

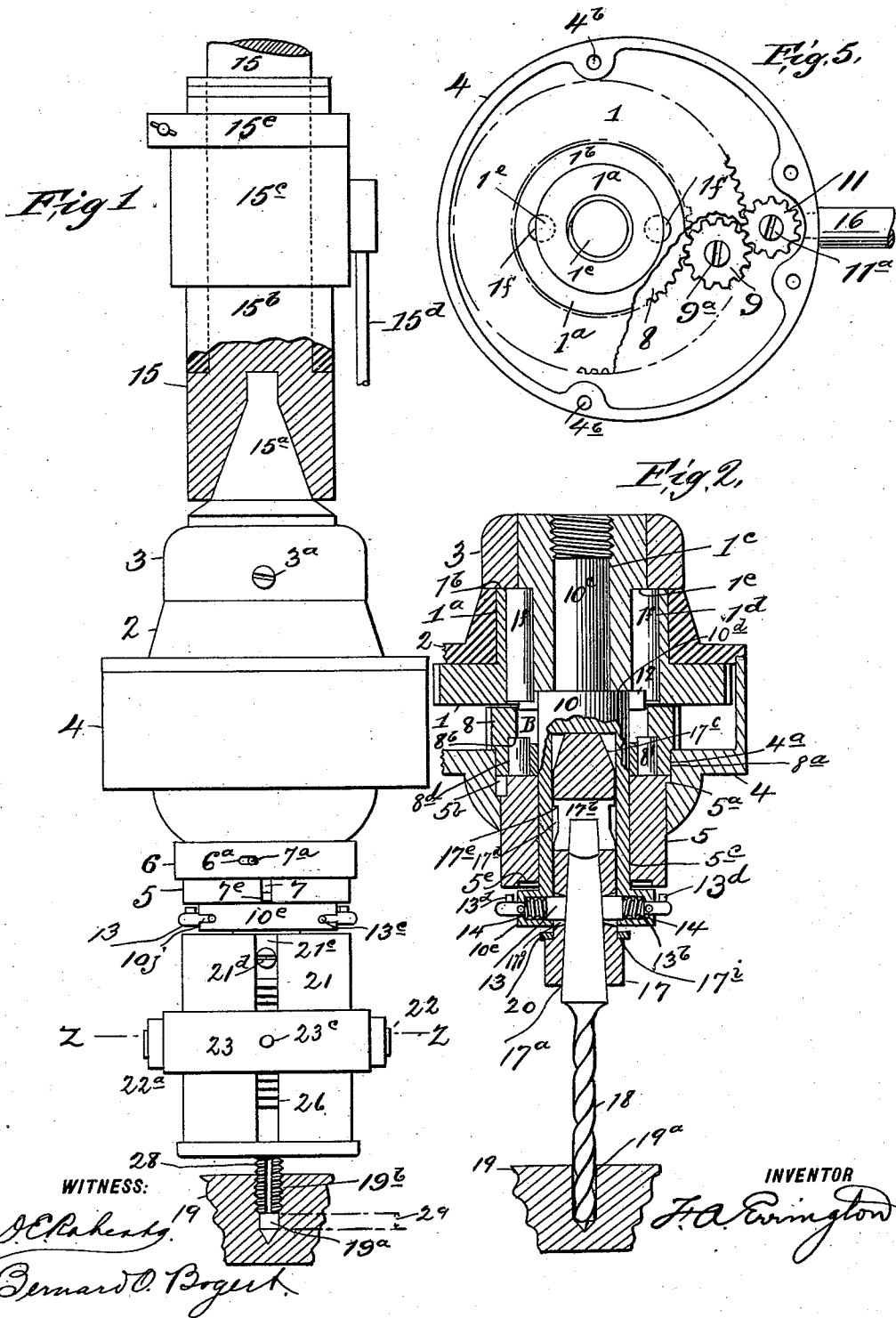
(No Model.)

2 Sheets—Sheet 1.

F. A. ERRINGTON.  
DRILLING AND TAPPING ATTACHMENT.

No. 578,485.

Patented Mar. 9, 1897.



