

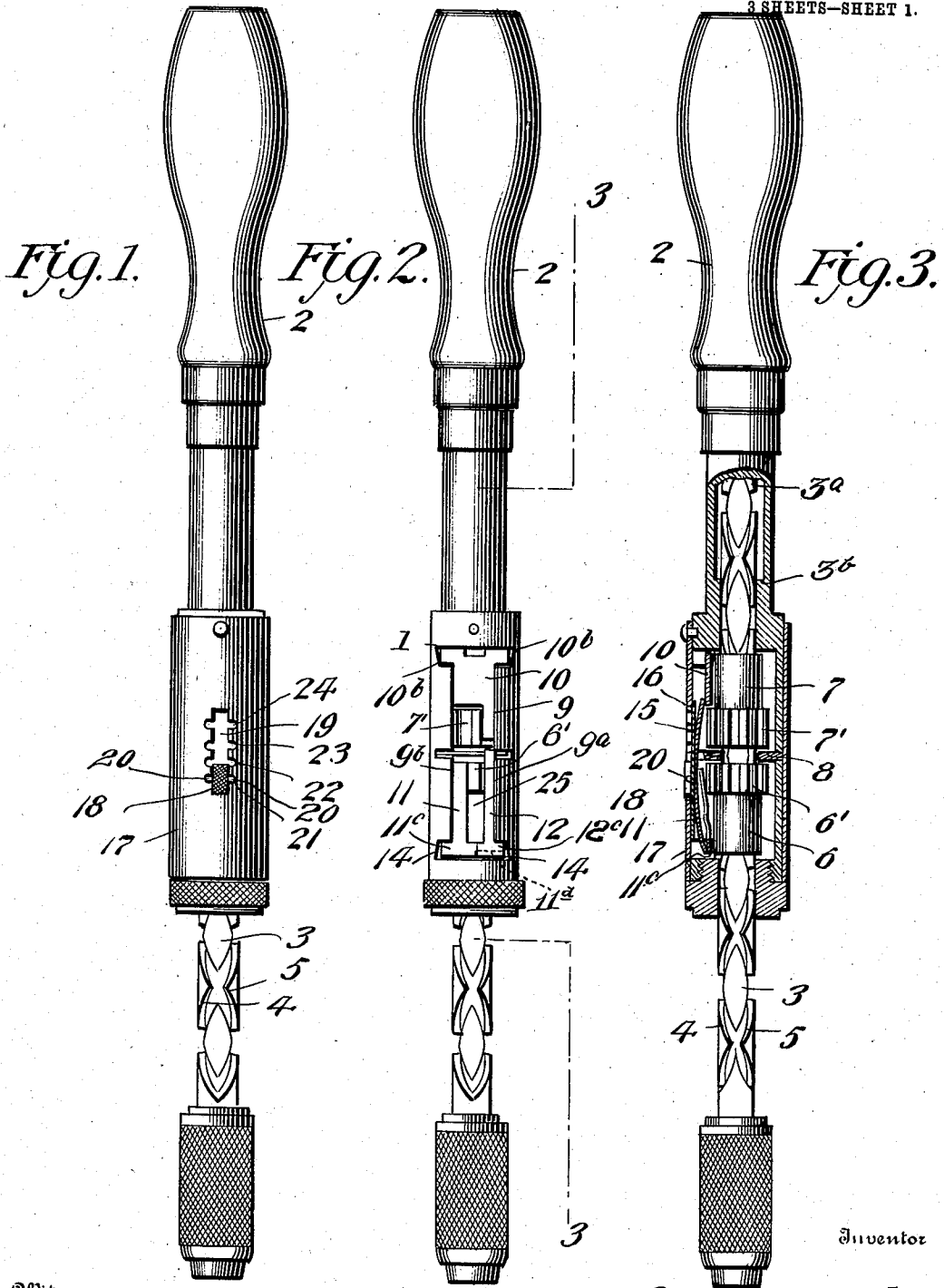
No. 873,296.

