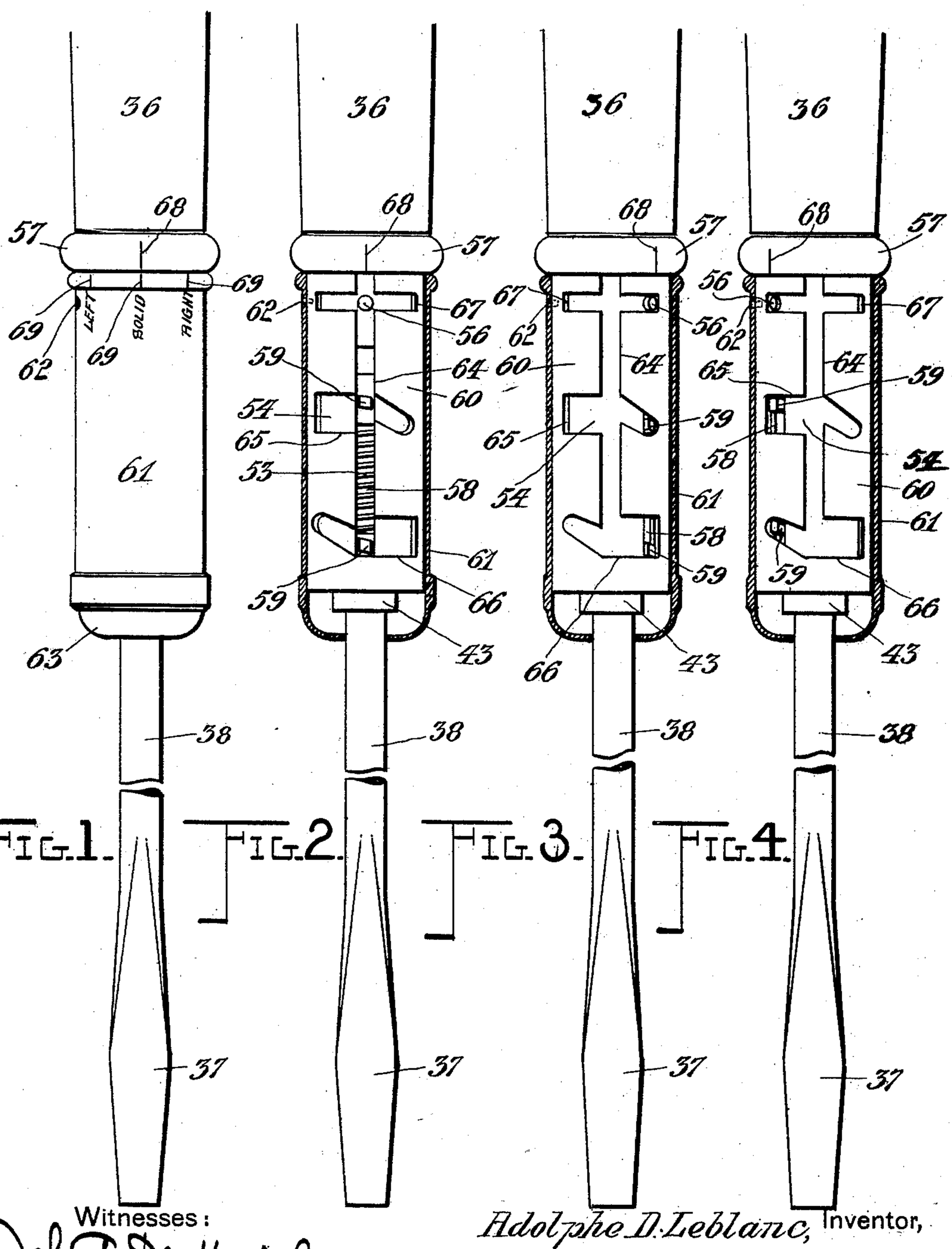
No. 711,169. Patented Oct. 14, 1902.

A. D. LEBLANC.

RATCHET SCREW DRIVER.

(Application filed June 5, 1902.)

(No Model.) 5 Sheets—Sheet 1.



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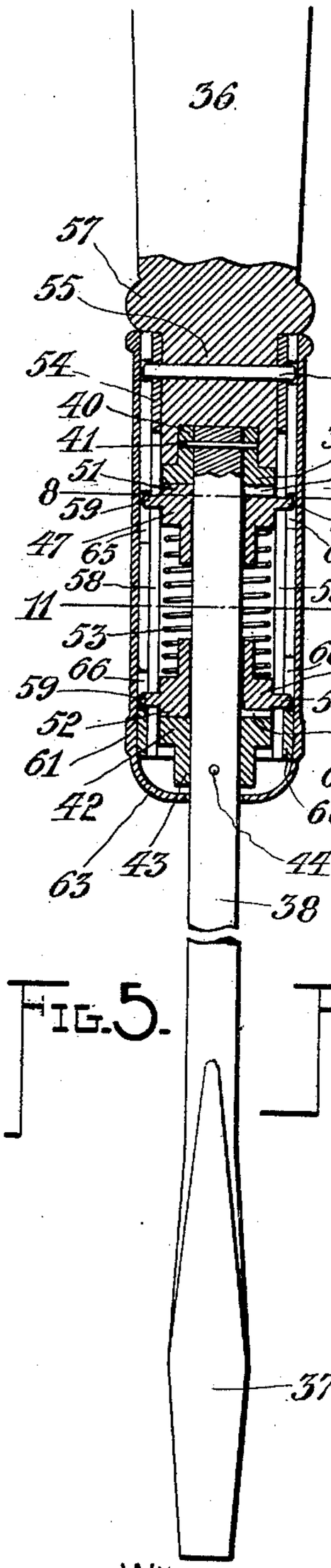

FIG. 5.

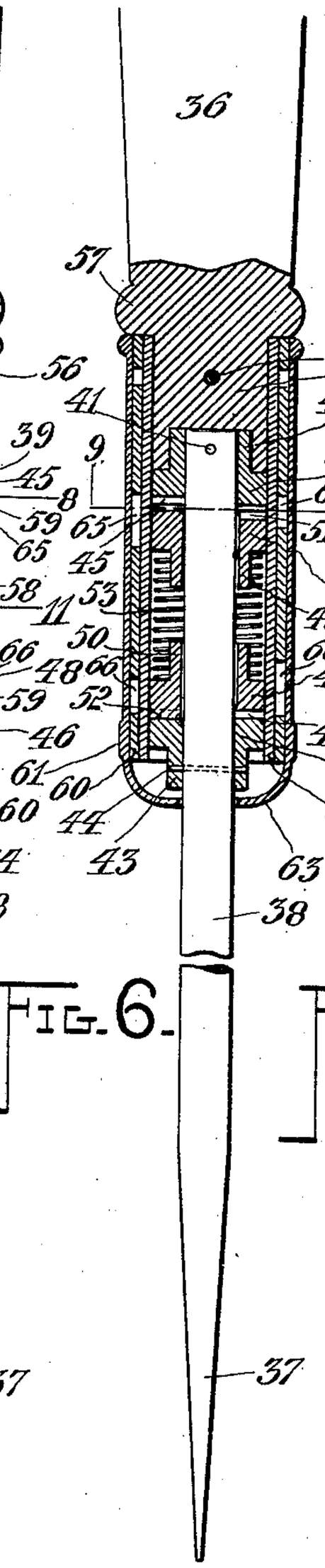

FIG. 6.

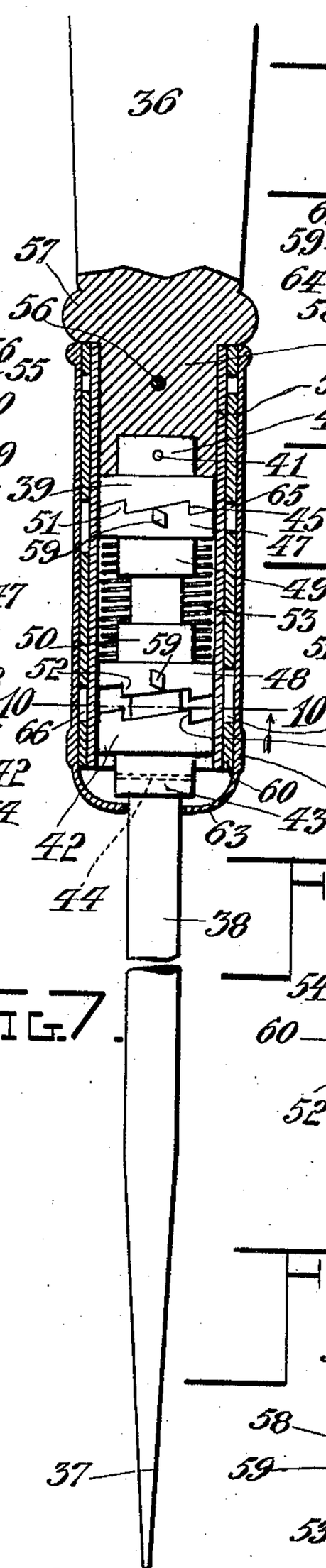

FIG. 7.

