G. DÜRRENBERGER.

TAPPING CHUCK.

APPLICATION FILED OCT. 15, 1910.

1,010,743. Patented Dec. 5, 1911.

2 SHEETS—SHEET 1.

Fig. 1.

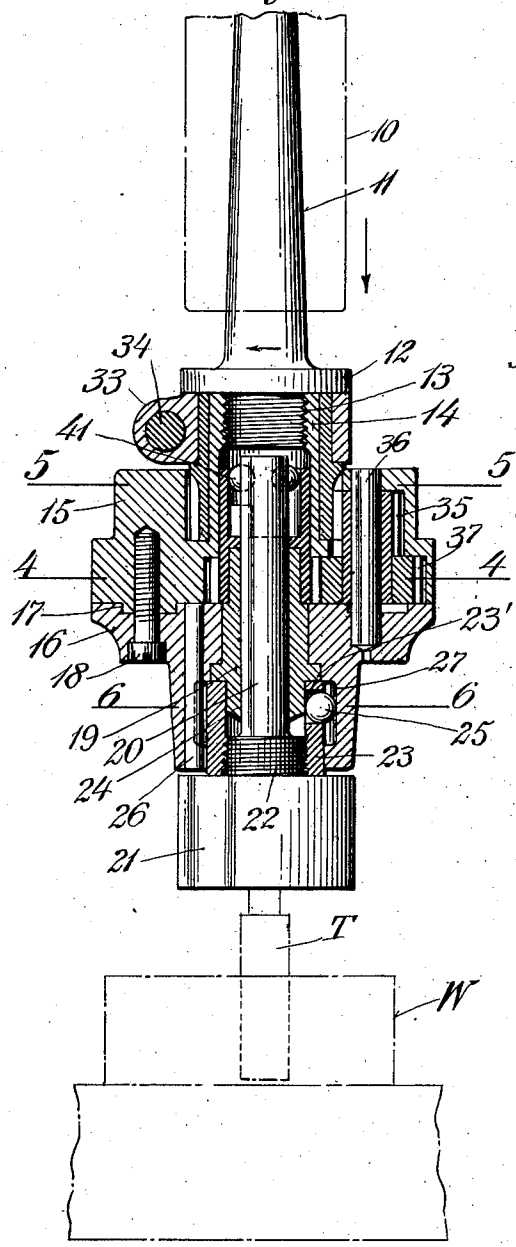
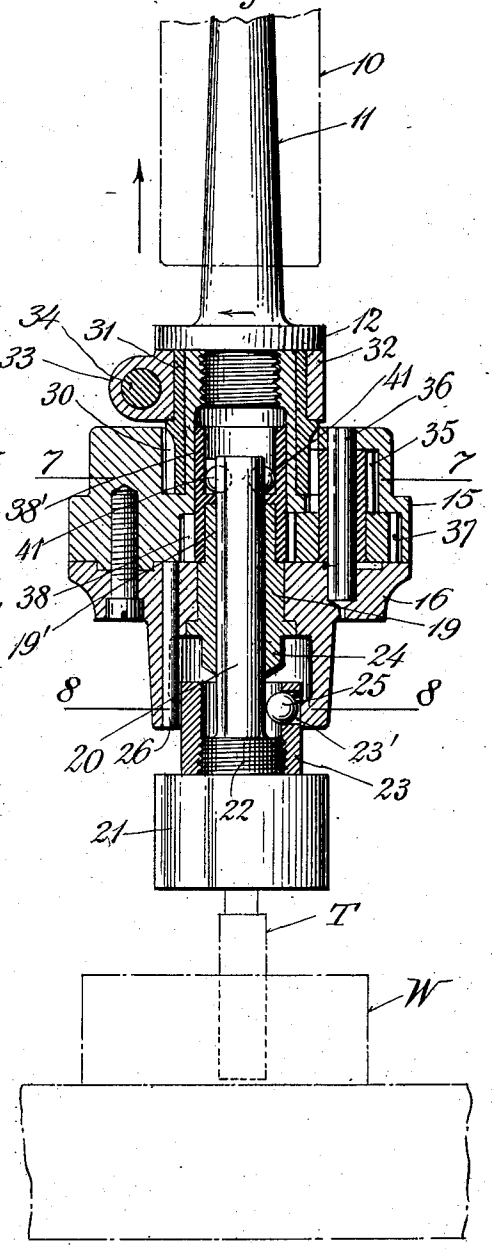


Fig. 2.