PATENTED DEC. 10, 1907.

C. H. CHAPPELLE.
SCREW DRIVER.

APPLICATION FILED AUG. 19, 1905.

3 SHEETS—SHEET 1.



Witnesses
Geoffman
C. C. Hines

Inventor
C. H. Chappelle
By *Victor J. Evans*
Attorney

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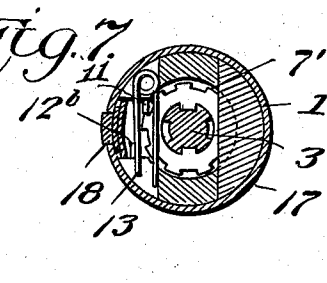
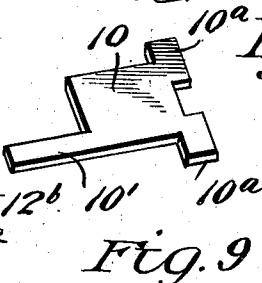
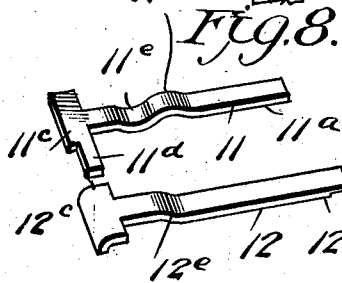
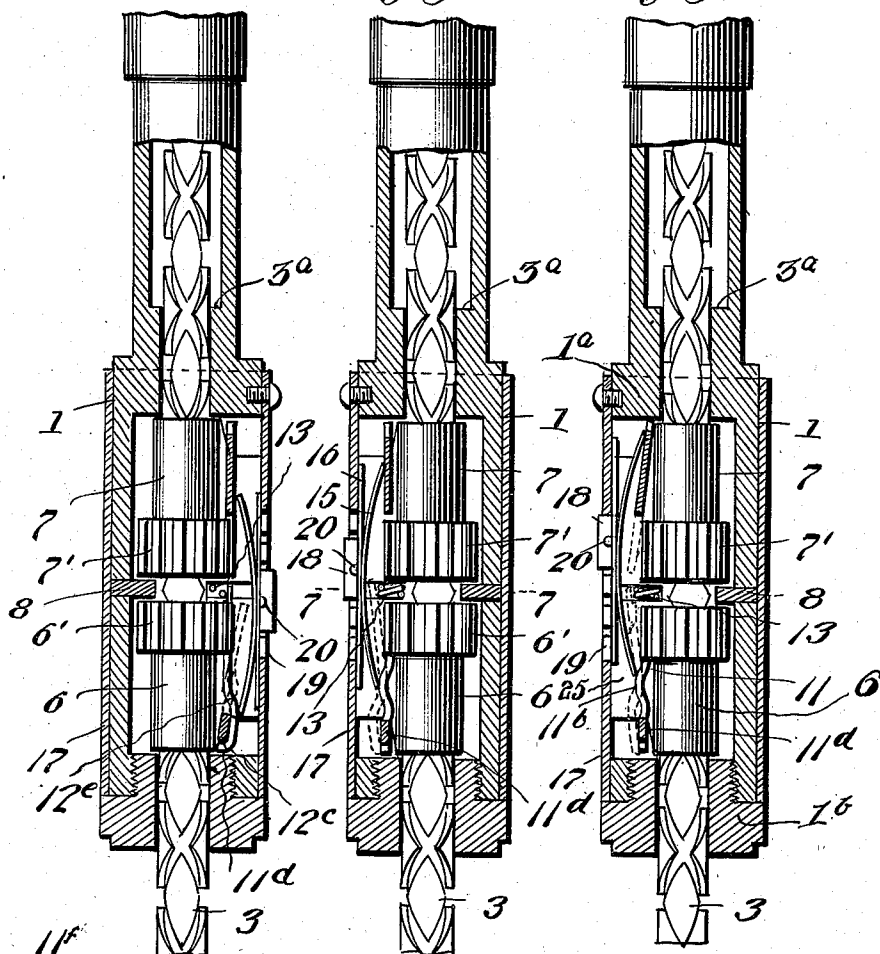
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3 SHEETS—SHEET 2.