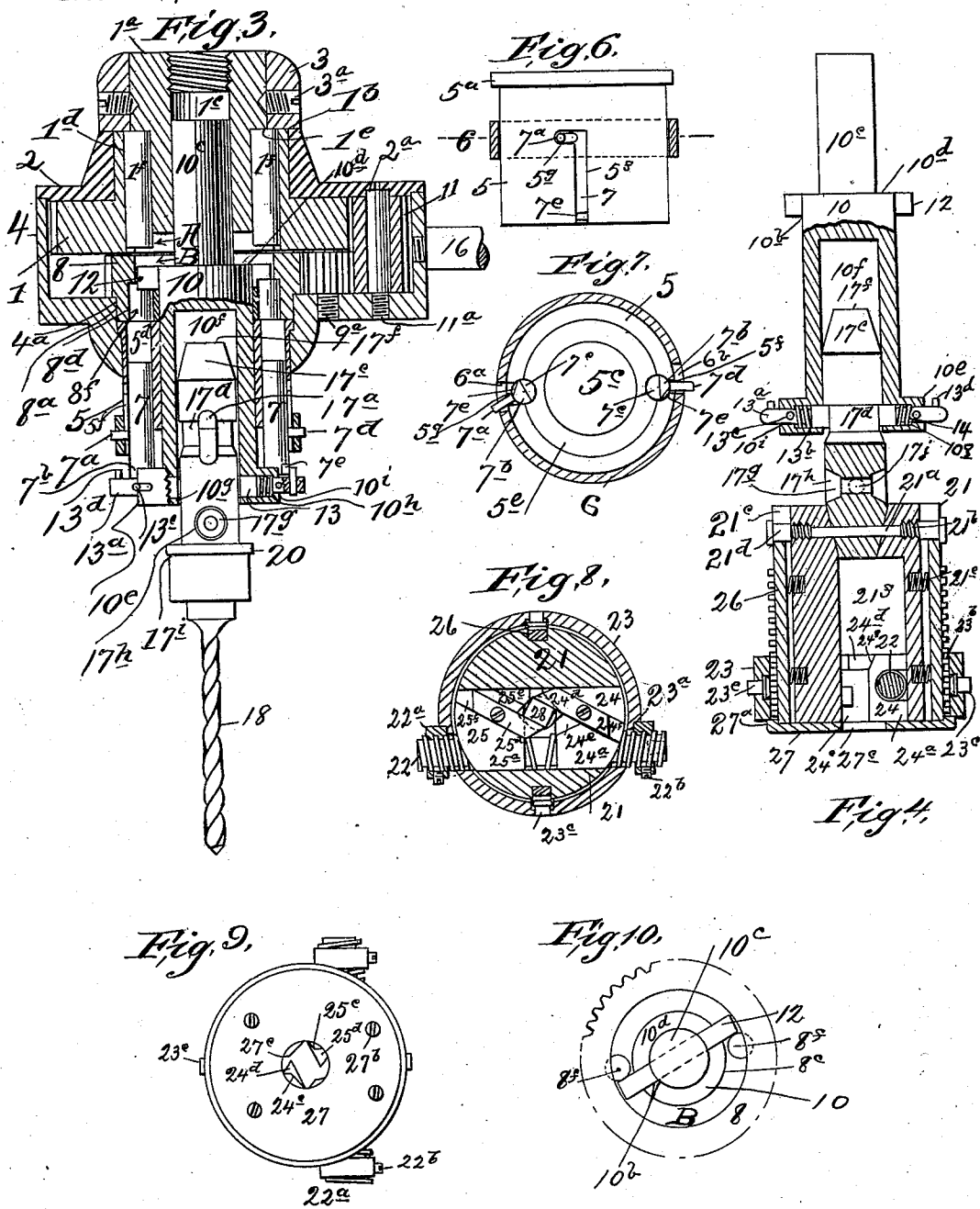
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WITNESS:

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# UNITED STATES PATENT OFFICE.

FRANKLIN A. ERRINGTON, OF EDGEWATER, NEW YORK.

## DRILLING AND TAPPING ATTACHMENT.

SPECIFICATION forming part of Letters Patent No. 578,485, dated March 9, 1897.

Application filed April 13, 1896. Serial No. 587,325. (No model.)

*To all whom it may concern:*

Be it known that I, FRANKLIN ALFRED ERRINGTON, a citizen of the United States, residing in the village of Edgewater, (post-office Stapleton,) county of Richmond, State of New York, have invented certain new and useful Improvements in Drilling and Tapping Attachments, which I desire to secure by Letters Patent of the United States, as described and shown in the following specification and drawings.

My invention relates, broadly, to means for connecting and disconnecting a driven shaft or tool-holder with and from a driving-spindle or the like, and more particularly to means for drilling and tapping from a driving-spindle without interrupting the rotation of said spindle, to means for stopping the longitudinal movement of the drill and tap successively at the same depth, to means for gripping and alining the tap by the round part and holding the tap from turning by the square part of its shank, and other improvements in the state of the art which I have shown combined in a drilling and tapping attachment of novel construction; and to these ends the invention consists in the novel details of improvement and the combination of parts described in this specification, illustrated in the drawings forming part hereof, and then pointed out in the claims.

Reference is to be had to the accompanying drawings, wherein—

Figure 1 is a front elevation of a machine constructed in accordance with my invention applied to the longitudinally-movable spindle of a drill-press or similar tool, showing the tap-holder in driving engagement with the driving-spindle and the position of the tap in the work when the stop-collar on the drill-press spindle arrests the longitudinal movement of the parts that rotate said driving-spindle. Fig. 2 is a front sectional view of Fig. 1, showing the internal mechanism, the drill-holder being substituted in place of the tap-holder to show the position of the drill in the work at a corresponding period. Fig. 3 is a side sectional view of Fig. 1, showing the driving-spindle in the reversing position, the locking-pins withdrawn by the interposition of the ejector-cams, and the tool-holder in the act of falling from the position

of rotary engagement to the non-rotary-supported position. Fig. 4 illustrates the tool-holder in the non-rotary-supported position. Fig. 5 is a plan view of Fig. 3, showing the parts with the cover and cover-collar removed. Fig. 6 is a front elevation of the ejector-bushing, the ejector-ring being broken to show the means of supporting the ejector-cams when not in use. Fig. 7 is an inverted end view of the ejector-bushing. Fig. 8 is a horizontal cross-section of the tap-holder on or about the line Z Z of Fig. 1, the top of the jaws being shown in full lines. Fig. 9 is an inverted end view of the tap-holder. Fig. 10 is a top view of the reversing-wheel, showing the clutch-bar in engagement with the reversing-pins.