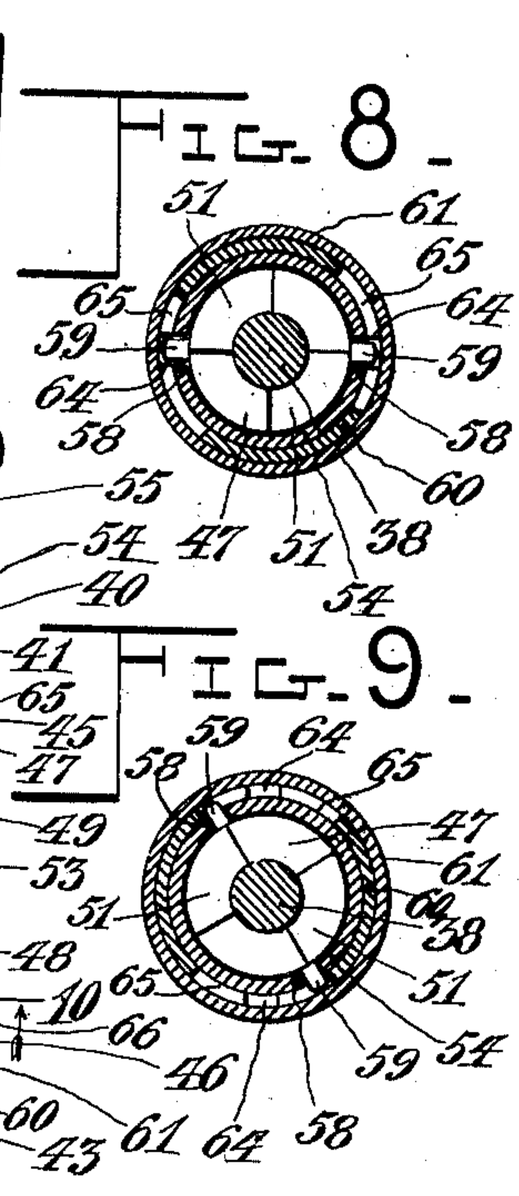

FIG. 8.

FIG. 9.

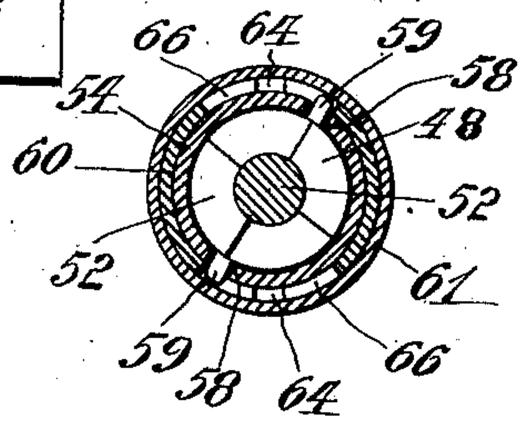

FIG. 10.

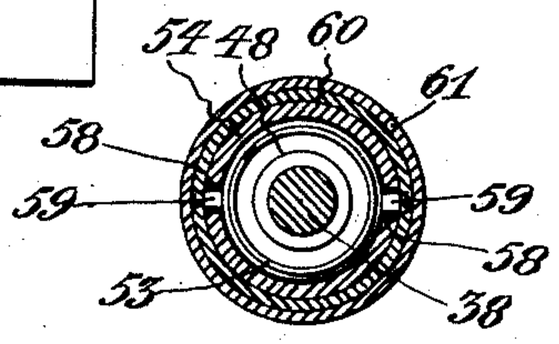

FIG. 11.

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(No Model.) 5 Sheets—Sheet 3.

FIG. 23.

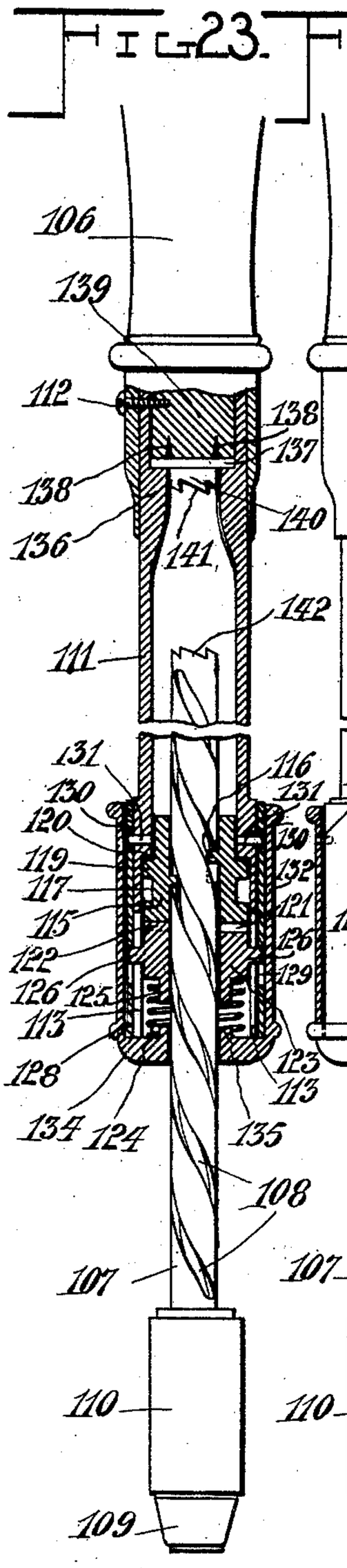

FIG. 24.

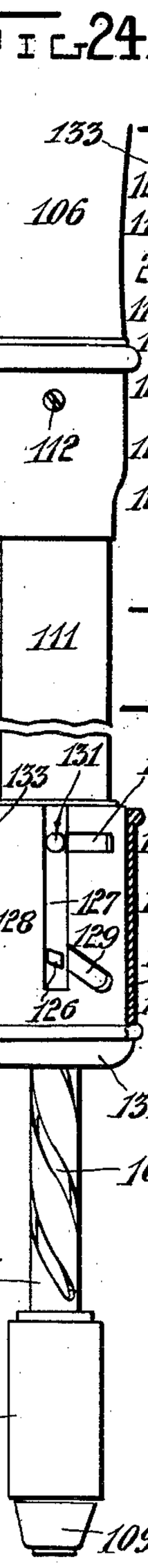

FIG. 26.

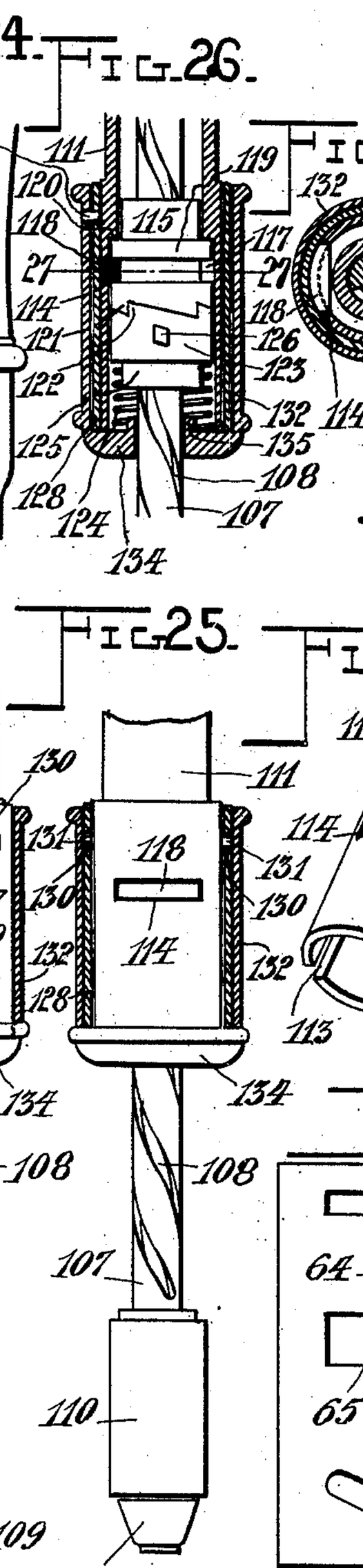

FIG. 27.

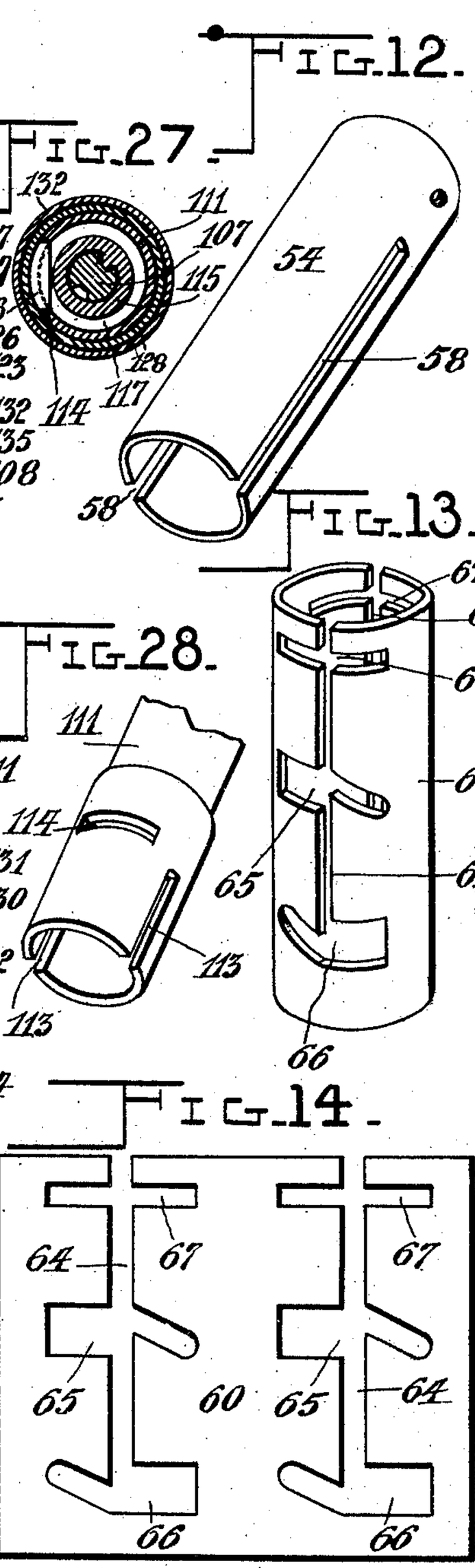

FIG. 12.