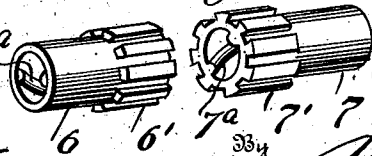
Fig. 4.

Fig. 5.

Fig. 6.



Witnesses
Georg Ackmann
C. C. Liver



Inventor
C. H. Chappelle,
Victor J. Evans
Attorney

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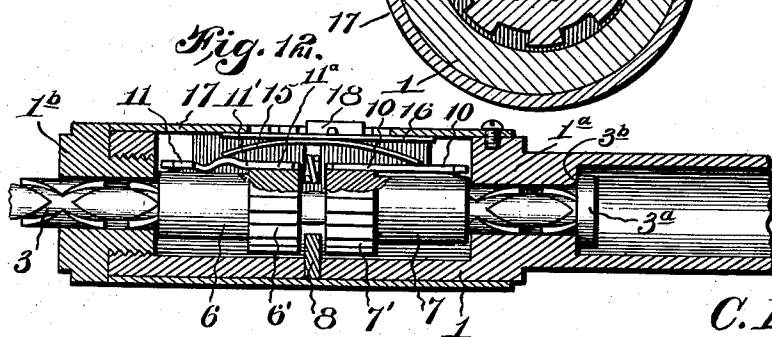
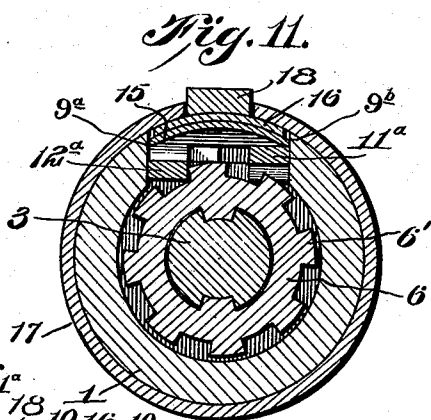
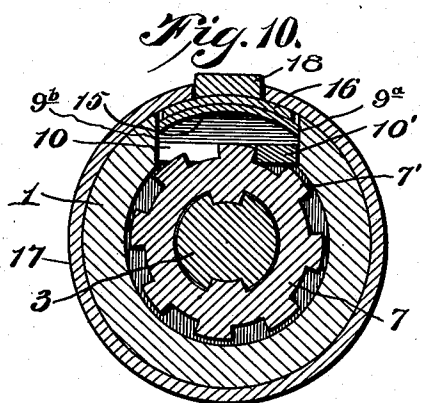
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APPLICATION FILED AUG. 19, 1905.

3 SHEETS—SHEET 3.



Inventor

C. H. Chappelle

Witnesses

Louis R. Heinrichs
C. C. Hines

By

Victor J. Evans

Attorney

UNITED STATES PATENT OFFICE.

CHARLES HENRY CHAPPELLE, OF WOODBURN, OREGON.

SCREW-DRIVER.

No. 873,296.

Specification of Letters Patent.

Patented Dec. 10, 1907.

Application filed August 19, 1905; Serial No. 274,954.

To all whom it may concern:

Be it known that I, CHARLES HENRY CHAPPELLE, a citizen of the United States of America, residing at Woodburn, in the county of Marion and State of Oregon, have invented new and useful Improvements in Screw-Drivers, of which the following is a specification.

This invention relates to improvements in screw-drivers, drills and other similar tools of that type embodying a reversely spiral-grooved spindle and pawl and ratchet operating mechanism for rotating said spindle upon the reciprocation of a handle.