I have preferably illustrated my invention as applied to a reversing mechanism of novel construction, in which the driving-wheel 1 is shown provided with parallel spur-gear teeth upon its periphery, and a hub 1<sup>a</sup>, projecting from its outer face, said hub being decreased in diameter at its upper part to form a shoulder 1<sup>b</sup>. Said wheel and its hub are pierced by a concentric bore or bearing 1<sup>c</sup>. (Shown screw-threaded at its upper end.) On the other side of said concentric bearing 1<sup>c</sup> I bore clutch-pin bearings 1<sup>d</sup> through from the inner face of said wheel 1 to the face of said shoulder 1<sup>b</sup>. I now recess the inner face of wheel 1 to form a clutch-chamber A therein, said clutch-chamber cutting into the clutch-pin bearings 1<sup>d</sup>, so that said pin-bearings open partly upon the face of said clutch-chamber and partly upon the inner face of the wheel 1. When the clutch-pins 1<sup>f</sup> are now driven into their bearings 1<sup>d</sup>, their outer ends abut against a stop-shoulder 1<sup>e</sup>, and their inner ends project longitudinally from the face of said clutch-chamber and laterally from its walls, by which construction the outer ends of said pins open upon the shoulder 1<sup>b</sup> to permit them to be readily driven out, and the stop-shoulder 1<sup>e</sup> regulates their longitudinal projection into the clutch-chamber A. The cover 2 is provided with a bore to receive the lower part of the hub 1<sup>a</sup>. The collar 3 is fitted over the upper part of said hub 1<sup>a</sup> and is secured thereto by the set-screws 3<sup>a</sup>, which mesh with indentures in the periphery of said hub, the inner face of said collar overhanging the

shoulder 1<sup>b</sup> to confine the cover 2 by a close running fit between said collar and the outer face of the driving-wheel 1. The use of the set-screws 3<sup>a</sup> permits the collar 3 to be used  
5 as a vise-piece to separate the parts without endangering the gear-teeth of the wheel 1. The above group of elements aline and drive a spindle 10 in the working direction.

The frame or case 4 is shown provided with  
10 a counterbore 4<sup>a</sup> to form a base-plate having a smaller central bore. The ejector-bushing 5 is driven into said smaller bore and its shoulder 5<sup>a</sup> rests upon said base-plate of said frame, and said bushing is pinned thereto by  
15 the pin 5<sup>b</sup>. Said bushing is pierced by a concentric spindle-bearing 5<sup>c</sup> (preferably shown of greater diameter than the bearing 1<sup>c</sup> of the wheel 1) and by eccentric ejector-bearings 5<sup>d</sup>, preferably located in the front and  
20 back of said bushing, the lower ends of said ejector-bearings opening partly upon the face of a recess 5<sup>e</sup> and partly on the outer face of said bushing 5. The slideways 5<sup>f</sup> are cut into both of said ejector-bearings, the  
25 front slideway having an offset 5<sup>g</sup>. The ejector-ring 6 surrounds the ejector-bushing 5 and is shown provided with a horizontal slot 6<sup>a</sup>. The ejectors 7, preferably shown in the form of pins, are slipped up into said  
30 ejector-bearings 5<sup>d</sup>, their pegs 7<sup>a</sup> passing through said slots 6<sup>a</sup> of the ring 6, and being driven into holes provided in said pins to receive them. The ejector-pins are held up in their bearings when not in use by the  
35 ring 6, turning the peg of the front ejector out of the slideway 5<sup>f</sup> into the offset 5<sup>g</sup>. The bottoms of the ejector-pins are provided with the cams 7<sup>b</sup> and supporting-surfaces 7<sup>c</sup>.

The reversing-wheel 8 is provided with parallel spur-gear teeth upon its periphery, and  
40 a hub 8<sup>a</sup> projects from its outer face. Said reversing-wheel is pierced by a concentric spindle-bore 8<sup>c</sup>, corresponding in diameter to that of the ejector-bushing. The clutch-pin  
45 bearings 8<sup>d</sup> are preferably bored from the outer face of the wheel 8 and only extend part way through said wheel, so that when I recess the inner face of said wheel 8 to form the clutch-chamber B said clutch-chamber  
50 cuts into said clutch-pin bearings, which thus open partly upon the face of said clutch-chamber. I now drive the reversing clutch-pins 8<sup>f</sup> into said bearings, and their inner  
55 ends abut against stop-shoulders 8<sup>b</sup>, and part of their peripheries project laterally into said clutch-chamber B. Said stop-shoulders 8<sup>b</sup> gage the distance said clutch-pins project longitudinally from the face of the clutch-chamber B. The wheel 8 is journaled in the frame  
60 4 by inserting its hub in the bore 4<sup>a</sup>. The frame 4 is provided with studs 9<sup>a</sup> 11<sup>a</sup>, the stud 11<sup>a</sup> being located at a greater distance from the wheel 8 than the stud 9<sup>a</sup>, so that when the reversing-pinion 9 is slipped over the stud  
65 9<sup>a</sup> its gear-teeth will mesh with those of the reversing-wheel 8, and when the double-depth pinion 11 is slipped over the stud 11<sup>a</sup> it will

mesh with the reversing-pinion 9 and avoid engagement with the reversing-wheel 8. This group of elements reverses the direction  
70 of rotation of spindle 10.

The spindle 10 is preferably shown in three sections of varying diameters, so that when the spindle 10 is now pushed up through the  
75 bore 5<sup>c</sup> of the bushing 5 the driving portion 10 of said spindle will be a working fit in the bearings 5<sup>c</sup> 8<sup>c</sup> of the bushing 5 and wheel 8. The recess 5<sup>e</sup>, in the outer face of bushing 5 permits the spindle 10 to rise until the upper  
80 face of the flange 10<sup>e</sup> encounters the face of the recess 5<sup>e</sup>, when a transverse bore 10<sup>b</sup>, which passes through the driving portion 10 of said spindle, will be above the inner face of the reversing-wheel 8 to permit the clutch-  
85 bar 12 to be inserted therein, said clutch-bar 12 being slightly shorter than the diameter of the clutch-chamber A B to form a sliding fit therein and its ends projecting beyond the periphery of said spindle to engage alternately  
90 with the clutch-pins 1<sup>f</sup> or 8<sup>f</sup> of said wheels 1 and 8. The upper end of the spindle 10 is reduced in diameter above the transverse bore 10<sup>b</sup>, forming a shoulder 10<sup>d</sup> to enable the alining portion 10<sup>c</sup> of said spindle to be a  
95 working fit in the smaller alining bore 1<sup>c</sup> in wheel 1. When wheel 1 and its connected parts are now placed in position, its gear-teeth mesh with those of the double-depth transmitting-pinion 11, and the cover 2 is  
100 screwed to the frame 4 by screws that mesh with the screw-holes 4<sup>b</sup> shown in said frame. (See Fig. 5.) This smaller alining-bearing for the spindle is designed to give the spindle  
105 sufficient rigidity to permit it to be used for drilling, which it would not possess if carried up in the full diameter required of its driving portion for the short distance available for the alining-bearing. The upper surface of the clutch-bar 12 is preferably flush  
110 with the shoulder 10<sup>d</sup> to secure a bearing of said shoulder upon the face of the clutch-chamber A.