FIG. 13.

FIG. 25.

FIG. 28.

FIG. 14.

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(No Model.) 5 Sheets—Sheet 4.

FIG. 15.

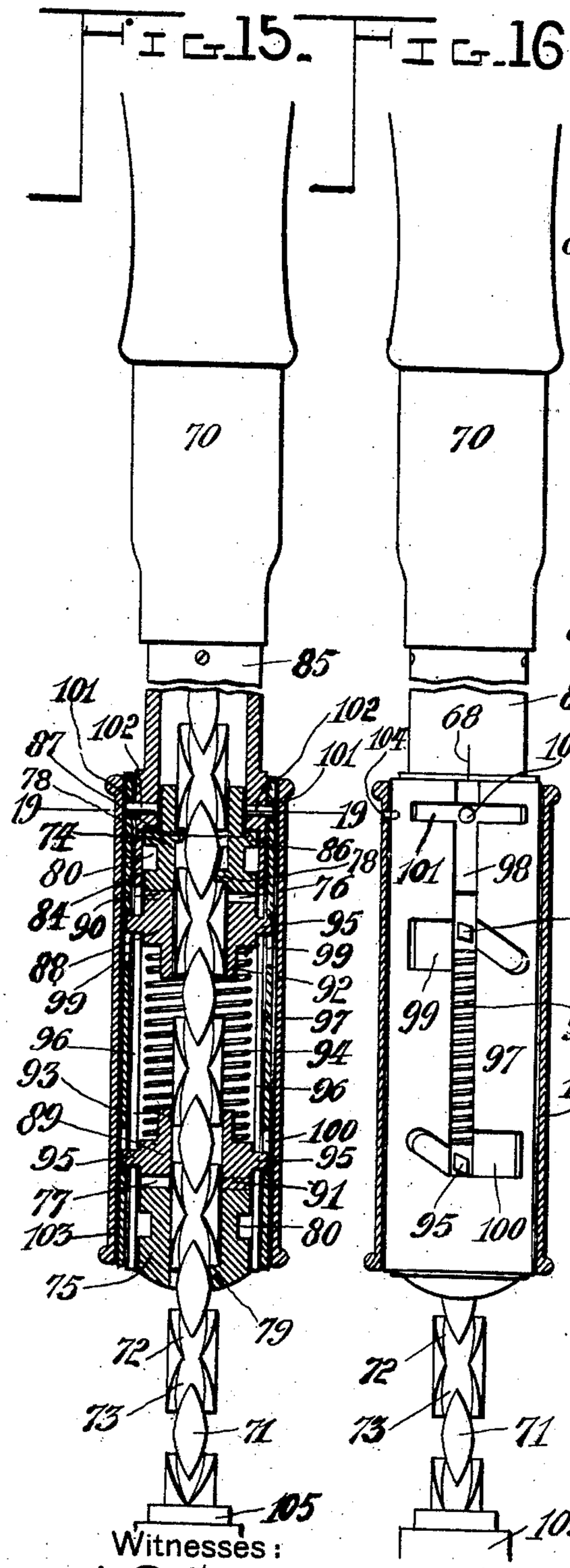


FIG. 16.

FIG. 18.

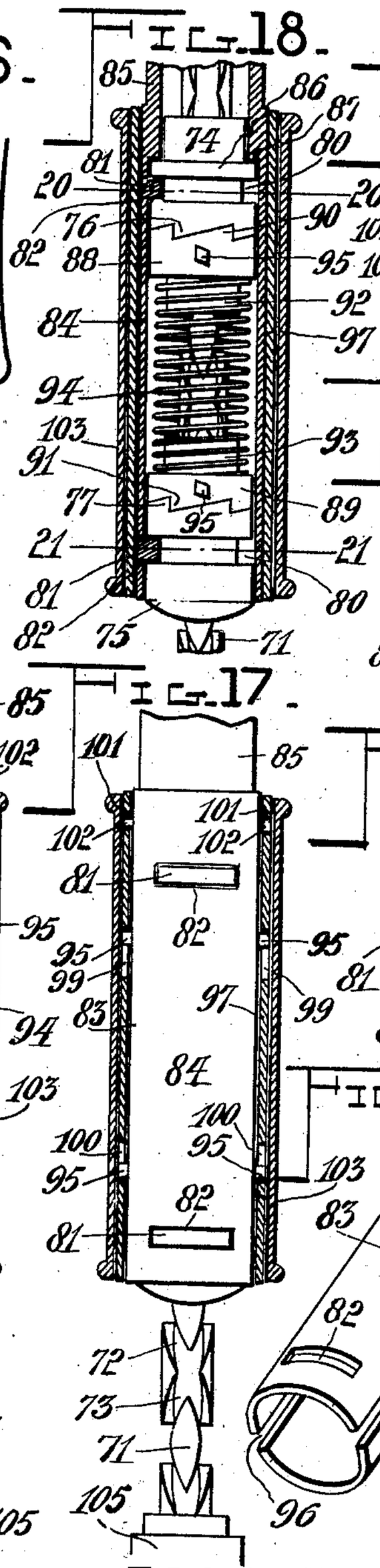


FIG. 19.

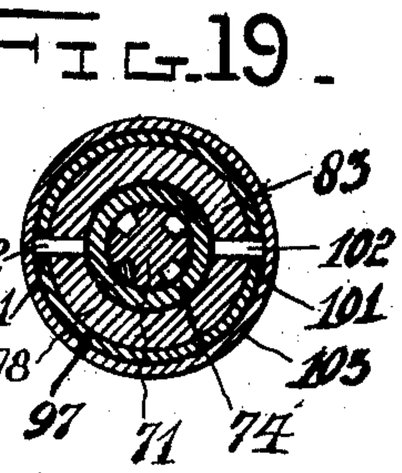


FIG. 20.

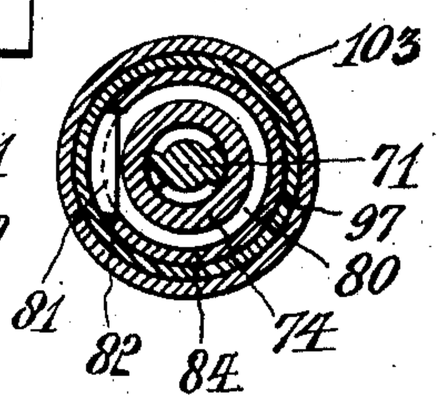


FIG. 17.

FIG. 21.

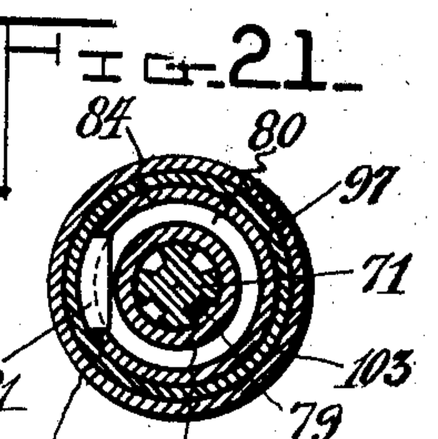
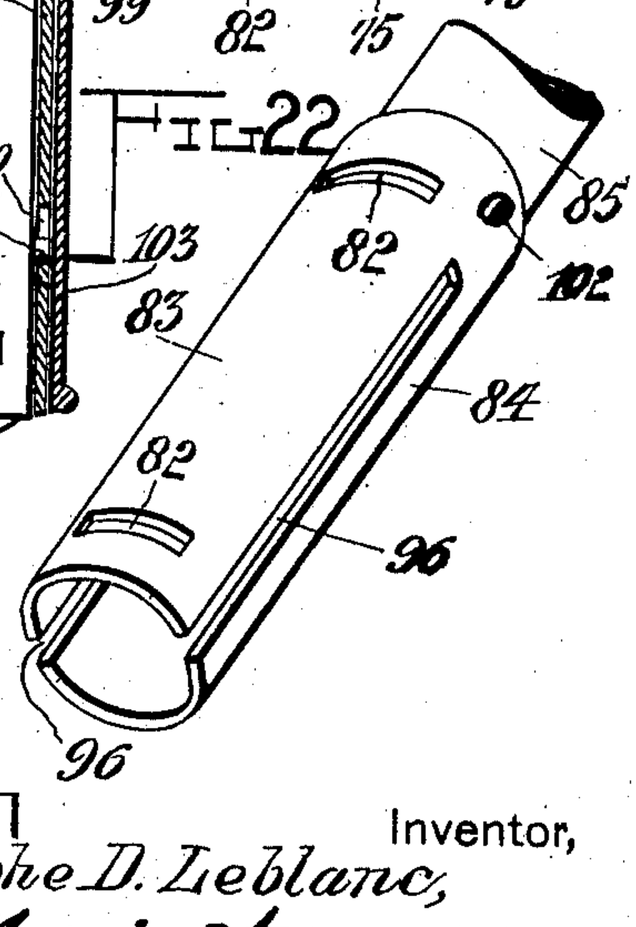


FIG. 22.



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RATCHET SCREW DRIVER.

(Application filed June 5, 1902.)

(No Model.) 5 Sheets—Sheet 5.

FIG. 29. FIG. 30. FIG. 31. FIG. 32.