The object of the invention is to provide a simple and novel construction of driving and shifting mechanism for tools of this character by which the driving mechanism may be adjusted,—first, to rotate the spindle either to the right or left upon the forward movement of the handle; second, to rotate the spindle continuously to the right by a back and forth movement of the handle; and, third, to lock the shaft so that it will not turn in either direction, to permit the tool to be used like an ordinary hand tool to drive and extract screws.

The preferred embodiment of the invention is illustrated in the accompanying drawings, in which:—

Figure 1 is a side elevation of the complete tool showing the shifter adjusted to the first notch or position to turn the spindle to the right upon the forward movement of the handle; Fig. 2 is a similar view with the casing and shifter removed; Fig. 3 is a longitudinal section on line 3—3 of Fig. 2; Figs. 4, 5 and 6 are longitudinal sections, respectively, showing the shifter and pawls adjusted to the second, third and fourth positions; Fig. 7 is a cross section on line 7—7 of Fig. 5; Fig. 8 is a perspective view of the locking pawls; Fig. 9 is a similar view of the nuts; Figs. 10 and 11 are cross sections on an enlarged scale through the nuts and pawls, illustrating the specific construction of the clutch teeth and fingers; and Fig. 12 is a longitudinal section showing the positions of the parts when the spindle is locked against rotation.

In the present specific disclosure of the invention, I have shown the same embodied in a screw driver or drill, but it will be understood that it may be applied to any tool of the ratchet type.

The numeral 1 in the drawings designates

the hollow or tubular body portion of the tool which is provided with a suitable handle 2, and 3 is a spindle having reverse spiral grooves 4 and 5.

Mounted on the spindle within the body 1 are two nuts 6 and 7, confined against outward movement by the end pieces or heads 1^a and 1^b of the body and separated by a segmental division plate 8, which holds them from inward longitudinal movement within the body, while permitting them to rotate therein. The inner end of the nut 6 is longitudinally grooved to form an annular series of teeth 6', while the inner end of the nut 7 is similarly provided with teeth 7'. On the nut 6 is an internal spiral rib 6^a arranged to travel in the spiral groove 4, and on the nut 7 is an internal spiral rib 7^a, arranged to travel in the spiral groove 5. It will thus be seen that by holding one of the nuts and allowing the other to be free the spindle in the forward movement of the body portion will turn in one direction, and when the other nut is held the spindle will be turned in the reverse direction when the body portion is moved forward. It will also be apparent that by locking both nuts against movement in either direction the spindle may be fixed against rotation to the body portion to permit the device to be used as an ordinary screw driver and that by permitting the nuts to rotate alternately in opposite directions or, in other words, alternately shifting them into and out of action as the body portion is moved forward and backward, a continuous rotary motion of the spindle in one direction may be secured. In order to attain these results I provide in connection with the nuts pawls for engaging the teeth thereof and shifting mechanism for adjusting the pawls, the teeth of the nuts and coacting pawls constituting clutch mechanism for rendering the nuts operative or inoperative, and the shifting mechanism constituting a part of said clutch mechanism, whereby the latter may be regulated to perform the several operations above set forth.

The body portion 1 is provided in one side with a longitudinal slot 9 for the reception of three locking pawls 10, 11 and 12. The pawl 10 is provided at one end with a finger 10' located at one side thereof and adapted to engage the teeth 7' of the nut 7, and its opposite end is formed with laterally projecting trunnions 10^a which seat in receiving notches 10^b formed at the upper end of the