The diameter of the lower portion of the spindle 10 is preferably increased until the periphery of the flange 10<sup>e</sup> overlaps the ejector-  
115 bearings 5<sup>d</sup>, said flange being a sliding fit in the recess 5<sup>e</sup> for the purpose above mentioned, and its upper surface acting as a stop to limit the downward movement of the ejectors. The spindle 10 is provided with an axial socket  
120 10<sup>f</sup>. The flange 10<sup>e</sup> is pierced by two transverse counterbores 10<sup>g</sup>, opening upon the socket 10<sup>f</sup> and having spring-plates 10<sup>h</sup>, and smaller bores 10<sup>i</sup>, opening upon the periphery of flange 10<sup>e</sup>. The periphery of flange  
125 10<sup>e</sup> is indented by slots 10<sup>j</sup>, passing through the center of the bores 10<sup>i</sup>. The locking-pins 13 are shown a working fit in the counterbores 10<sup>g</sup>, and their shanks 13<sup>a</sup> a corresponding fit in the smaller bores 10<sup>i</sup>, whereby the  
130 spring plates or shoulders 13<sup>b</sup> are formed. Two holes are bored through the shanks of said locking-pins, and spiral springs 14 are slipped over said shanks. Said locking-pins

are then inserted (shank first) in the transverse bores 10<sup>s</sup>, their shanks projecting through the small bores 10<sup>i</sup>, beyond the flange 10<sup>e</sup>. The shanks are now pulled out until the innermost holes appear in the slots 10<sup>j</sup>, when stop-pins 13<sup>c</sup> are inserted therein by a driving fit, their ends projecting beyond the periphery of the pins to prevent said pins turning. The cam-pins 13<sup>d</sup> are now driven into the other holes in said shanks and project upward therefrom. The stop-pins 13<sup>c</sup> also limit the distance the inner ends of the locking-pins project into the socket 10<sup>f</sup>.

I have preferably shown the above device connected with the longitudinally-movable spindle 15 of a drill-press or similar tool by the screw-threaded end of a shank 15<sup>a</sup>, meshing with the screw-threaded bore 1<sup>e</sup> of the driving-wheel 1, the tapered end of said shank being socketed in said spindle 15 in any usual manner. The spindle 15 is preferably journaled in a non-rotative sleeve 15<sup>b</sup>, that is moved longitudinally through a frame 15<sup>c</sup> through the medium of a lever 15<sup>d</sup>, all of which parts may be of usual or approved design. The longitudinally-movable non-rotative sleeve 15<sup>b</sup> is shown provided with an adjustable stop-collar 15<sup>e</sup>, adapted to engage the frame 15<sup>c</sup> and thereby arrest the longitudinal movement of spindle 15. The frame 4 is held from rotating and yet left freely movable longitudinally with the spindle 15 by the reversing-rod 16, resting against any non-rotative part of said drill-press or being held by the operator. The spindle 15 being rotated by any usual means, say to the right, the wheel 1 being rigidly connected to said spindle turns with it, and its gear-teeth turn the double-depth pinion 11, which transmits the motion to the reversing-pinion 9, which turns the reversing-wheel 8 in the opposite direction to the wheel 1, so that when the clutch-bar 12 is in engagement with the clutch-pins 1<sup>f</sup> of wheel 1 the spindle 10 will be turned in the driving direction coinciding with the direction of rotation of spindle 15, and when said clutch-bar is in engagement with the clutch-pins 8<sup>f</sup> of wheel 8 the spindle 10 will turn in the opposite direction to that of the spindle 15. The distance between the inner ends of the clutch-pins 1<sup>f</sup> 8<sup>f</sup> being greater than the height of the clutch-bar 12 the spindle 10 will cease to be driven by either of said sets of clutch-pins when the clutch-bar 12 is on the dead-center therebetween.