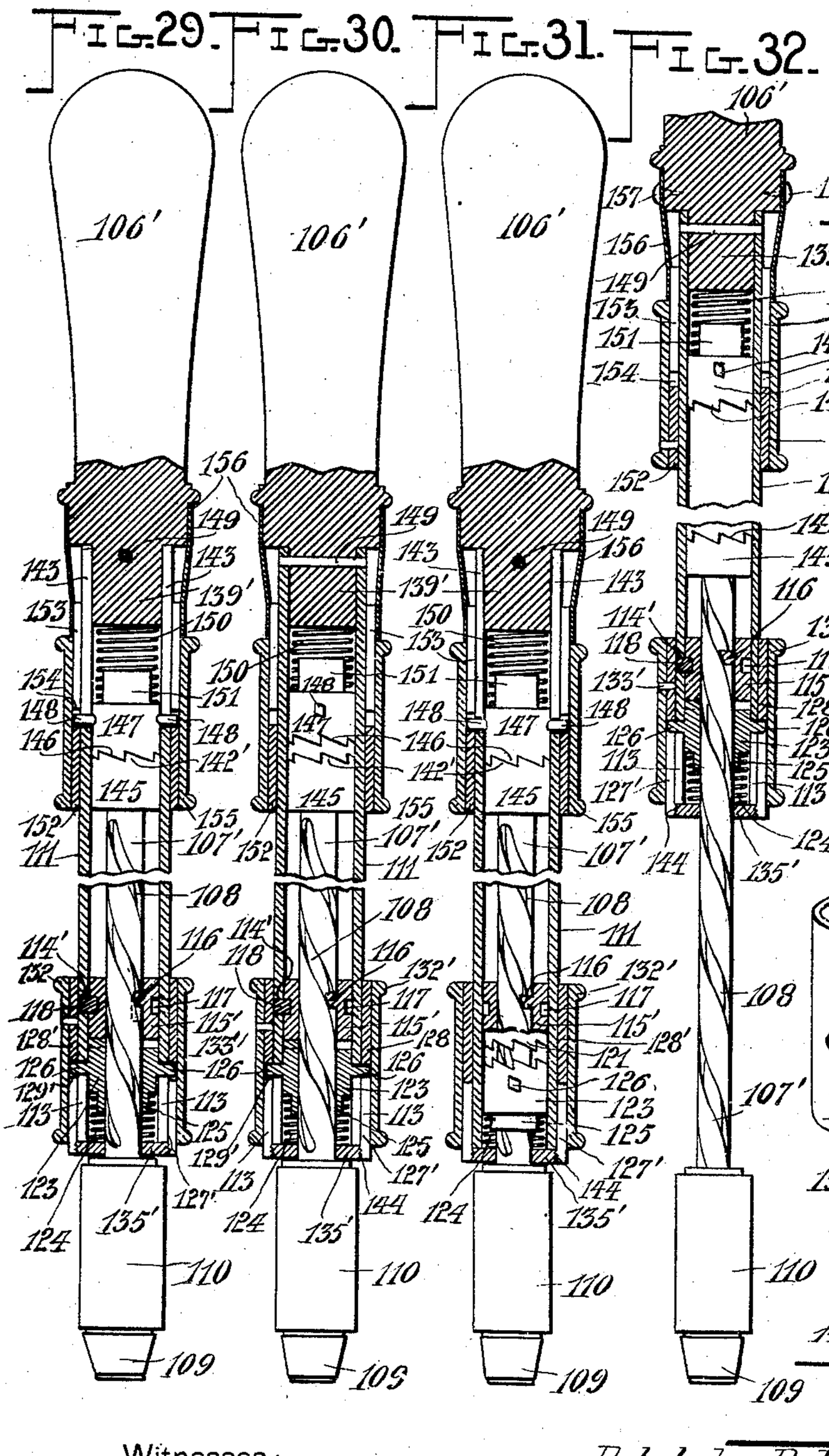

FIG. 33.

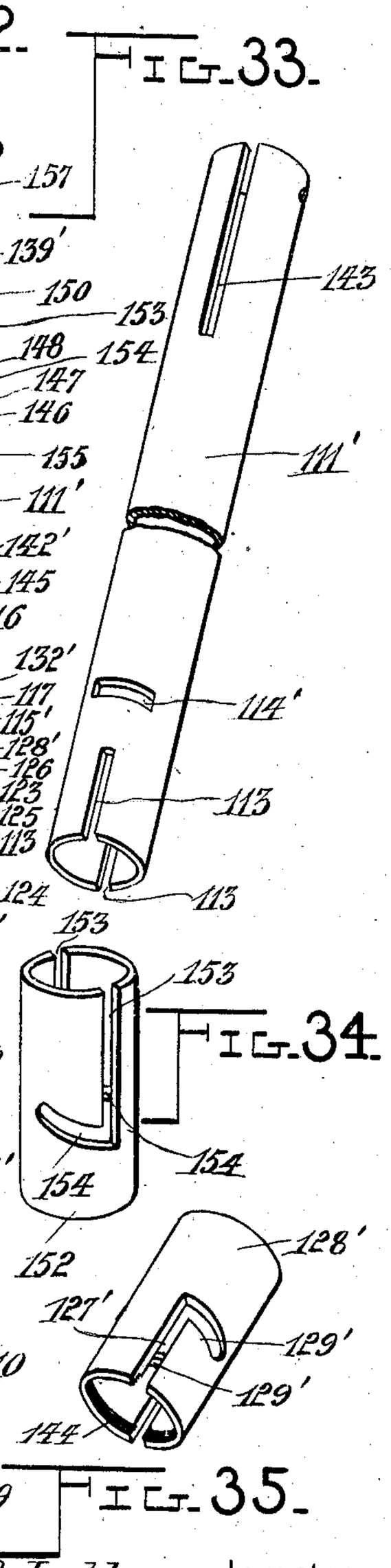

FIG. 34.

FIG. 35.

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UNITED STATES PATENT OFFICE.

ADOLPHE DELPHIS LEBLANC, OF MONTREAL, CANADA.

RATCHET SCREW-DRIVER.

SPECIFICATION forming part of Letters Patent No. 711,169, dated October 14, 1902.

Application filed June 5, 1902. Serial No. 110,248. (No model.)

To all whom it may concern:

Be it known that I, ADOLPHE DELPHIS LEBLANC, a subject of the King of Great Britain, residing in the city and district of Montreal, Province of Quebec, Canada, have invented certain new and useful Improvements in Ratchet Screw-Drivers; and I do hereby declare that the following is a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to ratchet mechanism especially adapted for certain wood and metal working tools which require to be rotated about their axis—as, for instance, bits, drills, and boring-tools generally; but my present improvements are especially adapted for use on screw-drivers.

The object of my invention is to produce a screw-driver of which the blade is connected to the handle by ratchet mechanism such as to cause the handle to turn with the blade in one direction of movement and to turn free from the blade in the opposite direction, or, again, when used in connection with what is known as the "spiral screw-driver" it is intended to cause the rotation of the screw-driver blade in a given direction when the blade is pushed down thereover and to permit it to remain stationary when the said handle is lifted therefrom.

Another object of my invention is to produce a duplex ratchet mechanism of this type which may be set so as to enable the above-mentioned object to be carried out when desired, or, again, by a simple shifting operation to fix the blade solidly to the handle, or, again, by a further shifting operation to reverse the direction of motion of the screw-driver blade.

Another object of my invention is to improve on mechanisms heretofore devised for this purpose, which had the fault of being too weak to solidly connect the blade and handle, so that they became easily broken, which fault was inherent in the mode of operation of the device and its construction.

To these and other ends my invention consists in a ratchet mechanism having interlocking crown-faced ratchet-wheels, one of which may be fixed to one of the rotating parts and the other slidably connected to the other rotating part, and I provide a rotatable sleeve covering the operative parts constituting the ratchet mechanism, which sleeve is so arranged that by shifting it from one point to another the two ratchet-wheels may be drawn out of interlocking connection with each other or restored thereto, according to the object in view.

In the most developed type of my ratchet mechanism I provide two sets of these crown-faced ratchet-wheels, one pair of which are connected either slidably or otherwise with the blade of the screw-driver or other tool, and the other pair are located between the two ratchet-wheels constituting the first pair and are held apart and against them by a spring. I further provide said last-mentioned pair of ratchet-wheels with certain radially-extending lugs or studs, which are adapted and arranged to slide in longitudinal slots formed in a sleeve fixed to the handle, and the said ratchet-wheels are arranged to be alternately pushed away from their respective interlocking wheels by said projecting lugs engaging in cam-slots in an outer rotatable sleeve, whereby the operation of the mechanism is changed, as will hereinafter be seen. I further adapt my crown-faced ratchet mechanism above referred to to screw-drivers or tools of the spiral type—that is to say, those having a spiral cam-groove whereby the shank or spindle of the tool is adapted to be rotated by the depression of the handle thereof—and examples of this construction will be hereinafter given.

My invention further consists in the construction and combination of parts hereinafter described, and more particularly brought out in the claims.