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2 SHEETS—SHEET 2.

Fig. 3.

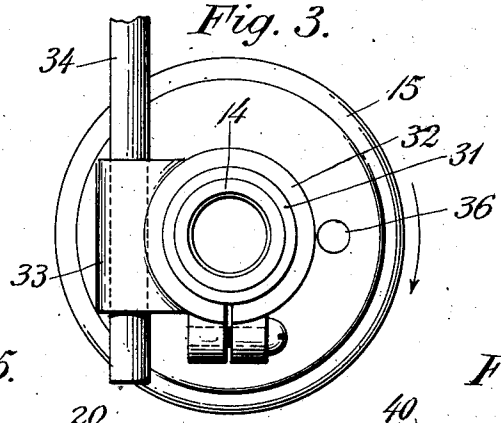


Fig. 5.

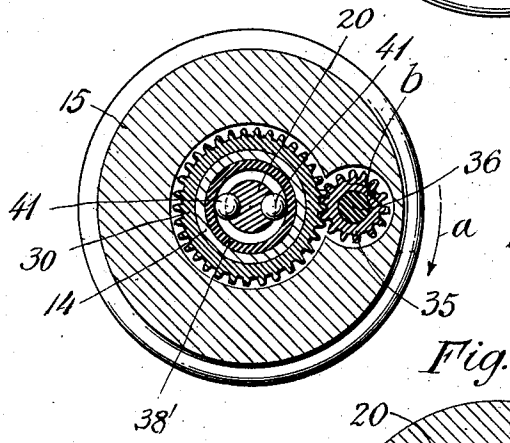


Fig. 7.

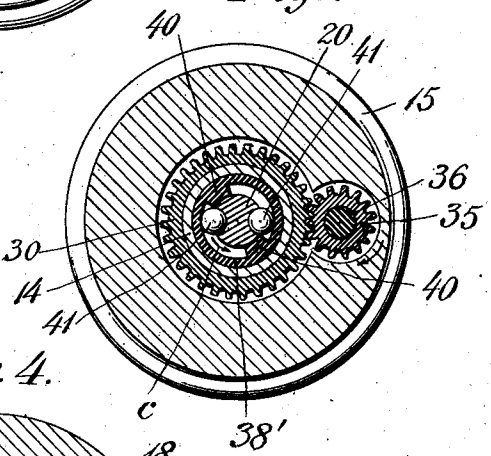


Fig. 4.

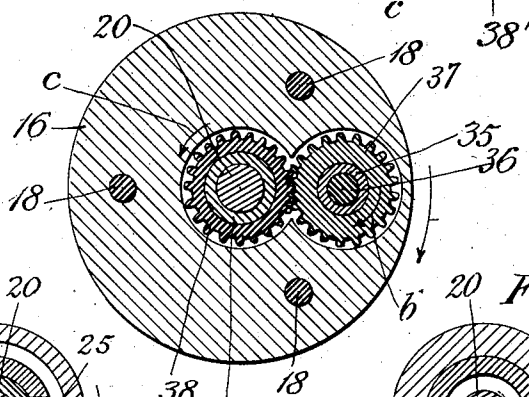


Fig. 6.

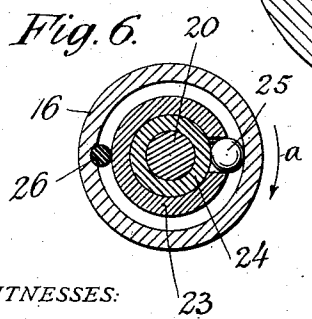
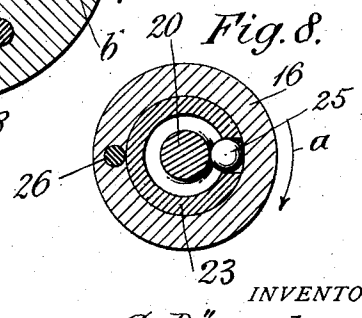


Fig. 8.



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UNITED STATES PATENT OFFICE.

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TAPPING-CHUCK.

