E. E. COGSWELL.

DRILL CHUCK.

APPLICATION FILED APR. 20, 1910.

969,341. **Patented Sept. 6, 1910.**

Fig. 1.

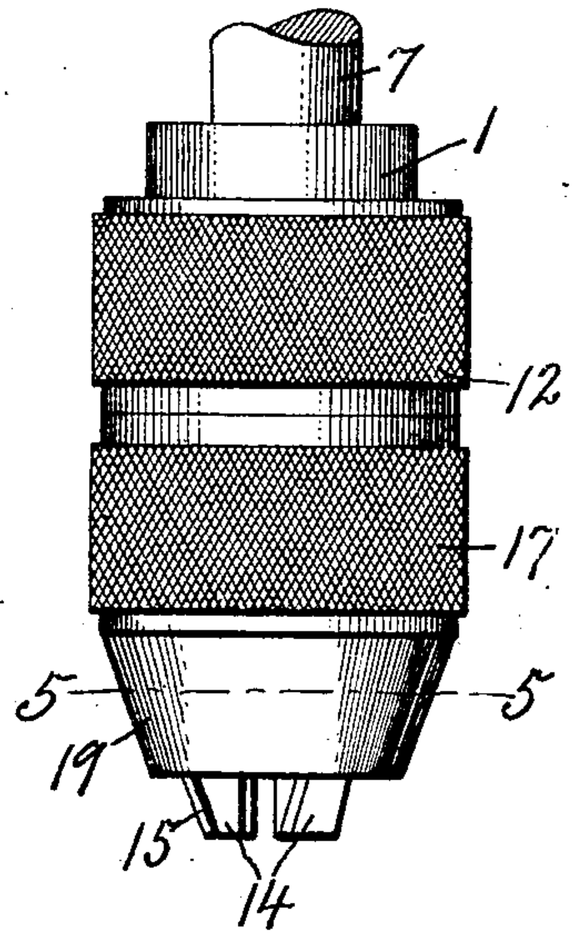


Fig. 2.

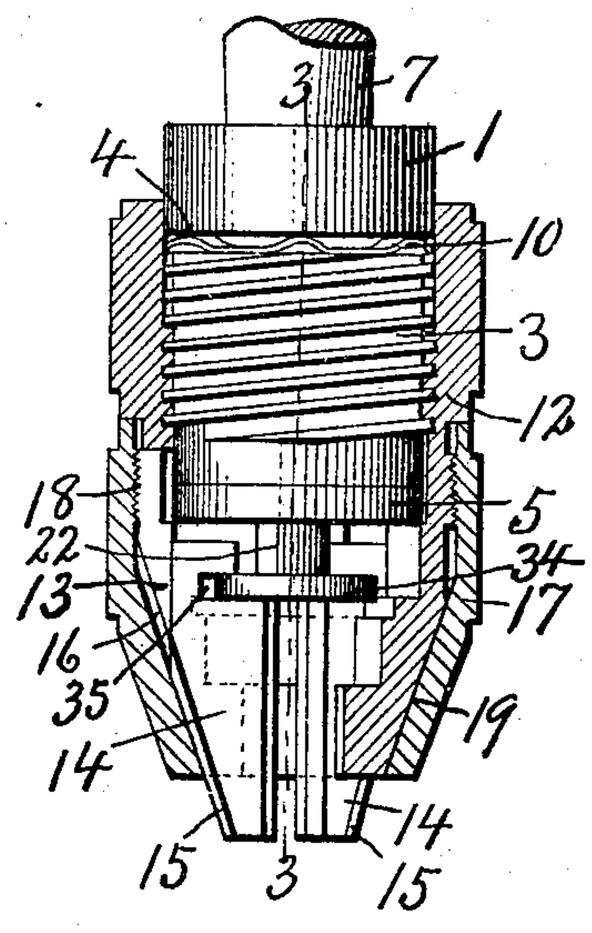


Fig. 3.

