which the head is mounted, said head having a recess, a bushing slidable in the recess, a spring for holding the bushing up in the recess, a knockout rod fixed to said bushing, means whereby, when the spindle descends to a predetermined point the knockout rod will be forced down, an electric switch, means for closing the switch when the knockout rod is pushed down, a solenoid for controlling the direction of rotation of the motor, and means for connecting the switch with the solenoid to energize it and reverse the motor when the switch is closed.

5. In a tapping machine, the combination with a reciprocable spindle for supporting a tapping tool and a reversible motor for rotating the spindle, of a pair of conducting wires insulated from each other, a pair of brush fingers, each resting against the exposed surface of one of said wires, an electric switch arranged to be closed by the descent of the spindle, a solenoid for controlling the direction of rotation of the motor, means for connecting said wires with the opposite poles of the solenoid, and electrical connections from the switch through the brush fingers and the two wires for reversing the motor when the switch is closed.

6. In a tapping machine, the combination with a reciprocable spindle for supporting a tapping tool and a reversible motor for rotating the spindle, of an insulating member having a slot, a pair of conducting wires supported by the in-

5 sulating member and insulated thereby from each other, a brush holder having a pair of brush fingers, each resting against the exposed surface of one of said wires, a switch finger, means for operating said switch finger when the spindle descends, an electric switch finger, a solenoid for controlling the direction of rotation of the motor, means for connecting said wires with the opposite poles of the solenoid, and electrical connections from the switch through the brush fingers and the two wires for reversing the motor when the switch is closed.

10 7. In a tapping machine, the combination with a reciprocable spindle for supporting the tapping tool and a reversible motor for rotating the spindle, of a switch finger, an electric switch operated by the switch finger, means whereby the switch finger is actuated to close the switch when the spindle descends to a certain point, means connected with the switch for reversing the motor, a cross head stud, a collar thereon, a spring between the collar and the hub for holding the hub frictionally with respect to the cross head stud, whereby, when the switch finger is operated to close the switch to reverse the motor, the friction will hold the cross head stud in switch closing position so long as the tap is being fed out of the work.

20 8. In a tapping machine, the combination with a reciprocable spindle for supporting the tapping tool and a reversible motor for rotating the spindle, of a cross head stud, a quill, means on the stud for operating the quill, a switch finger having a hub through which the cross head stud passes, an electric switch operated by the switch finger, means whereby the switch finger is actuated to close the switch when the spindle descends to

a certain point, means connected with the switch for reversing the motor, a collar on the cross head stud, a spring between the collar and the hub for holding the hub frictionally with respect to the cross head stud, whereby, when the switch finger is operated to close the switch to reverse the motor, the friction will hold the cross head stud in switch closing position so long as the tap is being fed out of the work.

25 9. In a tapping machine, the combination with a reciprocable spindle for carrying the tapping tool, and a reversible motor for rotating the spindle, of a switch finger, an electric switch adapted to be closed by the motion of the switch finger, a knockout rod, means carried by the spindle for moving the knockout rod to actuate the finger to close the switch, a solenoid for controlling the direction of rotation of the motor, means connected with said switch for energizing the solenoid when the switch is closed, and means for lifting the finger out of operative position to render the machine operable for other work.

30 10. In a tapping machine, the combination with a reciprocable spindle for supporting the tapping tool and a reversible motor for rotating the spindle, of a cross head stud, a quill surrounding the spindle, means loose on the cross head stud for raising and lowering the quill, a toothed collar fixed to said means, a hub loose on the cross head stud, operating arms on the hub, a latch carried on the operating arms and movable in the hub and having a latch tooth entering the spaces between the teeth on the collar and of a width less than those spaces, for the purpose described.

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