slot 9, the walls of said notches being inclined to permit said pawl to tilt to throw the finger 10' into and out of engagement with the teeth 7'. The pawls 11 and 12 are disposed opposite each other and in parallel relation and terminate, respectively, in fingers 11^a and 12^a at their inner ends to engage the teeth 6' of the nut 6. The finger 12^a of the pawl 12 projects beyond the inner end of the toothed portion of the nut 6 and is formed in its underside with a notch or recess 12^b for the reception of a spring 13 disposed transversely in the body portion between the two nuts and adapted to exert upward pressure to normally hold the finger 12^a out of engagement with the teeth 6'. At their outer ends the two pawls 11 and 12 are formed with trunnions 11^c and 12^c which seat at their outer ends in notches 14 formed at the outer end of the slot 9, the walls of said notches being inclined to permit said pawls to tilt to throw their fingers into and out of engagement with the teeth 6'. The inner end of the trunnion 11^c of the pawl 11 is notched or cut away at its outer edge, as indicated at 11^d, to receive the inner end of the trunnion 12^c of the pawl 12 which fits thereover and is curved downwardly at its outer edge to lie in the plane of the lower surface of the trunnion 11^c, the construction thus being such that when pressure is applied to the outer end of the pawl 12 both pawls will be tilted to throw their fingers out of engagement with the teeth 6'. The pawl 11 is formed with a depression 11^e located opposite or in transverse alinement with an offset or elevated portion 12^e on the pawl 12, and inwardly beyond said depressed portion 11^e the pawl 11 is further provided with an offset or elevated portion 11^f located above the plane of the finger of the pawl 12. The outer side edges of pawls 10 and 12 bear against the side wall 9^a of slot 9, while the outer side edge of pawl 11 bears against the opposite side wall 9^b of said slot.

In order to throw the pawls into and out of engagement with their respective nuts, I mount a shifter 15 within the slotted portion 9 of the body 1 above the pawls, said shifter comprising a bowed spring having one of its ends resting on the pawl 10 and its other end adapted to engage the elevated and depressed portions or contact points of the pawls 11 and 12. Fixed intermediate its ends to the center of the convex outer side of the shifter is a pressure plate 16 bearing against the underside of a sleeve or casing 17 suitably secured to the body portion, which pressure plate is adapted to cooperate with the retaining lugs hereinafter described to hold the shifter against movement when in adjusted position. Fixed in any suitable manner to the center of the outer side of the pressure plate is a finger piece or lug 18 which is adapted to slide in a longitudinal slot 19 formed in the casing 17 and is pro-

vided with laterally projecting retaining lugs 20 adapted in the various shifted positions of the shifter to engage sets of lateral seat notches 21, 22, 23 and 24 formed in the side walls of the slot 19. It will be understood that the upward pressure of the bowed spring shifter holds the finger piece 18 elevated in the slot 19, and with the retaining lugs 20 engaging one of the sets of notches, and that upon exerting downward pressure upon said finger piece the latter may be depressed below the plane of the slot 19 to move the retaining lugs 20 out of engagement with the notches and below the inner surface of the casing 17, thus permitting the finger piece to be moved longitudinally in the slot 19 to correspondingly adjust the shifter 15. Upon releasing the finger piece at the prescribed position to which it has been adjusted, it will be elevated by the spring pressure of the shifter 15 and the retaining lugs 20 seated in the notches to hold the finger piece and shifter against movement. The pawls 11 and 12 are separated between their finger portions by a division lug or projection 25 formed or secured upon the body portion 1, and the outer edges of all the pawls bear against the side walls of the slot 9, in the manner before described whereby the pawls are reinforced to prevent the same from bending under the pressure of the nuts 6 and 7.