1,010,743. Specification of Letters Patent. Patented Dec. 5, 1911.

Application filed October 15, 1910. Serial No. 587,147.

To all whom it may concern:

Be it known that I, GEOREGER DÜRRENBERGER, a citizen of the United States, and resident of Portland, in the county of Middlesex and State of Connecticut, have invented certain new and useful Improvements in Tapping-Chucks, of which the following is a full, clear, and exact specification.

This invention relates to tapping devices, and more especially to that class thereof which are adapted for use in connection with the spindles or drill-presses, lathes, and similar machines, and it has for one of its objects the provision of such a device which is provided with a reversing mechanism contained within the casing and whereby the movement of the tool-holder will be automatically reversed according to the direction of pressure which may be applied to the drill-spindle. In other words, the present invention deals with a device which has a tapered shank adapted to be held in a drill-spindle which, when pushed toward the work, will cause the tap-holder to rotate therewith in the same direction; while, on the other hand, when the drill-spindle is pushed away from the work, the movement of the tap-holder will be reversed and, at the same time, its speed will be increased over that of the "entering" or working-speed.

The invention has been clearly illustrated in the accompanying drawings in which similar characters denote similar parts, and in which—

Figure 1 represents a central vertical section of a tapping device embodying my improvements, the several component elements thereof being shown in position when the drill-spindle is pushed toward the work (downwardly) and the tap is cutting its way. Fig. 2 is a section similar to Fig. 1, but illustrates the parts in their positions which they occupy when the drill-spindle is pushed away from the work (upwardly) and the tap-holder is consequently in its reverse motion to withdraw the tap from the work. Fig. 3 is a top view of my improved tapping device, the tapered shank or collet being removed. Fig. 4 is a horizontal section on line 4, 4 of Fig. 1. Fig. 5 represents a horizontal section on line 5, 5 of Fig. 1 and shows the reverse-clutch inoperative. Fig. 6 is a horizontal section on line 6, 6 of Fig. 1 and illustrates the work-clutch ready to operate. Fig. 7 is a horizontal section on line 7, 7 of Fig. 2 showing the reverse-clutch in action, and Fig. 8 is a horizontal section on line 8, 8 of Fig. 2 illustrating the working clutch inoperative.

Briefly stated, my improved tapping device comprises a casing which is provided with a tapered shank or collet adapted to be "set" into the drill-spindle and which will consequently rotate therewith constantly in the same direction. Mounted in this casing is a spindle, which carries the tool-holder proper and which is adapted to be directly clutched to the casing so as to rotate in unison therewith, this condition being prevalent when a tap contained in the holder is cutting its way into the work. The tap-holder spindle is also adapted to be clutched to what may be termed a "reverse-gear" which can freely rotate in the casing, but in a reverse direction from that of the casing, this reverse movement resulting through the intervention of gearing which (as has been above stated) produces also acceleration of speed of the tap-holder-spindle.

Referring now to the drawings, the numeral 10 denotes the lower end of a drill-press spindle having a tapered socket to receive a correspondingly shaped collet or shank 11 having a collar 12 and screw-threaded (as at 13) into a hub 14 which forms a part of the upper section 15 of the casing. It should be stated here, that the casing consists of two sections, 15 and 16 respectively, which are fitted into each other as at 17, and are held together by screws 18 (three being shown). The direct driving mechanism is contained within the lower section 16 of the casing and comprises a bushing 19 driven into the casing section 16 and also serving as a bearing in which the chuck-spindle 20 is journaled. The lower end of the chuck-spindle 20 is rigidly secured to the tool-holder or chuck 21 which is adapted to receive the tap or drill or any similar tool T as desired, and its construction may be of any well known form. Near its point of junction with the chuck 21, the spindle 20 is somewhat enlarged (as at 22) and is in preferably screw-threaded connection with

a sleeve 23, the inner diameter of which is of such size as to permit the lower end 24 of the bushing 19 to enter thereinto and into position shown in Fig. 1. It will be noted that the lower end-surface 24 is beveled so that this surface may act as a cam for forcing one or more balls 25 outwardly through perforations 23′ in which said balls are seated, such outward position of the balls 25 bringing the same into condition to be engaged by one or more striker-pins 26 securely held within the lower casing section 16 which is provided with an annular recess 27 the wall of which limits the outward movement of the ball 25 so that the latter will, as a matter of fact, be seated more than one-half of its diameter within the recess 26.