The drill-holder 17 is preferably shown provided with a concentric tapered socket 17<sup>a</sup>, terminating in a transverse slot 17<sup>b</sup>, to receive the usual tapered shank and teat of a standard drill 18, as regularly manufactured. (See Fig. 2.) To adapt said drill-holder for connection with the spindle 10, I have tapered the upper end of said drill-holder at 17<sup>c</sup> to enable its end to pass between and its sloping sides to push back the locking-pins 13. Said locking-pins then slide along the periphery of the drill-holder until they meet the concentric supporting-groove 17<sup>d</sup>, when the springs 14 push said locking-pins under the shoulder 17<sup>e</sup> of said groove. (See Fig. 4.) In this position the tool-holder is supported by the driving-spindle 10, but is not in rotary engagement therewith, so that the operator can safely grasp the tool-holder, either to insert or withdraw it, without the danger of its turning in his hand, which is a serious objection to all previous methods of changing tools from a rotating driving-spindle. When I now lower the frame 4, through the medium of the lever 15<sup>d</sup>, the point of the drill 18 encounters a piece of work 19, and the continued descent of the parts of the device along the tool-holder that is thus held stationary will push the locking-pins 13 out of the concentric groove 17<sup>d</sup>, and they will slide along the periphery of the tool-holder until the top 17<sup>f</sup> of the shank reaches the bottom of the socket 10<sup>f</sup> of the driving-spindle 10. The spindle 10 will then be held from further longitudinal movement and the driving-wheel 1 will descend along said spindle until its clutch-pins 1<sup>f</sup> engage the clutch-bar 12. The spindle 10 will now be rotated in the working direction, and the resistance of the cutting edges of the drill 18 will hold the drill-holder stationary. The locking-pins 13 now slip around the periphery of the tool-holder until said pins arrive at the transverse bores or segmental slots 17<sup>g</sup>, located at or about this level. The slots 17<sup>g</sup> extend through a greater arc of the periphery of the shank of the tool-holder than the diameter of the locking-pins 13, so that the springs 14 thrust said locking-pins into said segmental slots 17<sup>g</sup> to their full driving depth before the peripheries of said locking-pins encounter the opposing driving-face 17<sup>h</sup> of said segmental slot. The driving-faces of said parts thus meet each other in full engagement to lock the tool-holder in rotary engagement with the driving-spindle 10. The segmental slots 17<sup>g</sup> are preferably shown of greater height than the diameter of the locking-pins to permit the top of the shank to wear away the bottom of the socket without interfering with the action of the locking-pins. As the surface on the top of the shank is small, I preferably employ a washer 20, driven upon said shank and fitting against the shoulder 17<sup>i</sup>. This washer can be readily replaced when worn. When the top of the shank wears a certain amount into the bottom of the socket 10<sup>f</sup>, the shoulder 17<sup>i</sup> or washer 20 (if used) will bear upon the outer surface of the spindle 10 before the lower wall of the slots 17<sup>g</sup> have risen sufficiently to interfere with the locking-pins slipping into said segmental slots. The opposing driving-sides 17<sup>h</sup> of the segmental slots are preferably made tangents of an imaginary circle 17<sup>j</sup>, of the same diameter as the locking-pins and concentric with the shank of the tool-holder, which construction provides a full bearing where the driving-surfaces of the slots and pins meet.

When the stop-collar 15<sup>e</sup> encounters the

frame 15<sup>c</sup> of the drill-press, pressure upon the lever no longer presses the cutting edges of the point of the drill against the work, and the cutting of the drill 18 ceases. The operator in raising the lever 15<sup>d</sup> with one hand raises the spindle 15 and the frame or case 4. The tool, tool-holder, and spindle 10 being held stationary by their own weight and the friction of the drill in the hole, the cross-bar 12 is disengaged by the continued raising of the frame 4 from the driving-pins 1<sup>f</sup> until said clutch-bar 12 rests upon the face of the clutch-chamber B, (see Fig. 10,) when the direction of the rotation of the spindle 10 is thereby reversed and the drill 18 raised out of the hole 19<sup>a</sup>. The other hand of the operator will now turn the ejector-ring 6 until the other side of its slot 6<sup>a</sup> pushes the ejector-peg 7<sup>a</sup> out of the offset 5<sup>e</sup>, when the ring 6 and the two ejectors will fall downward until the supporting-surfaces 7<sup>c</sup> of said ejectors rest upon the upper surface of the flange 10<sup>e</sup> of the spindle 10. As the spindle 10 is now rotating in the reverse direction, as aforesaid, the cam pins or lugs 13<sup>d</sup> are forced over the projections formed upon the flange 10<sup>e</sup> by the ejector-cams 7<sup>b</sup>, thereby withdrawing the locking-pins 13 from the segmental slots 17<sup>e</sup> of the tool-holder at the moment that said cam-pins 13<sup>d</sup> pass the thickest portion of said ejector-cams 7<sup>b</sup>. (See Fig. 3.) The tool-holder being thus released from the spindle 10 immediately begins to fall under the action of gravity; but in the construction shown the cam-pins 13<sup>d</sup> pass the thickest portions of said ejector-cams 7<sup>b</sup> so quickly that the pressure of the locking-pins 13 is almost instantly renewed upon the periphery of the falling tool-holder, and the locking-pins 13 slip again into the concentric supporting-groove 17<sup>d</sup> and, encountering the shoulder 17<sup>e</sup>, arrest the descending movement of the tool-holder, which is again supported in non-rotary engagement with the spindle 10. The locking-pins 13 thus act in the dual capacity of means to enable said spindles to have rotary driving engagement with each other and as a catch to connect said spindles longitudinally and permit the driven shaft to stand still in the grasp of the operator while the driving-spindle rotates independently. When the cam-pins 13<sup>d</sup> again pass over the ejector-cams 7<sup>b</sup>, the locking-pins 13 are thereby withdrawn from the groove 17<sup>d</sup>, and the operator merely prevents the entirely-released tool-holder (which he already has hold of) from falling to the floor. The ejectors are raised up and replaced in their former supported position with the peg 7<sup>a</sup> of the front ejector in the offset 5<sup>e</sup>, which necessitates partly turning the ejector-pin (see Fig. 7) in front, the back ejector-pin being merely raised and lowered and the slot 6<sup>b</sup> being sufficiently long to permit of the turning of the ring 6 for the purpose above mentioned without the ends of said slot 6<sup>b</sup> striking the peg 7<sup>a</sup>. The shanks of the drill-holder and tap-holder corresponding in their coaction with

the parts of spindle 10, I have preferably used the same reference-letters wherever possible on both shanks to avoid confusion. The flattening of the entering edge and raising-faces 7<sup>c</sup> of the ejector-cams is shown as desirable; but the construction of these pins and cams may be greatly varied and still be included within the principle herein shown and described.