I have shown several forms in which my invention may be carried out in the accompanying drawings, wherein—

Figures 1 to 14, inclusive, illustrate the first form of ratchet mechanism, wherein the latter is adapted simply to a blade or shank rotatable about its axis relatively to the handle, but not reciprocable therein, and of these Fig. 1 is a side elevation showing the complete tool, unnecessary parts being broken away to enable the same to be illustrated within the limits of the sheet. Fig. 2 is a side elevation showing the adjusting-sleeve

in central longitudinal section and illustrating the adjustment to a solid connection of the handle and blade. Fig. 3 is a similar view to Fig. 2, showing the sleeve adjusted to the position adapted to a right-handed rotation of the blade. Fig. 4 is a similar view to Fig. 3, showing the adjustment in position for a left-handed rotation of the blade. Fig. 5 is a central longitudinal section through the ratchet mechanism, showing the blade in elevation and the parts in the position shown in Fig. 2. Fig. 6 is a similar view to Fig. 5, but showing the parts in the position shown in Fig. 3. Fig. 7 is a similar view to Fig. 6, but showing the parts in the position shown in Fig. 4 and the ratchet mechanism in elevation. Fig. 8 is a transverse section through the ratchet mechanism, taken on the line 8 8 of Fig. 5. Fig. 9 is a similar section taken on the line 9 9 of Fig. 6. Fig. 10 is a similar section taken on the line 10 10 of Fig. 7 looking from below. Fig. 11 is a similar section taken on the line 11 11 of Fig. 5. Fig. 12 is a perspective view of the handle-sleeve. Fig. 13 is a similar view of the cam-sleeve. Fig. 14 is a developed view of the cam-sleeve. Figs. 15 to 22 illustrate my ratchet mechanism as applied to a screw-driver of the double-spiral type, and of these Fig. 15 is a longitudinal central section through the ratchet mechanism, showing the screw-spindle and the handle in elevation and the parts in position for solid connection of the handle and screw-spindle similar to the position shown in Fig. 2. Fig. 16 is a side elevation with the adjusting-sleeve in longitudinal central section and the parts also as shown in Fig. 2. Fig. 17 is a view similar to Fig. 16, but taken at right angles thereto and showing both the adjusting and cam sleeves in longitudinal central section. Fig. 18 is a longitudinal central sectional elevation through the same parts as in Fig. 15 except that the ratchet-wheels and spring are shown in elevation. Fig. 19 is a transverse section on the line 19 19 of Fig. 15. Fig. 20 is a similar view taken on the line 20 20 of Fig. 18. Fig. 21 is a similar view taken on the line 21 21 of Fig. 18. Fig. 22 is a perspective view of the handle-sleeve of this type of tool. Figs. 23 to 28, inclusive, illustrate a third form of screw-driver of the single-spiral type, and of these Fig. 23 is a longitudinal central section through the ratchet mechanism, showing the handle and screw-spindle in elevation. Fig. 24 is a side elevation with the adjusting-sleeve in longitudinal central section. Fig. 25 is a similar view taken at right angles to Fig. 24 and showing both the adjusting and cam sleeves in longitudinal central section. Fig. 26 is a longitudinal central section of the mechanism constituting my invention, showing the screw-spindle and ratchet-wheels in elevation. Fig. 27 is a transverse section through the ratchet mechanism, taken on the line 27 27 of Fig. 26. Fig. 28 is a perspective view of the handle-sleeve. Figs. 29 to 35, inclusive, illustrate the fourth form of ratchet mechanism as adapted to a tool of the single-spiral type, and of these Fig. 29 is a central longitudinal section through the parts of the apparatus, showing the handle, screw-spindle, and one ratchet-wheel in elevation and the parts in position for solid connection. Fig. 30 is a similar view to Fig. 29, but showing the parts in position for right-handed rotation, as used in screwing in, either by the use of the spiral groove or by the ordinary oscillation of the handle, as in the first form of screw-driver. Fig. 31 is a similar view, but showing the parts in position for left-handed rotation, as used in unscrewing, this being accomplished by the oscillation of the handle. Fig. 32 is a similar view of the same tool, showing the adjustments as in Fig. 30 and the screw-spindle drawn out ready for use in the ordinary spiral method of screw-driving. Fig. 33 is a perspective view of the handle-sleeve used with this instrument shown in Figs. 29 to 32, inclusive. Fig. 34 is a similar view of the upper cam-sleeve. Fig. 35 is a similar view of the lower cam-sleeve.

The same numerals of reference denote like parts in each of the several figures of the drawings.

Referring first to the plain ratchet style, (illustrated in Figs. 1 to 14, inclusive,) this being the simplest construction, the handle of the screw-driver is shown at 36 and the blade at 37, the latter having a cylindrical shank 38, which abuts at its upper end against the base of the handle, as shown in Figs. 5, 6, and 7, and on its butt-end it carries a crown-faced ratchet-wheel 39, which has an axially-extending hub portion 40, which is secured fast to the cylindrical shank 38 by a transverse pin 41 or any suitable means. Some distance below this ratchet-wheel 39 is fixed another ratchet-wheel 42, the counterpart of the wheel 39, having a cylindrical hub 43, connected by a transverse pin 44 to the shank 38. The teeth 45 and 46 of the two crown-faced ratchet-wheels 39 and 42 are formed on the opposing faces of these wheels and are of a radial nature, having alternately axial and oblique faces, so as to be directed or pointed in opposite directions around the shank 38, and with them mesh two other ratchet-wheels, (designated, respectively, 47 and 48,) which have cylindrical hubs 49 and 50 and are loosely mounted on the shank 38 between the two ratchet-wheels 39 and 42, so as to permit both of rotation and reciprocation thereon. The two loose ratchet-wheels 47 and 48 have likewise radial ratchet-teeth 51 and 52, which are opposed in direction to the teeth 45 and 46, respectively, and coact therewith, so that when the teeth 45 are in engagement with the teeth 51 the wheel 47 drives the wheel 39 in a left-handed direction and when the teeth 46 are in engagement with the teeth 52 the wheel 48 drives the wheel 42 in a right-handed direction. The two loosely-mounted wheels 47 and 48 are held normally pressed

apart by a coiled spring 53, which lies within the circumference of the wheels and surrounds the hubs 49 and 50 thereof, being thus held separated from the shank 38, and thus when not otherwise prevented both of the loose wheels 47 and 48 are held in engagement with their respective fixed wheels 39 and 42, as illustrated in Fig. 5. Surrounding all four of the wheels and the spring thereof is a metallic sleeve 54, which is attached to the tongue 55 of the handle by means of a transverse pin 56 and is seated against the shoulder 57 of the handle, and the sleeve 54 will accordingly be appropriately designated herein as the "handle-sleeve." This sleeve is of an internal diameter sufficient to just inclose the ratchet-wheels, while permitting them to turn easily therein. It is provided on its sides with a pair of longitudinal slots 58, which extend from the bottom to a point near the top and are wide enough for the projection thereinto of a pair of laterally-projecting lugs 59, carried by each of the loose ratchet-wheels 47 and 48, which are thus prevented from turning relatively to the handle, while they are permitted to slide longitudinally therein, the said lugs 59 sliding in the slots 58, into which they extend. The handle-sleeve 54 is surrounded exteriorly by another sleeve, which fits loosely over it and is herein termed the "cam-sleeve," being designated by the numeral 60. This sleeve is also in turn surrounded by a solid sleeve 61, which slides loosely thereover and is secured thereto by one or more rivets 62 at any convenient point. This sleeve is therefore merely in the nature of a guard or covering for the cam-sleeve and the other operative parts and is herein termed the "adjusting-sleeve," because it is the part which is handled to adjust the ratchet mechanism to its different positions. This sleeve is solid for its entire length, and its lower end is inwardly curved, so as to surround and shield the mechanism, as shown at 63, this part lying close to the periphery of the shank 38. The cam-sleeve 60 is shown in perspective view in Fig. 13, and it has a series of cuts or slots therein, as follows: At opposite sides there are two longitudinal slots 64, which extend from the upper end to near the lower end and are of the same width as the slots 58 on the handle-sleeve 54, and into these slots extend also the projecting ends of the lugs 59, as shown in Figs. 2 and 5. Branching from each of these longitudinal slots and midway thereof is a cross-slot 65, the left-hand side of which is rectangular and of sufficient axial width to leave room for the reciprocation of the lugs 59 as the wheel 47 passes loosely over the teeth of the wheel 39 and to prevent it being engaged therewith. The other or right-hand end of the slot 65 is formed of the same width as the lug 59 and extends obliquely downwardly from the upper side of the left-hand portion of the slot 65 a sufficient distance to draw the lug 59 down far enough to draw the wheel 47 clear of the teeth 45, this position being illustrated in Figs. 3 and 6. At the lower end of the longitudinal slot 64 is another slot 66 of precisely the same shape as the slot 65 except that it is reversed, so that the rectangular portion is on the right hand and the oblique portion is on the left and extends upwardly instead of downwardly from the slot 66. Both of these slots are arranged opposite the lugs 59, so that the latter will pass thereinto when the cam-sleeve is turned in either direction from its central position by the adjusting-sleeve 61. This adjustment is clearly illustrated in Figs. 3 and 4. Near the upper end of each of the slots 64 is a transverse rectangular slot 67, with which coact the projecting ends of the pin 56, which pass thereinto as the sleeve 61 and cam-sleeve 60 are turned back and forth and prevent the latter from being withdrawn from their positions to cover the ratchet mechanism except when they are in central position, as shown in Fig. 2.