By reference to Fig. 6, it will be understood that the lower casing 16 will rotate with the drill spindle in the direction of arrow *a*, so that when the striker 26 comes in contact with the ball 25, this sleeve or hub 23 of the tool-holder 21 will then also be rotated in unison with the casing. This constitutes what may be termed the "direct or working drive" which results in having the tap T cut its way into the work W.

I will now describe the manner in which the movement of the tool-holder spindle 20 will be automatically reversed and accelerated by simply pushing the drill spindle upward and away from the work and without reversing its movement or changing its speed. The reverse movement of the tool-holder 21 is illustrated in action in Fig. 2 of the drawings, where it will be seen that the drill-spindle with the casing sections 15 and 16 has been moved upward from the position shown in Fig. 1, thus causing the ball 25 to be retracted from its previous position so as to clear the striker 26. It will be noted that the tool-holder 21 is just exactly in the same position as it was before, but that now there is a space between the lower end of the casing section 16 and the top of the tool-holder 21, this space representing the upward movement of the drill spindle to effect the disengagement of the ball 25 from the striker and, at the same time, to throw into action the reversing mechanism which latter comprises the gear 30 having a hub 31 projecting above the upper casing section 15 and engaged by a clamping collar 32 (see also Fig. 3). This collar is provided with a lateral extension 33 adapted to receive a rod 34 the rear end of which is intended to contact with some part of the drill-press to prevent the gear 30 from rotating, without, however, interfering with the vertical movement of the drill-spindle and the tapping device in its entirety carried thereby. In other words, the rod 34 simply serves as a means to hold the gear 30 stationary during the rotation of the drill-spindle. It will also be understood that the hub 14 of the casing is perfectly free to rotate within the hub 31 of the gear. Meshing with the gear 30, is a pinion 35 which is journaled on a stud 36 extending through both casing sections 15 and 16, this pinion having at its lower end a gear 37 firmly united thereto, so that under all conditions said pinion and gear must rotate simultaneously and in unison. Meshing with the gear 37, is a gear 38 of similar diameter, while the pinion 35 is somewhat smaller than the gear 30. The gear 38 is mounted for free rotation within the hub 14 of the upper casing 15, and also on the upper portion 19′ of the bushing 19. Vertical movement of the gear 38 relative to the casing sections is prevented by the construction clearly shown in the drawings.

From the foregoing description, it will be understood that when the casing travels in the direction of arrow *a* (Fig. 5), and the gear 30 is held stationary in the manner above stated, the stud 36 will be revolved around the axis of the gear 30, so that the pinion 35 will be rotated on the stud 36 in the direction of arrow *b* (Fig. 5). Consequently the gear 37 (see Fig. 4) will also be rotated in the direction of arrow *b* and the gear 38 will thus be rotated in a reverse direction indicated by arrow *c* in that figure. By virtue of the different diameters, it is evident that the speed of the gear 38 is increased over that of the casing. Now the gear 38 constitutes a "clutch-gear" which is adapted to be clutched to the tool-holder-spindle in the manner indicated in Fig. 7 of the drawings. Here it will be seen that the hub 38′ of the gear 38 has a pair of abutments or strikers 40 which, when the tool-holder spindle 20 is in its lowermost position (as shown in Fig. 2), will engage a pair of balls 41 firmly seated and disposed diametrically-opposite in the tool-holder-spindle 20, it being understood that the gear hub 38′ moves in the direction of arrow *c* (Fig. 7). Hence it is clear that now the movement of the tool-holder spindle has a higher rate of speed, and is also reversed to "back out" the tap from the work W. By comparing Figs. 1 and 2, it will be noted that the abutments 40 are comparatively short vertically, so that in Fig. 1 there appears to be more room than necessary to withdraw the abutments 40 from the balls 41. On the other hand, this extra space is intentionally provided so as to afford an opportunity for both the balls 25 and 41 to be entirely free from their respective abutments in what may be termed an intermediate position, a feature which will prevent breaking of the parts.

Many changes may be made in the particular construction and organization of the component elements of the device without

departing from the spirit of the invention. This statement applying especially to the balls and their coöperative abutments or strikers.