The tap-holder or chuck 21, shown provided with a shank of similar design to that above described for the drill-holder, having transverse bores or segmental slots and supporting-groove to coact with the spindle 10 and its locking-pins, is preferably pinned to said shank by the pin 21<sup>a</sup>, passing through transverse bores in the driving-body 21, and in the tapered lower end of said chuck-shank, shown socketed in said driving-body. The outer ends of said transverse bore 21<sup>b</sup> open upon the bottoms of longitudinal slots or grooves 21<sup>c</sup> and are shown screw-threaded to receive screws 21<sup>d</sup>, which abut against the ends of the cross-pin 21<sup>a</sup>, leaving the bottom surface of the heads of said screws about even with the periphery of said driving-body and projecting beyond the shaft of the screw, forming a shouldered recess under the screw-heads. One or more spring-holes are provided along the bottoms of said longitudinal slots and spiral springs 21<sup>e</sup> inserted therein. The large transverse jaw-slot 21<sup>f</sup> is cut through said driving-body at right angles to the depth of said longitudinal slots and without cutting into them or the spring-holes and extending from the bottom of said driving-body part way toward the top, for a distance sufficient to afford longitudinal adjustment of a set of jaws 24 25 between the driving-forks into which the driving-body 21 is thus divided, to compensate for the differences in length between the various drills and taps of associated diameters to be used in said drilling and tapping attachment. I provide one side of said jaws with right and left hand screw-threads, respectively, and projections 24<sup>a</sup> 25<sup>a</sup>, extending beyond said screw-threaded portions over and under a right and left hand threaded clamping-screw 22, to secure a bearing for said jaws upon both of the inner walls of the jaw-slot 21<sup>f</sup>.

The longitudinal adjustment of the jaws 24 25 may be variously arranged, but I have preferably selected a construction in which the part that supports the screw 22 and the jaws 24 25 is continued entirely around said jaws and the forks of the driving-body 21 in the form of a supporting-ring 23, in which said screw is journaled and said jaws supported and centered. The supporting-ring 23 thus performs the office of the usual slotted chuck-body with solid sides and open ends, and the forks of the driving-body 21 act both as a driving connection between said driving-body and said supporting-ring, and as a means to retain the jaws 24 25 in mesh with the screw 22. The strength, lightness,

and economy in manufacture of this novel and mutually-supporting construction is obviously superior to any construction where the screw-threaded portion of the jaw slides beyond the chuck-body, even where the solid sides of such a construction are tied together by a solid or removable face-plate, as my principle of continuing the body entirely around the jaws in the form of a ring, in which the right and left threaded screw is journaled and the jaws supported, offers the maximum resistance (with least weight and leverage) to the jaws being forced away from the screw and out of line by the angular pitch of the meshing threads under the strain of clamping work or a tool between the half-nut jaws, the transverse strain so generated being directly resisted by the encircling ring with the strength of its uninterrupted periphery. The ends of said clamping-screw 22 pass through transverse bores 23<sup>a</sup> in the ring 23, said transverse bores being externally counterbored, and said clamping-screw 22 is held from transverse movement through said ring-bearings by lock-nuts 22<sup>a</sup> being screwed upon its ends and bearing against the outer faces of the counterbores 23<sup>a</sup> of said ring, said lock-nuts being held in position by the set-screws 22<sup>b</sup>. The above-mentioned lateral pressure of the threaded parts when tightly clamping a tool between the jaws can be utilized to clamp the ring in any desired position along the forks of the driving-body; but I have also provided a positive locking mechanism, as more reliable when holding large sizes of taps. The inner surface of said supporting-ring 23 is provided with rack-teeth 23<sup>b</sup>, formed by concentric grooves cut into said ring. The central grooves 23<sup>b</sup> are interrupted at points opposite said longitudinal slots 21<sup>c</sup> by internal counterbores passing through the opposite sides of the ring 23 and containing push-pins 23<sup>c</sup>, having shoulders to bear against the inner faces of said counterbores and shanks to pass through and project beyond the periphery of the ring 23. I now slip the spline-racks 26 under the ring 23 and along the longitudinal slots 21<sup>c</sup> until their upper ends are in the shouldered recess under the heads of the screws 21<sup>d</sup> and bear against the shafts of said screws. The springs 21<sup>e</sup> then press said racks 26 into mesh with the rack-teeth 23<sup>b</sup> of said ring 23, the tops of the teeth of the spline-racks 26 pressing against the push-pins 23<sup>c</sup>, bringing their shoulders against the inner faces of their counterbores and their shanks beyond the periphery of the ring 23, preferably for a distance equal to the depth of said rack-teeth. The flange 27<sup>a</sup> of the face-plate 27 fits around the lower edges of the forks of the driving-body 21 and over the lower ends of the spline-racks 26. Screws 27<sup>b</sup> fasten said face-plate 27 to said driving-body, and a concentric bore 27<sup>c</sup> admits the shanks of tools to the clamping-jaws 24 25. By this construction, when the operator desires to move the jaws longi-

tudinally along the driving-body, his thumb and finger compress the push-pins 23<sup>c</sup>, which push back the spline-racks 26 against the spiral springs 21<sup>e</sup> until the racks 26 and 23<sup>b</sup> are disengaged, when the smooth inner faces of the push-pins 23<sup>c</sup> slide along the tops of the racks 26 (see Fig. 8) until the desired longitudinal adjustment is accomplished, when the operator releases the push-pins 23<sup>c</sup> and the spline-racks 26 reengage the ring-racks 23<sup>b</sup> to lock said ring, screw, and jaws in the desired position.