From the above description the operation of the form of my improvement thus far described will be clear without much further explanation. When the adjusting and cam sleeves are in the positions shown in Fig. 2, both of the loose ratchet-wheels 47 and 48 are free to be pressed by the spring 53 against the teeth of the opposing ratchet-wheels 39 and 42, as shown in Fig. 5, and the blade 37 is thus prevented from rotating in either direction relatively to the handle 36. When, however, the sleeve 61 is given a turn to the right, (as seen by the person holding the screw-driver,) the parts assume the position shown by Figs. 3 and 6, in which the upper ratchet-wheel 47 is drawn out of engagement with the teeth 45 of the ratchet-wheel 39, and the lower ratchet-wheel 48 is now resiliently engaged with the wheel 42, so as to forcibly rotate the screw-driver to the right, but to pass loosely over the teeth 46 when the handle 36 is oscillated toward the left, the parts being thus in position for right-handed screw-driving or screwing in of ordinary screws. When the sleeve 61 is turned in the opposite direction—that is to say, toward the left as seen by the person holding it—then the upper wheel 47 is returned into resilient engagement with the teeth 45 of the wheel 39, and the lower wheel 48 is drawn up out of engagement with the teeth 46 of the wheel 42, so that now the parts are in position for left-handed screw-driving—that is to say, the handle when oscillated to the left will forcibly carry the blade with it, but when oscillated in the opposite direction the wheel 47 passes loosely over the teeth 45 of the wheel 39, these positions being shown in Figs. 4 and 7. To indicate the various positions to the user of the tool, I may appropriately form a mark or incision 68 on the shoulder 57 of the handle, which is opposite to one of three corresponding marks or nicks 69, which may be appropriately marked with the words "Left," "Solid," and "Right,"

as shown in the drawings. When the handle-sleeve is central, then the ends of the pin 56 are opposite the longitudinal slots 64 and the two outer sleeves may be readily withdrawn from the handle-sleeve, thus releasing also the ratchet mechanism, which is attached to the shank 38 of the blade, and permitting the same to be open to inspection.

I will now describe the second form of my improved screw-driver, which is shown in Figs. 15 to 22, inclusive, this form being that known as the "double-spiral" type and adapted for spiral screw-driving. I herein provide a handle 70 and a loose screw-spindle 71, which has two oppositely-wound pairs of spiral grooves 72 and 73, these numerals designating the left-hand and right-hand grooves, respectively, adapted, respectively, to right and left hand screw-driving. Upon this spindle 71 are mounted two crown-faced ratchet-wheels 74 and 75, which resemble the ratchet-wheels 39 and 42 and have oppositely-facing ratchet-teeth 76 and 77 formed on their opposing faces; but the ratchet-wheels 74 and 75 are in this case not rigidly attached to the spindle 71, but have each a pair of inwardly-extending spiral lugs designated, respectively, 78 and 79, the first of which on the upper ratchet-wheel 74 extend into the right-hand spiral grooves 73, while the other, 79, on the lower ratchet-wheel 75 extend into the left-hand spiral groove 72. It will thus be seen that each of the two ratchet-wheels is capable of a certain spiral movement on the screw-spindle 71 when not otherwise prevented therefrom; but the two pairs of spirals are in opposite directions, corresponding to the two spiral grooves. In order to prevent the two ratchet-wheels 74 and 75 from moving longitudinally relatively to one another and to keep them in their proper positions, each of these ratchet-wheels is provided with an annular groove or recess 80, into which extends a segmental or saddle-shaped key 81, (shown in plan view in Figs. 20 and 21,) which keys are loosely fixed in rectangular transverse grooves 82, formed at the top and bottom of the handle-sleeve 83, which is of considerable length, as usual in this type of screw-driver, having an enlarged portion 84 surrounding the ratchet mechanism and corresponding roughly to the handle-sleeve 54 of the first form of screw-driver and a reduced tubular portion 85, which need be only of sufficient diameter to permit of the reciprocation of the butt-end of the screw-spindle 71 therein, and the upper end of the handle-sleeve 83 is secured to the handle 70 by any suitable means. The keys 81 thus hold the two ratchet-wheels 74 and 75 in proper position at the ends of the enlarged portion 84 of the handle-sleeve, while permitting them to rotate freely at all times, and the upper ratchet-wheel 74 may also be provided with a collar 86, seated against a shoulder 87, formed on the upper end of the enlarged portion 84 of the handle-sleeve, whereby to further sustain the ratchet-wheel 74 against the thrust of the handle. Between the two ratchet-wheels 74 and 75 thus confined are loosely mounted a second pair of ratchet-wheels 88 and 89, the crown-teeth 90 and 91 of which mesh, respectively, with the teeth 76 and 77 in the same manner as in the form first described, and the two ratchet-wheels 88 and 89 are similarly provided with reduced hubs 92 and 93, about which is coiled a compression-spring 94, and with projecting lugs 95, which also extend into the two longitudinal slots 96 in the handle-sleeve. Outside of the handle-sleeve is mounted also a cam-sleeve 97, which has longitudinal and transverse slots 98, 99, and 100, formed precisely the same as and corresponding to the slots 64, 65, and 66, respectively, so that when the cam-sleeve is turned to the right or left one of the two pairs of lugs 95 and the ratchet-wheel 88 or 89 on which they are mounted are carried out of engagement with the opposing ratchet-wheel 74 or 75, so as to permit the latter to turn free thereof. The cam-sleeve 97 is also preferably provided near the upper end with a pair of transverse slots 101, similar to the transverse slots 67 and with which coact two pins 102, which project radially from the side of the handle-sleeve 83 at opposite ends of a diameter. The cam-sleeve may be properly covered by a suitable adjusting-sleeve 103, to which it is connected by a rivet 104. The mode of operation of this form of screw-driver is analogous to that of the one formerly described, the screw-spindle 71 taking the place of the blade 37, there being a chuck 105 at the lower end thereof, to which the blade or other tool may be secured. When the adjusting-sleeve 103 is in the center, as shown in Fig. 16, the two ratchet-wheels 88 and 89 are free and the teeth thereof are in engagement with those of the opposing ratchet-wheels 74 and 75, and thus the latter are fixed, and the screw-spindle is likewise fixed to the handle and can have no movement relative thereto. Now when the adjusting-sleeve is turned in one direction from the center—say toward the left, as seen by the holder—one of the loose ratchet-wheels (in this case the upper one, 88) is carried down by the cam-slot 99 out of engagement with the wheel 74, and when pressure is now brought upon the handle 70, the screw-spindle 71 being drawn out therefrom, the lug 79 on the ratchet-wheel 75 will force the screw-spindle to rotate as the handle is pushed down over the spindle, being itself kept from rotating by engagement with the wheel 89, the lugs 95 of which engage with the sides of the slots 96 in the handle-sleeve. When the spindle is completely covered and the handle is at the bottom thereof, it is drawn up again for another screwing operation, and the ratchet-wheel 75 will now rotate freely on the groove 72, because the wheel 89 offers no resistance to its backward motion, and said wheel 89 will therefore click loosely over the teeth 77 of the wheel 75, permitting the handle 70 to ascend without rotating the spindle

71 in either direction. During both the ascending and descending movements of the handle the upper ratchet-wheel 74 will of course be rotated alternately first in one direction and then in the other as it passes up and down in the groove 73; but this will not interfere with the movements of the handle, inasmuch as the teeth 90 of the wheel 88 are held out of engagement therewith. When the adjusting-sleeve 103 is turned in the opposite direction—that is to say, toward the left—the reverse movements will take place—that is to say, the lower ratchet-wheel 89 is now drawn up out of engagement with the teeth 77 of the ratchet-wheel 75 by means of the oblique cam-groove 100, while the upper ratchet-wheel 88 is permitted to be pressed into engagement with the teeth 76 of the wheel 74 by the spring 94, and when the handle 70 is now pressed downwardly the spindle 71 will be caused to rotate in a left-handed direction, as in ordinary unscrewing operations. Also this screw-driver is capable not simply of spiral screw-driving, as thus far described, but equally well of ratchet screw-driving, as in the case of the original form, and this takes place without further adjustment when the handle 70 is at the bottom of the screw-spindle 71, and by oscillating said handle precisely the same movements of the ratchet-wheels take place as in the case of the first-described form of my invention whether the adjusting-sleeve be set for a right-handed or left-handed screwing operation.