It is to be understood that the teeth 7' and the bearing face of the finger 10' of the pawl 10 are so relatively arranged and shaped as to adapt the finger 10' to engage the teeth and hold the nut 7 from rotation to the left, while permitting the finger to ride over said teeth to adapt said nut to rotate without interference to the right. The two pawls 11 and 12 on the contrary constitute a duplex pawl to, respectively, permit the nut 6 to rotate freely in one direction or the other, accordingly as one pawl or the other is in engagement therewith, while locking it against movement in the opposite direction. The pawl 11, for instance, is adapted to engage the teeth 6' to hold the nut 6 from rotation to the right, while permitting it to rotate to the left, while the pawl 12 when engaged with the teeth 6' permits the nut to rotate to the right, while holding it from rotation to the left. In order to secure these respective results, the notches between the teeth of the nuts are made narrower than the fingers of the pawls, so that said fingers cannot drop bodily into the notches but engage the shoulders thereof in a peculiar manner, it being observed by reference to Figs. 7, 10 and 11 that the planes of all the fingers are so far tangent to the periphery of the ratchets that only one edge thereof engages one shoulder of the notch while the other shoulder of the notch underlies the tangential under surface of the finger, permitting ratchet action. By

reference to Fig. 10 it will be seen that the finger 10' of the pawl 10 lies tangent to the periphery of the nut 7 in such manner that its inner side edge, when said finger is in locking position, fits within a notch between adjacent teeth and bears against the rear shoulder of the notch, while its outer edge abuts against the slot wall 9^a and overlies the front shoulder of the notch, so that said finger will hold the nut firmly against rotation to the left, while permitting it to rotate to the right, in which latter action the teeth of the nut slide across the under surface of the finger. The same relative proportions and arrangement of the parts named pertains in the case of the ratchet wheel 6 and pawls 11 and 12, the notches between the teeth of said wheel being narrower than the fingers 11^a and 12^a of said pawls, while said fingers are disposed in a plane tangent to the periphery of the ratchet teeth. As a result, the finger 11^a, when in locking position, seats at its inner edge in the adjacent notch of the nut and bears against the rear shoulder thereof, while the front shoulder of the notch lies beneath said finger, whereby the arrangement of the finger between said rear shoulder and slot wall 9^b prevents rotation of the nut to the right, while permitting ratchet action and rotation of said nut to the left; while the finger 12^a, when in locking position, seats at its inner edge in a notch, bears at its inner edge against the rear shoulder of the notch and lies between the same and the slot wall 9^a and above the front shoulder of the notch, thus locking the nut against rotation to the left, while permitting it to have rotation to the right, the rear shoulders of the notches in the various ratchet actions sliding in each case under the lower surfaces of the pawl fingers, as will be readily understood from the foregoing description.

With this understanding the operation is as follows: Figs. 1, 2 and 3 show the position of the parts for securing a rotary movement of the spindle to the right when the body portion is moved forward, and it will be seen that in this position the finger piece 18 is located at the lower end of the slot 19, and the retaining lugs 20 are seated in the notches 21. In this position the upper end of the shifter 15 bears upon the finger end of the body of the pawl 10 and holds the finger 10' thereof in engagement with the teeth 7', thus locking the nut 7 against movement to the left. The lower end of the shifter in this position bears directly upon the trunnion 12^c of the pawl 12, its pressure thereby on the fulcrum ends of pawls 11 and 12 serving to tilt both of said pawls to hold the fingers thereof out of engagement with the teeth of the nut 6, thereby permitting said nut to freely rotate in both directions. The forward movement of the body portion will thereby cause the nut 7 to act upon the

groove 5 of the spindle and rotate said spindle to the right. When the handle is moved backward, both nuts will turn loosely on the spindle, since the nut 6 is not engaged by either of the pawls 11 and 12, while pawl 10 will allow nut 7 to have retrograde rotation, thus permitting the body portion to move back without rotating the spindle.