Having noticed that the sides of the square head of a tap are chords from equidistant points on the periphery of its round shank, I have preferably provided the lower parts of the jaws 24 25 with any usual form of alining faces 24<sup>c</sup> 25<sup>c</sup> to grip and aline the round portion of the shank of the tap and have made a radical departure in the construction of the upper set of driving-faces 24<sup>d</sup> 25<sup>d</sup> in that they overhang the gripping and alining faces 24<sup>c</sup> 25<sup>c</sup> to fill in the segments removed from the periphery of the round shank to square the head of the tap and extend at an acute angle to the line of motion of the concentrically-movable jaws 24 25 to form driving faces or jaws 24<sup>d</sup> 25<sup>d</sup>, which are always parallel to each other and at a distance apart less than but proportionate to the distance between the gripping and alining faces 24<sup>c</sup> 25<sup>c</sup>. By this construction a standard tap 28 of usual manufacture can be gripped and alined by the round and only perfectly true portion of the shank between the alining faces 24<sup>c</sup> 25<sup>c</sup> and prevented from turning by the driving-faces 24<sup>d</sup> 25<sup>d</sup>, bearing against the sides of the square head. (See Figs. 8 and 9.) For convenience in manufacture I have preferably shown the driving faces or fingers 24<sup>d</sup> 25<sup>d</sup> made separately and screwed to tops of the jaws 24 25 with beveled ends and slideways 24<sup>e</sup> 25<sup>e</sup> and angular slots 24<sup>f</sup> 25<sup>f</sup>, arranged to avoid weakening the jaws 24 25.

When I now desire to tap the hole 19<sup>a</sup>, drilled in the work 19, as above explained, I first regulate the projection of the tap 28 from the tap-holder 21 until the total length from the top of the shank of the tap-holder to the end of the tap 28 is less than the total length of the drill and drill-holder by the depth of the driving engagement of the clutch-bar 12 with the driving clutch-pins 1<sup>f</sup>, so that when the operator has connected the tap-holder with the spindle 10 and fed down the spindle 15 and the frame 4, as previously explained, for the drill-holder and drill and the stop-collar 15<sup>e</sup> encounters the frame 15<sup>e</sup> of the drill-press the tap will be at the point shown in Fig. 1 and the internal mechanism in the position shown in Fig. 2. The spiral action of the teeth of the tap 28 upon the threads 19<sup>b</sup> thus cut in the hole 19<sup>a</sup> under the continued rotation of the spindle 15 continues to advance the tap 28 longitudinally until the tap has thus moved longitudinally independent

of the parts that rotate the spindle 10 for the distance shown in dotted lines 29 in Fig. 1, when the clutch-bar 12 will thereby be disengaged from the driving clutch-pins 1<sup>f</sup> and the tap 28 cease to rotate at the same depth as that attained by the drill 18. The frame 4 is now raised, through the medium of the lever 15<sup>a</sup> or otherwise, until the clutch-bar 12 is thereby engaged with the reversing clutch-pins 8<sup>f</sup>, and the tap 28 is thus backed out of the hole 19<sup>a</sup> by the reversal of the rotation of the spindle 10. The ejector-pins 7 are again lowered to disengage the tap-holder from spindle 10, when the drill-holder may be again inserted for the next hole, and so on. This effects a great saving in time, and by automatically stopping the tap at the same depth as the drill previously made the hole prevents the danger of breakage. Again, in heavy work the problem is to get the hole in line with the tap, as any deviation would break the tap, and by the above construction this is perfectly effected.

I do not confine myself to the use of two locking-pins, having used one satisfactorily in experimental tests, but preferably show two in order to equalize the strain and more clearly illustrate the principles of my invention.

The above construction may be varied without departing from the spirit and principles of my invention.

Having now described my invention, what I claim is—

1. The combination of a casing having a cover provided with a bearing-aperture, a gear-wheel having a hub projecting through said bearing-aperture beyond said cover, a detachable collar surrounding said projecting end of said hub and attached thereto by a set-screw to confine said cover between said collar and said wheel, said wheel having an axial bearing and an eccentrically-located clutch-pin bearing, a clutch-pin located in said clutch-pin bearing, a spindle journaled in said axial bearing, a clutch connected to rotate with said spindle, another wheel having a clutch, and gearing carried by said casing to rotate said wheels in opposite directions, substantially as described.

2. The combination of two wheels, each of said wheels being provided with a clutch, a spindle pierced by a clutch-bar and having an alining and supporting shoulder or collar 10<sup>d</sup>, to bear against the surface of one of said wheels and to reinforce said spindle where said clutch-bar passes through it, and a casing carrying gearing to rotate said wheels in opposite directions, substantially as described.

3. The combination of a rotative spindle having an axial socket, a locking-pin carried by said spindle and extensible into said socket, said locking-pin being provided with a lug, a non-rotative part, an ejector-cam connected with said non-rotative part, and means to move said ejector-cam to and from

engagement with said lug of said locking-pin, substantially as described.

4. The combination of a rotative spindle having an axial socket, a locking-pin carried by said spindle and extensible into said socket, said locking-pin being provided with a lug, a non-rotative part, and a longitudinally-movable ejector-cam, said non-rotative part and said cam being connected together by a slip-joint located eccentrically to the axis of said spindle to hold said cam from rotation with said spindle during the engagement of said cam with said lug of said locking-pin, substantially as described.

5. The combination of a rotative spindle having an axial socket, a locking-pin carried by said spindle and extensible into said socket, said locking-pin being provided with a projection, a non-rotative part, and a longitudinally-movable cam connected with said non-rotative part to operate said locking-pin, said spindle also having an external flange provided with a slot to receive said projection of said locking-pin, substantially as described.

6. The combination of a rotative spindle having an axial socket, a locking-pin carried by said spindle and extensible into said socket, said locking-pin being provided with a lug, a non-rotative part, and a longitudinally-movable cam connected with said non-rotative part and adapted to operate said locking-pin, said spindle also having a flange to arrest the longitudinal movement of said cam, substantially as described.