The third form of my invention (illustrated in Figs. 23 to 27, inclusive) is different from either of the foregoing, and being adapted for only one direction of spiral screw-driving is somewhat less simple in some respects than either of the foregoing. In this case the handle of the screw-driver is designated as 106 and the screw-spindle as 107, having formed spirally thereon a pair of unidirectional spiral grooves 108 and carrying at its lower end any suitable form of chuck 109, with a hand-collar 110 loosely fitted over the same. The handle-sleeve 111 is similar in a general way to the handle-sleeve 83 of the former type of screw-driver, having a long tubular portion attached at its upper end to the handle by means of a suitable fastening 112 and having its lower end enlarged, as shown in Fig. 28, and provided with a pair of opposite longitudinal slots 113 and a pair of short transverse rectangular slots 114 intermediate of the same, these two pairs of slots corresponding to the slots 96 and 82, respectively. Surrounding the spindle 107 is a single ratchet-wheel 115, having a pair of lugs 116 extending into the grooves 108 to connect the ratchet-wheel 115 operatively therewith. The ratchet-wheel 115 has an annular groove or recess 117 around its periphery, into which extends a segmental key 118, seated in the slot 114 of the handle-sleeve and which forms a means of sustaining the wheel 115 to keep it in place, while the latter has a thrust-collar 119 seated against the shoulder 120 of the handle-sleeve to take the thrust of the ratchet-wheel 115. The ratchet-wheel 115 has crown-teeth 121, which mesh with the oppositely-directed crown-teeth 122 of the loose ratchet-wheel 123, which is free on the screw-spindle 107 and is normally held pressed into engagement with the ratchet-wheel 115 by a coiled spring 124, surrounding the reduced hub portion 125 thereof. The loose ratchet-wheel 123 has a pair of radial lugs 126, which extend into the slots 113 of the handle-sleeve, and thus prevent the wheel 123 from rotating relatively thereto, and they also project beyond the latter into the longitudinal slots 127 of the cam-sleeve 128, which in this case is provided with a simple obliquely and downwardly directed cam-slot 129, extending from the right side only of said slots 127, because this cam-sleeve has a motion in only one direction from the position shown in Fig. 24. The cam-sleeve 128 is further provided near the top with a pair of rectangular transverse slots 130, which extend likewise only from the side of the slots 127 and are arranged to receive the ends of a pair of pins 131, which project radially from opposite sides of the handle-sleeve, as shown in Fig. 23, thus preventing the cam-sleeve and the adjusting-sleeve 132, secured thereto by a rivet 133, from being removed except when they are in the position shown in Fig. 24. The lower end of the adjusting-sleeve 132 is in this case turned inwardly to form an annular cup-shaped flange 134, which has surrounding the spindle 107 an upstanding hub or axial flange 135, adapted to form a guard for the end of the spring 124, similar to the hub 125 of the ratchet-wheel 123. Near the upper end of the handle-sleeve and within the same is an annular shoulder 136, on the upper side of which is sustained a disk 137, which has points or lugs 138 on its upper surface driven into the butt or shank 139 of the handle 106, and depending from the lower side of the disk 137 is a crown-faced ratchet 140, having teeth 141 directed in the opposite direction from that of the teeth 122 on the ratchet-wheel 123. This ratchet 140 is of the same general diameter as the screw-spindle 107, which has on its upper end a set of oppositely-directed coacting teeth 142, adapted to engage the teeth 141 when the screw-spindle is fully retracted into the handle-sleeve 111. In this position it will be seen that the instrument is adapted for left-handed ratchet screw-driving, provided the ratchet-wheel 123 is drawn out of engagement with the wheel 115, by turning the adjusting-sleeve to the left from the position shown in Fig. 24. In the position shown in the drawings the instrument is ready for right-handed spiral screw-driving, and in this case the interlocking ratchet-wheels 123 and 115 cause the rotation of the spindle 107 when the handle 106 is pushed down thereover, and when it has reached the bottom of the spindle the instrument is then

ready for solid screw-driving in either direction.

An improvement on the instrument last described, though somewhat less simple, is that illustrated in Figs. 29 to 35, inclusive, which is also adapted for unidirectional spiral screw-driving, but for ratchet screw-driving in either direction, as may be desired. This instrument, like that of Figs. 23 to 28, inclusive, has a handle 106′, a screw-spindle 107′, having a pair of left-handed spiral grooves 108, a chuck 109, and a hand-collar 110. The handle-sleeve 111′ (illustrated in perspective in Fig. 33) has at its lower end a pair of opposite longitudinal cuts or slots 113 and at its upper end a similar pair of slots 143. On the lower end of the sleeve 111′ is rotatably mounted a crown-faced ratchet-wheel 115′, having a pair of lugs 116 extending into the grooves 108, and said ratchet-wheel has an annular groove 117, into which extends the segmental key 118, which is mounted in the transverse slot 114′ of the sleeve 111′ exactly as in the case of the corresponding and partly identical parts in Figs. 23 to 28. The intermeshing ratchet-wheel 123, having the radial lugs 126, and the reduced hub portion 125 are also exactly the same as in the form referred to, while a coiled spring 124 is seated against the lower end of the wheel 123 to hold it resiliently in engagement with the wheel 115′. Around the lower end of the handle-sleeve 111′ is loosely mounted a cam-sleeve 128′, which is of a different form from the sleeve 128, inasmuch as the longitudinal slots 127′ thereof are cut from the lower end up to a point opposite the lugs 126 when in their normal or upper position—that is to say, the slots 127′ are of the same length as the slots 113. From the upper end of the slots 127′ and at the right side thereof extend the transverse oblique slots 129′, into which the lugs 126 are drawn when the cam-sleeve 128′ is rotated to the left, thus withdrawing the ratchet-wheel 123 from engagement with the ratchet-wheel 115′. The lower end of the cam-sleeve 128′ has in this case an internal screw-thread 144, which engages with the external thread on a disk 135′, which surrounds the spindle 107, and closes the lower end of the cam-sleeve, forming a rest or abutment for the spring 124. Exteriorly of the sleeve 128′ is fixed the adjusting-sleeve 132′, which is fixed to the cam-sleeve by a transverse rivet 133′. The handle-sleeve 111′ is, as shown, not reduced at its upper end, but is continuously cylindrical throughout, and the upper end of the spindle 107′ has a cylindrical head 145, which is of the same diameter as the internal diameter of the sleeve 111′ and is guided thereby to hold the spindle in axial position. The upper side of this head 145 is provided with a set of ratchet-teeth 142′, faced in the opposite direction from the teeth 121 of the ratchet-wheel 115′, and these teeth engage with the opposing teeth 146 on a crown-faced ratchet-wheel 147, which is reciprocably mounted in the upper end of the sleeve 111′ and which has oppositely-disposed radial lugs 148, which are engaged in the upper longitudinal slots 143 of the handle-sleeve 111′. The handle 106′ has a tenon 139′ projecting into the upper end of the handle-sleeve and secured thereto by a transverse pin 149 or other suitable means, and between the lower end of the tenon 139′ and the ratchet-wheel 147 is mounted a compression-spring 150, which keeps the ratchet-wheel in downwardly-pressed position and is guided by the radial hub 151 of the ratchet-wheel, which lies within the coils of the spring, as shown. Externally of the handle-sleeve, on the upper end thereof, is mounted a second cam-sleeve 152, which is of a similar form to that of the sleeve 128′, having a pair of oppositely-disposed longitudinal slots 153, depending from the top end to a point intermediate of said sleeve, and a pair of transverse oblique cam-slots 154, extending from the lower end of said longitudinal slots upwardly and to the left, as shown in Fig. 34, the bottom of the slots 153 being level with the bottom of the slots 143, so as to permit the ratchet-wheel 147 to reach the lowest point of its movement when the slots 153 overlie the slots 143. Externally of the cam-sleeve 152 may be appropriately mounted a second adjusting-sleeve 155, by which the cam-sleeve may be turned in either direction to lower or raise the ratchet-wheel 147. The upper end of the cam-sleeve 152 projects into a cover-sleeve 156, carried by the handle and secured thereto by pins 157.

The position of the ratchet-wheel 147 is such that the head 145 of the screw-spindle will be engaged with it when the screw-spindle has been fully retracted within the handle and when said ratchet-wheel 147 is in its lowermost position, and in this case the lower cam-sleeve 128′ having been turned by the adjusting-sleeve 132′, so as to withdraw the ratchet-wheel 123 from the ratchet-wheel 115′, the screw-driver is in position for left-handed ratchet screw-driving, the teeth 146 being engaged with the teeth 142′, so as to turn the screw-spindle with the handle when the latter is oscillated to the left, but to cause the teeth 146 to click loosely over the teeth 142′ when the handle 106′ is oscillated in the opposite direction. If, on the other hand, both adjusting-sleeves 132′ and 155 are rotated in the opposite direction—that is to say, to the left, as seen by the holder of the tool—the ratchet-wheel 147 will be withdrawn out of engagement with the teeth 142′ of the head 145 and the ratchet-wheel 123 will be restored to engagement with the ratchet-wheel 115′, so that now the oscillation of the handle will be followed by a right-handed rotation of the screw-spindle and the tool or blade carried thereby. The position is the same when used for spiral screw-driving, the handle being withdrawn and pushed down over the screw-spindle, as in the usual manner, and is already illustrated in the preceding form of tool, this in-and-out

motion being followed by a rotation of the screw-driver in one direction and a loose rotation of the wheel 123 in the opposite direction, as will be evident.

The many different forms under which my invention may appear and the different styles of tools to which it may be applied will now be evident, as well as the great improvement embodied in this or preceding styles of instrument, whereby the action is not merely facilitated, but the tool greatly strengthened, as hereinabove pointed out.

While I have shown in the accompanying drawings the preferred form of my invention, it will be understood that I do not limit myself to the precise form shown, for many of the details may be changed in form or position without affecting the operativeness or utility of my invention, and I therefore reserve the right to make all such modifications as are included within the scope of the following claims or of mechanical equivalents to the structures set forth.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A ratchet mechanism for screw-drivers and similar tools comprising a handle, a spindle rotatably mounted therein, a pair of interlocking ratchet-wheels mounted on said spindle, one of which is rotatively connected to said spindle and the other rotatively connected to said handle, means for resiliently pressing said ratchet-wheels into interlocking engagement, a radially-projecting lug formed on and extending outwardly from said last-mentioned ratchet-wheel, and a cam-sleeve surrounding said handle and loosely mounted thereon and having a cam-slot into which said lug projects, whereby the rotation of said cam-sleeve causes the two ratchet-wheels to be withdrawn from interlocking connection.

2. A ratchet mechanism for screw-drivers and similar tools comprising a handle having a sleeve extending from the lower end thereof and solidly fixed thereto, a spindle rotatable in said handle within said sleeve, a pair of crown-faced ratchet-wheels connected with said spindle and having oppositely-facing teeth, a second pair of crown-faced ratchet-wheels loosely mounted on said spindle and reciprocably connected with said handle and adapted to interlock with the respective first-named ratchet-wheels and to be disengaged therefrom, means for resiliently pressing said second pair into engagement with said first pair, one or more radial lugs projecting from said second pair, and a rotatable sleeve mounted on said first-named sleeve and having oblique cam-slots therein into which said lugs project, whereby rotation of the sleeve in opposite directions causes the members of said second pair to be alternately withdrawn from said first pair.