In order to secure a continuous rotary movement of the spindle to the right upon the forward and backward movement of the body portion, the finger piece 18 is adjusted until its locking lugs 20 rest in the notches 22, whereby the shifter will be adjusted to the position shown in Fig. 4 in which its upper end will continue to bear upon the finger end of the pawl 10 and hold the finger 10' thereof in engagement with the teeth of the nut 7, thus continuing to hold said nut from rotation to the left while the lower end of the shifter will engage the elevated portion 12^c of the pawl 12 and rest in the recess or depressed portion 11^c of the pawl 11. By this means pressure will be exerted upon the fulcrum end of pawl 12 to hold its finger 12^a in engagement with the teeth 6', while at the same time holding the finger 11^a of the pawl 11 tilted up out of engagement with said teeth, since the pressure of trunnion 12^c on trunnion 11^c will still be sufficient to keep pawl 11 in the position before described. Upon the forward movement of the body portion the nut 7 will, therefore, act to rotate the spindle to the right, while the nut 6 will impart corresponding movement thereto upon the backward movement of the body portion, thus effecting a continuous rotary movement of the spindle to the right as the body portion is reciprocated.

In order to lock the spindle to the body portion so that it cannot rotate and so that the tool may be used as an ordinary hand screw driver for driving and withdrawing screws, the finger piece 18 is adjusted until its retaining lugs 20 seat within the notches 23. This movement of the finger piece will adjust the shifter so that its upper end will continue to maintain engagement with the finger end of the body portion of the pawl 10 and hold the finger 10' thereof in engagement with the nut 7, while the lower end of the shifter will be adjusted to the position shown in Fig. 5 in which it bears upon the elevated portion 11^b of the pawl 11 and stands above the pawl 12, thus permitting the latter to be forced and held by spring 13 out of engagement with the teeth of the nut 6, while the finger 11^a of the pawl 11 will be held by the pressure of the shifter in locking engagement with said teeth. Thus the nut 7 will be held by the pawl 10 from rotation to the left, while the nut 6 will be held by the pawl 11 from rotation to the right. If the spindle is not then fully projected, the movement of the nut 6 to the left permitted by pawl 12

will allow the spindle to be drawn outward to its fullest extent or the body portion to be moved rearwardly thereon until a stop 3^a on the inner end of the spindle engages a shoulder 3^b on the hollow shank of the tool, by which the spindle will be held from further outward movement. At this stage, as neither nut can turn in either direction, the spindle will be locked against rotation in either direction, thereby fixing it to the holder so that the tool may be used as an ordinary hand screw driver.

In order to secure a rotary movement of the spindle to the left when the body portion is moved forward the finger piece 18 is adjusted until its retaining lugs 20 rest in the seat notches 24, thereby adjusting the shifter to the position shown in Fig. 6, in which it will be seen that the upper end of the shifter bears upon the trunnions 10^a of the pawl 10 and acts to tilt the finger 10' out of engagement with the teeth of the nut 7, while the lower end of the shifter still maintains engagement with the elevated portion 11^f of the pawl 11 and holds the finger 11^a thereof in engagement with the teeth of the nut 6. In this action the pawl 12 will continue to be held out of engagement with nut 6 by spring 13. This adjustment of the shifter throws the two pawls 10 and 12 wholly out of action and locks the nut 6 against movement to the right by the pawl 11, whereby upon the forward movement of the body portion said nut 6 will operate to rotate the spindle to the left.

It will thus be seen that by the described construction of the pawl and shifter mechanism, the parts of the clutch may be adjusted to secure an intermittent rotary movement of the spindle to the right or left when the body portion is moved forward, or to lock the spindle against movement to the body portion, or to continuously rotate said spindle to the right upon the back and forward movement or reciprocation of said body portion.

I am aware of prior tools of this type in which these adjustments and several operations are independently obtainable, that is to say, that it is common in this class of tools to provide means to secure a right or left rotary movement of the spindle, and that I am also aware of a construction in which one of these movements is attained in connection with an adjustment securing a continuous rotary movement of the spindle in one direction, but I believe that I am the first to provide a construction in which all of these adjustments are secured in a single tool.