I claim:

1. In a tapping device, the combination of a rotatable casing, a normally-free tool-holder-spindle, a coupling member movable radially relatively to the axis of rotation of said spindle, for coupling together said casing and spindle, and means for positively moving the coupling member in one direction on relative movement of the casing and spindle in the direction of said axis.

2. In a tapping device, the combination with a rotatable casing, and a normally-free tool-holder-spindle, of a tubular sleeve secured to said spindle and having an aperture, a coupling-member in said aperture and movable radially relatively to the axis of said spindle, an abutment carried by said casing, and a device carried by said casing and adapted to enter said tubular sleeve for moving said coupling-member outwardly to engage said abutment.

3. In a tapping device, the combination with a rotatable casing having at its lower end a chamber, a striker held in said casing and projecting into said chamber, and a tool-holder-spindle mounted for rotation and longitudinal movement in said casing, of a tubular sleeve secured to said spindle and movable within said chamber, a clutch-member carried by said sleeve and movable relatively thereto, and a device carried by said casing for moving said clutch-member outwardly and into engagement with said striker during the longitudinal movement of said spindle in the casing.

4. In a tapping device, the combination with a rotatable casing, and a tool-holder-spindle mounted for rotation and longitudinal movement therein, of a striker carried by said casing, a radially-movable clutch-member carried by said spindle, and a device having a beveled face for engaging said clutch-member and moving the same outwardly and into engagement with the striker during the movement of the spindle relatively to the casing.

5. In a tapping device, the combination of a rotatable casing, a normally-free tool-holder-spindle, an apertured member, and a striker, one of said parts being connected with the casing, and the other with said spindle, a coupling member movable radially in opposite directions with respect to the axis of said spindle into and out of the range of action of said striker within the aperture of said apertured member, and means for positively operating said coupling member in one of its directions on relative movement of the spindle and casing in the direction of said axis.

6. In a tapping device, the combination with a rotatable casing, a driving gear journaled on said casing, means for holding said driving gear stationary during the rotation of the casing, a driven gear in axial alinement with the driving gear and journaled for free rotation in said casing, said driven gear having a tubular hub provided with an internal abutment, and means for driving the driven gear from the driving gear at an accelerated speed and in a reverse direction, of a tool-holder-spindle having a striker adapted to engage said abutment when said spindle is moved relatively to the casing in one direction.

7. In a tapping device, the combination with a rotatable casing, a driving gear journaled in said casing, means for holding said gear against rotation during the rotation of the casing, a driven gear journaled on said casing in axial alinement with the driving gear and having a tubular hub provided with abutments, and mechanism for driving the driven gear in a reverse direction from that of the casing, of a tool-holder-spindle rotatable and longitudinally-movable in said casing, and a pair of balls seated in said spindle and adapted to engage said abutments during the longitudinal movement of said casing in one direction.

8. In a tapping device, the combination of a rotatable casing, a normally-free tool-holder-spindle, a coupling member for coupling together the rotatable casing and spindle and movable radially with respect to the axis of said spindle, means for positively moving said coupling member in one direction when there is a relative movement in one direction of said spindle and casing, a driving gear supported for rotation by the casing, a driven gear operatively connected with and actuated by said driving gear, an abutment and a striker, one of which is carried by the spindle and the other of which is carried by said driven gear, and means for causing the striker and abutment to move into and out of coöperative rotation on relative movement of the casing and spindle in the direction of said axis.

9. In a tapping device, the combination of a rotatable casing, a normally-free tool-holder-spindle, a ball, constituting a coupling member, movable radially relatively to the axis of rotation of said spindle, for coupling together said casing and spindle, and means for positively moving said ball in one direction on relative movement of the casing and spindle in the direction of said axis.

10. In a tapping device, the combination with a rotatable casing, a driving gear journaled in said casing, a driven gear also journaled in said casing, mechanism for driving the driven gear in a reverse direction from

that of the casing, a tool-holder-spindle rotatable and longitudinally movable in said casing, a ball, and a coöperating abutment constituting a coupling device, one of the members of said coupling device being supported by the spindle, and the other by the driven gear, said ball being adapted to engage said abutment during the longitudinal movement of the casing in one direction.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."