3. A ratchet mechanism for screw-drivers and similar tools comprising a handle having a sleeve extending from the lower end thereof and solidly fixed thereto, a spindle rotatable in said handle within said sleeve, a pair of crown-faced ratchet-wheels connected with said spindle and having oppositely-facing teeth, a second pair of crown-faced ratchet-wheels loosely mounted on said spindle and reciprocably connected with said handle and adapted to interlock with the respective first-named ratchet-wheels and to be disengaged therefrom, means for resiliently pressing said second pair into engagement with said first pair, one or more radial lugs projecting from said second pair and extending through longitudinal slots in said sleeve, a rotatable sleeve mounted on said first-named sleeve and having cam-slots therein into which said lugs project, whereby rotation of the sleeve in opposite directions causes the members of said second pair to be alternately withdrawn from said first pair, and an adjusting-sleeve inclosing said rotatable sleeve and secured thereto and forming a casing for said ratchet mechanism.

4. A ratchet mechanism for screw-drivers and similar tools comprising a handle, a cylindrical handle-sleeve fixed to the lower end thereof and having longitudinal slots therein, a spindle or shaft rotatably mounted in said handle concentrically of said sleeve, a pair of crown-faced ratchet-wheels connected with said spindle and having teeth on their adjacent faces oppositely directed from one another, a second pair of crown-faced ratchet-wheels loosely mounted on said spindle between said first pair and having teeth interlocking respectively with the members of said first pair, a spring mounted on said spindle between said second pair of ratchet-wheels and adapted to press them resiliently into interlocking engagement with the first pair, a pair of oppositely-disposed radial lugs projecting from each of said second pair of ratchet-wheels and extending into said longitudinal slots, and a second sleeve rotatably mounted on the first sleeve and having oblique cam-slots therein into which said radial lugs project, whereby the rotation of said second sleeve in one direction from the central position causes one ratchet-wheel of the second pair to be removed from interlocking engagement with the corresponding wheel of the first pair, and a rotation in the opposite direction removes the other ratchet-wheel of the second pair from interlocking engagement with the other wheel of the first pair.

5. A ratchet mechanism for screw-drivers and similar tools comprising a handle, a cylindrical handle-sleeve fixed to the lower end thereof and having longitudinal slots therein, a spindle or shaft rotatably mounted in said handle concentrically of said sleeve, a pair of crown-faced ratchet-wheels connected with said spindle and having teeth on their adjacent faces oppositely directed from one another, a second pair of crown-faced ratchet-wheels loosely mounted on said spindle between said first pair and having teeth inter-

locking respectively with the members of said first pair, a spring mounted on said spindle between said second pair of ratchet-wheels and adapted to press them resiliently into interlocking engagement with the first pair, a pair of oppositely-disposed radial lugs projecting from each of said second pair of ratchet-wheels and extending into said longitudinal slots, a second sleeve rotatably mounted on the first sleeve and having oblique cam-faces therein into which said radial lugs project, whereby the rotation of said second sleeve in one direction from the central position causes one ratchet-wheel of the second pair to be removed from interlocking engagement with the corresponding wheel of the first pair, and a rotation in the opposite direction removes the other ratchet-wheel of the second pair from interlocking engagement with the other wheel of the first pair, and an adjusting-sleeve covering and inclosing said second sleeve and the ratchet mechanism and connected to said second sleeve, whereby to enable the same to be rotated by the hand.

6. A ratchet mechanism for screw-drivers and similar tools comprising a handle, a cylindrical handle-sleeve fixed thereto and depending therefrom, a spindle rotatably mounted within said handle-sleeve and concentrically therewith, a pair of crown-faced ratchet-wheels fixed respectively to the upper end and to an intermediate point of said spindle and having oppositely-directed ratchet-teeth on their opposing faces, a second pair of ratchet-wheels loosely mounted on said spindle between said first pair and having crown-teeth arranged to interlock with the members of said first pair, a coiled compression-spring surrounding said spindle and abutting against said second pair of ratchet-wheels to press them into resilient engagement with the first pair, a pair of oppositely-disposed radial lugs on each ratchet-wheel of said second pair arranged to extend into longitudinal slots formed in said handle-sleeve to prevent said second pair of ratchet-wheels from rotating relatively thereto, and a cam-sleeve rotatably mounted on said handle-sleeve and having a pair of longitudinal slots extending from the upper to near the lower end thereof, and transverse oblique and rectangular slots arranged to receive and engage the projecting ends of said radial lugs.

7. A ratchet mechanism for screw-drivers and similar tools comprising a handle, a cylindrical handle-sleeve fixed thereto and depending therefrom, a spindle rotatably mounted within said handle-sleeve and concentrically therewith, a pair of crown-faced ratchet-wheels fixed respectively to the upper end and to an intermediate point of said spindle and having oppositely-directed ratchet-teeth on their opposing faces, a second pair of ratchet-wheels loosely mounted on said spindle between said first pair and having crown-teeth arranged to interlock with the members of said first pair, a coiled compression-spring surrounding said spindle and abutting against said second pair of ratchet-wheels to press them into resilient engagement with the first pair, a pair of oppositely-disposed radial lugs on each ratchet-wheel of said second pair arranged to extend into longitudinal slots formed in said handle-sleeve to prevent said second pair of ratchet-wheels from rotating relatively thereto, a cam-sleeve rotatably mounted on said handle-sleeve and having a pair of longitudinally-extending slots from the upper end to near the lower end thereof, and transverse oblique and rectangular slots arranged to receive and engage the projecting ends of said radial lugs, a transverse pin connecting said handle-sleeve to the handle and having projecting ends extending into a transverse slot in the upper end of said cam-sleeve, and an adjusting-sleeve inclosing said cam-sleeve and the operative parts and solidly fixed to said cam-sleeve, substantially as described.

8. A ratchet mechanism for screw-drivers and similar tools comprising a handle, a tubular sleeve fixed thereto and depending from the lower end thereof, a screw-spindle having a pair of opposite spiral grooves rotatably and reciprocably mounted in said sleeve and concentric therewith, a pair of crown-faced ratchet-wheels rotatably keyed to said sleeve and prevented from longitudinal motion therein and having lugs extending into the respective spiral grooves of said spindle, a second pair of crown-faced ratchet-wheels having teeth adapted to interlock with the teeth of said first pair loosely mounted on said spindle and reciprocably keyed to said sleeve, means for resiliently pressing said second pair of ratchet-wheels into engagement with said first pair, and means for independently withdrawing either of said second pair of ratchet-wheels from the corresponding wheel of the first pair.

9. A ratchet mechanism for screw-drivers and similar tools comprising a handle, a tubular sleeve fixed thereto and depending from the lower end thereof, a screw-spindle having a pair of opposite spiral grooves rotatably and reciprocably mounted in said sleeve and concentric therewith, a pair of crown-faced ratchet-wheels rotatably keyed to said sleeve and prevented from longitudinal motion therein and having lugs extending into the respective spiral grooves of said spindle, a second pair of crown-faced ratchet-wheels having teeth adapted to interlock with the teeth of said first pair loosely mounted on said spindle and reciprocably keyed to said sleeve, means for resiliently pressing said second pair of ratchet-wheels into engagement with said first pair, and an adjusting-sleeve having means attached thereto, whereby the rotation thereof in opposite directions alternately withdraws the wheels of the second pair from engagement with the corresponding wheels of the first pair.

10. A ratchet mechanism for screw-drivers

and similar tools comprising a handle, a tubular sleeve fixed thereto and depending from the lower end thereof, a screw-spindle having a pair of opposite helical grooves therein and rotatably mounted in said sleeve and concentric therewith, a pair of crown-faced ratchet-wheels having oppositely-directed teeth on their opposed faces, said ratchet-wheels being rotatably keyed to said handle-sleeve and prevented from longitudinal motion therein and having lugs extending into the respective helical grooves, a second pair of ratchet-wheels loosely mounted on said screw-spindle between the members of said first pair and having crown-teeth engaging respectively therewith, a coiled compression-spring mounted on said screw-spindle and resiliently pressing the members of said second pair into engagement with the members of said first pair, a pair of opposite radial lugs on each of said second pair projecting into longitudinal slots in said tubular sleeve, and a cam-sleeve having oblique slots therein arranged to engage the projecting ends of said radial lugs and alternately withdraw the wheels of the second pair from engagement with the respective wheels of the first pair.

11. A ratchet mechanism for screw-drivers and similar tools comprising a handle, a tubular sleeve fixed thereto and depending from the lower end thereof, a screw-spindle having a pair of opposite helical grooves therein and rotatably mounted in said sleeve and concentric therewith, a pair of crown-faced ratchet-wheels having oppositely-directed teeth on their opposed faces, said ratchet-wheels being rotatably keyed to said handle-sleeve and prevented from longitudinal motion therein and having lugs extending into the respective helical grooves, a second pair of ratchet-wheels loosely mounted on said screw-spindle between the members of said first pair and having crown-teeth engaging respectively therewith, a coiled compression-spring mounted on said screw-spindle and resiliently pressing the members of said second pair into engagement with the members of said first pair, a pair of opposite radial lugs on each of said second pair projecting into longitudinal slots in said tubular sleeve, a cam-sleeve having oblique slots therein arranged to engage the projecting ends of said radial lugs and alternately withdraw the wheels of the second pair from engagement with the respective wheels of the first pair, and an adjusting-sleeve covering said cam-sleeve and the operative parts of the mechanism, substantially as described.

In witness whereof I have hereunto set my hand in the presence of two witnesses.

ADOLPHE DELPHIS LEBLANC.

Witnesses:

T. MYNARD,

J. ED. PAGE.