Having thus described the invention, what is claimed as new, is:—

1. In a tool of the class described, the combination of a reciprocatory body portion, a right and left spiral-grooved spindle, nuts

confined against longitudinal movement in the body portion and provided with projections respectively engaging the grooves in the spindle, said nuts having clutch teeth, a tilting pawl operative to engage the teeth of one nut to permit rotation of said nut in one direction while locking it against movement in the other direction, a second tilting pawl adapted to engage the teeth of the other nut to permit rotation thereof in one direction while holding it from rotation in the other direction, a third tilting pawl adapted to engage the teeth of the latter named nut to operate reversely to said second pawl, said second and third pawls being connected for simultaneous adjustment under certain conditions and provided with contact portions, a spring to hold said third pawl normally out of engagement with the nut, and a sliding shifter controlling all three pawls, said shifter being adjustable to regulate the action of said pawls to control the nuts to secure a right or left intermittent rotary motion of the spindle or a continuous rotary motion thereof when the body portion is reciprocated or to lock said spindle to the body portion.

2. In a tool of the class described, the combination of a reciprocatory body portion provided with a longitudinal slot having a series of seat notches, a right and left spiral-grooved spindle, nuts confined against longitudinal movement in the body portion and provided with projections respectively engaging the grooves in the spindle, said nuts having clutch teeth, a tilting pawl operative to engage the teeth of one nut to permit rotation of said nut in one direction while locking it against movement in the other direction, a second tilting pawl adapted to engage the teeth of the other nut to permit rotation thereof in one direction while holding it from rotation in the other direction, a third tilting pawl adapted to engage the teeth of the latter-named nut to operate reversely to said second pawl, said second and third pawls being connected for simultaneous adjustment under certain conditions and provided with contact portions, a spring to hold said third pawl normally out of engagement with the nut, and a spring-supported shifter sliding in said slot in the body portion and provided with locking lugs to engage the seat notches and bearing portions to operatively engage all three pawls, the construction being such that by moving the shifter to engage the several seat notches the pawls may be adjusted thereby to control the nuts to secure a right or left intermittent rotary motion of the spindle or a continuous rotary motion thereof when the body portion is reciprocated or to lock said spindle to the body portion.

3. In a tool of the class described, the combination of a reciprocatory body portion, a rotary spindle provided with reverse spiral grooves, clutch nuts provided with projec-

tions engaging said grooves, a single pawl controlling one nut to permit rotary movement thereof in one direction and lock the same against rotation in the opposite direction, a compound pawl formed of members controlling the reverse movements of the other nut, said members being connected for simultaneous or independent adjustment and provided with portions whereby they may be simultaneously or independently moved, a spring for retracting one of said pawl members, and a shifter controlling all three pawls and adjustable to shift the same to control the nuts to secure a right or left intermittent rotary motion of the spindle or a continuous rotary motion thereof when the body portion is reciprocated or to lock said spindle to the body portion.

4. In a tool of the character described, the combination of a reciprocatory body portion, a right and left spirally grooved spindle, nuts confined against longitudinal movement in the body portion and provided with projections respectively engaging the grooves in the spindle, said nuts having clutch teeth, a tilting pawl having a finger to engage the teeth of one nut to permit rotation of said nut in one direction while locking it against

movement in the reverse direction, a pair of tilting parallel pawls having fingers to engage the teeth of the other nut to respectively control the rotation thereof in opposite directions, one of said pawls being formed with a raised portion and the other with a depression and a raised portion, and said pawls also having engaging projections to adapt them to tilt in unison, substantially as described, a retracting spring acting upon the finger of the first named pawl provided with a raised portion, and a shifter upon the body portion having portions to bear upon the pawls and cooperate with the said raised portions thereof to tilt the pawls, whereby said shifter may be adjusted to govern the pawls to control the nuts to secure a right or left intermittent rotary motion of the spindle or a continuous rotary motion thereof when the body portion is reciprocated or to lock said spindle to the body portion.

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

CHARLES HENRY CHAPPELLE.

Witnesses:

GRANT CORBY,
R. H. SCOTT.