7. The combination of a rotative spindle provided with an axial socket and having a transverse bore opening upon said socket, a spring-plate provided in said transverse bore of said spindle, a locking-pin also provided with a spring-plate and located in said transverse bore of said spindle, a spiral spring surrounding said locking-pin and located between said spring-plates to extend said locking-pin into said socket, and cam mechanism to withdraw said locking-pin from said socket, substantially as described.

8. The combination of a rotative spindle having an axial socket, two locking-pins carried by said spindle, each of said locking-pins being provided with a spring to extend it into said socket and a lug to withdraw it therefrom, a non-rotative part, and a ring provided with two ejector-cams to coact with said lugs, said ring being connected with said non-rotative part by a slip-joint located eccentrically to the axis of said spindle, substantially as described.

9. The combination of a spindle having an axial socket, a locking-pin carried by said spindle and extensible into said socket, and a shaft having a tapered end, a transverse bore, and a flange extending beyond its periphery below the center of said bore, substantially as described.

10. The combination of a spindle having an axial socket and a catch extensible into said

socket, with an independent shaft whose diameter permits it to be freely inserted into and removed from said socket during the rotation of said spindle, and means to connect

5 said spindle and shaft together in rotary driving engagement, said shaft having a shoulder that is so located along the periphery of said shaft that said shoulder is above said catch before said spindle and shaft enter into said  
10 rotary driving engagement to connect said spindle and shaft longitudinally together while permitting one to rotate independently of the other, substantially as described.

11. The combination of a spindle having an  
15 axial socket, a locking-pin carried by said spindle and extensible into said socket, with a shaft adapted to enter said socket and provided with a transverse bore and a shoulder located along its periphery between said  
20 transverse bore and the inner end of said shaft, substantially as described.

12. The combination of two screw-threaded jaws, a ring surrounding said jaws and having aligned transverse bores in its opposed  
25 walls, a right and left threaded screw journaled in said transverse bores in said ring and meshing with the threads of said jaws, means provided at each of said transverse bores to prevent end movement of said screw  
30 in said ring, and means to retain said jaws in mesh with said screw, substantially as described.

13. The combination of a body having a rack, a spring located under said rack, another part having a rack to mesh with said  
35 body-rack, and a push-button carried by said last-mentioned part and provided with a plane surface to bear directly upon the outer ends of the teeth of said body-rack to disconnect  
40 said racks, substantially as described.

14. The combination of a body having a jaw-slot, a ring surrounding said body, a clamping-screw located in said jaw-slot and journaled in said ring, and two concentrically-  
45 movable screw-threaded jaws located in said jaw-slot and meshing with said clamping-screw, substantially as described.

15. The combination of a body having a jaw-slot, a ring surrounding said body, a  
50 clamping-screw located in said jaw-slot and journaled in said ring, lock-nuts on the ends of said clamping-screw, and screw-threaded jaws located in said jaw-slot and meshing with said clamping-screw, substantially as  
55 described.

16. The combination of a body having a jaw-slot, a ring surrounding said body and longitudinally movable thereon, a right and left threaded screw located in said jaw-slot  
60 and journaled in said ring, two jaws, one side of said jaws bearing upon one of the side walls of the jaw-slot and the other side of said jaws being screw-threaded to mesh with said screw and having projections that extend  
65 beyond said screw-threaded portions of

said jaws over and under said screw, whereby said ring can be clamped to said body by the lateral pressure exerted by said threaded parts when under strain, substantially as described.

17. The combination of a body having two jaws, means to move said jaws together the lower portions of said jaws having opposing  
70 alining surfaces, the upper portions of said jaws overhanging said lower portions and having two parallel driving-surfaces extending inward beyond said lower alining surfaces at an acute angle to the direction of movement of said jaws, substantially as described.

18. The combination of a body having a pair of concentrically-movable jaws provided with alining faces, and a pair of parallel driving-fingers fastened to the upper surface of said jaws and extending inward beyond said  
85 lower alining faces at an acute angle to the direction of movement of said jaws, substantially as described.

19. The combination of a body having a jaw-slot, a ring surrounding said body, a  
90 spline or splines partly embedded in said body and partly in said ring to connect said parts together, a clamping-screw located in said slot in said body and journaled in said ring, and two screw-threaded jaws located in  
95 said slot in said body and meshing with said clamping-screw, substantially as described.

20. The combination of a body, a longitudinally-movable part connected with said body, a pair of jaws supported by said longitudinally-movable part, said longitudinally-movable part being provided with means to move  
100 said jaws together, and means to lock said longitudinally-movable part at intervals along said body, substantially as described.

21. The combination of a body, a longitudinally-movable ring surrounding said body, a pair of screw-threaded jaws, a clamping-screw journaled in said ring and meshing with  
110 said screw-threaded jaws, and means to lock said longitudinally-movable ring at certain intervals along said body, substantially as described.

22. The combination of a body having a rack or racks, a longitudinally-movable ring  
115 surrounding said body and provided with a rack or racks, means to disengage said racks, a pair of jaws supported by said ring, and means to move one of said jaws toward the other, substantially as described.

23. The combination of a body having a rack or racks, a longitudinally-movable ring surrounding said body and having a rack or racks to engage said body rack or racks, a spring or springs to hold said racks in mesh,  
125 means to disengage said racks, a pair of jaws supported by said ring, and means to move said jaws together, substantially as described.

24. The combination of a body having a transverse jaw-slot and a longitudinal groove  
130

or grooves in its periphery, a rack or racks  
located in said groove or grooves, a longitudi-  
nally-movable ring surrounding said body  
and having a rack or racks to engage said  
5 body-racks a punching pin or pins carried by  
said ring, a spring or springs located in said  
longitudinal groove or grooves to hold said  
body and ring racks in engagement, a pair of

jaws supported by said ring, and means to  
move said jaws together, substantially as de- 10  
scribed.

Stapleton, New York, April 11, 1896.

F. A. ERRINGTON.

Witnesses:

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