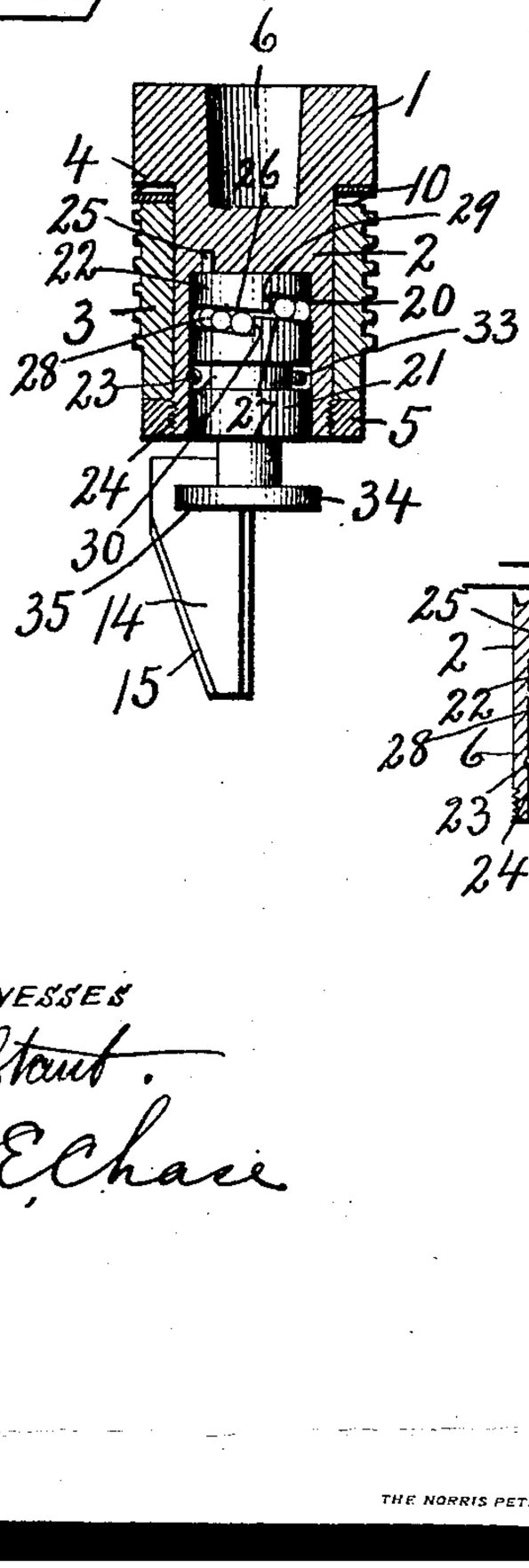


Fig. 5.

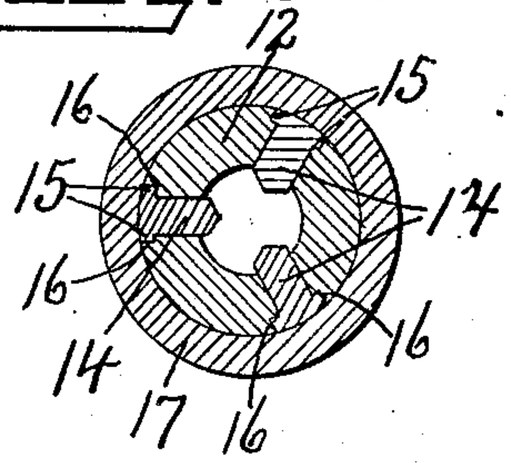


Fig. 4.

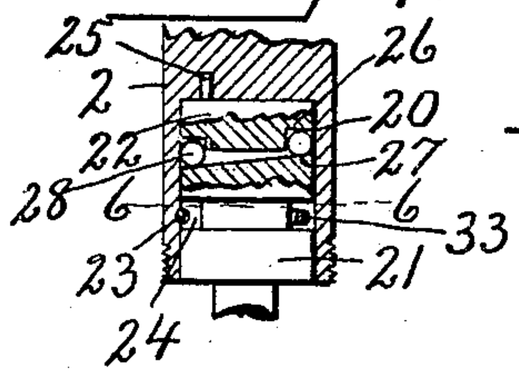
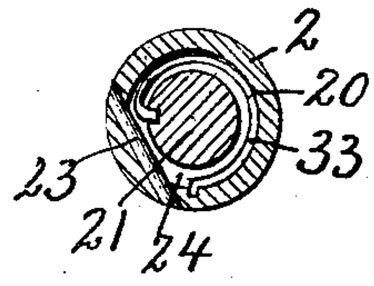


Fig. 6.



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DRILL-CHUCK.

969,341. Specification of Letters Patent. **Patented Sept. 6, 1910.**

Application filed April 20, 1910. Serial No. 556,590.

To all whom it may concern:

Be it known that I, ELMER E. COGSWELL, of Syracuse, in the county of Onondaga, in the State of New York, have invented new and useful Improvements in Drill-Chucks, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

This invention relates to certain improvements in drill chucks similar to that set forth in my pending application No. 548,535, filed March 11, 1910, involving the use of threaded members screwing one upon the other and radially movable jaws guided in tapering ways on one of said members and operatively connected to the other member whereby the relative endwise movement of said members causes the jaws to open and close.

The main object as in my copending case referred to is to provide means whereby the jaws may be opened and closed or changed from one extreme position to the other with greater rapidity and with a less number of turns than usual with the chucks now in common use.

Another object is to prevent the jaw operating elements, such as the threaded head and sleeve, from becoming set one upon the other when the jaws are tightly set upon the work. In other words I have sought to provide means whereby the final tightening and initial releasing operations of the jaw actuating mechanism may be effected independently of the rotation of the threaded parts one upon the other, and at the same time to render the action of said means automatic and dependent upon such relative rotation of the threaded elements.

One of the specific objects of my present invention over that shown in my copending application referred to, is to simplify the general structure, so that the parts may be quickly and easily assembled and at the same time to provide a more uniform end thrust spring pressure between the outer end of the threaded sleeve and adjacent portion of the head bv interposing a circular flat spring suitably corrugated to give it the desired resilience.

A further specific object is to interpose the retracting spring for the auxiliary head in the same groove which receives the retaining pin for holding said auxiliary head against endwise movement.

Other objects and uses relating to specific parts of the jaw tightening and releasing mechanism will be brought out in the following description.

In the drawings: Figure 1 is an elevation of a drill chuck embodying the various features of my invention. Fig. 2 is a sectional view of the casing showing the interior mechanism in elevation. Fig. 3 is a longitudinal sectional view taken on line 3—3, Fig. 2, omitting the outer casing, showing the auxiliary jaw supporting head and cams in elevation. Fig. 4 is a longitudinal sectional view through the auxiliary head and cams. Figs. 5 and 6 are transverse sectional views taken respectively on line 5—5, Fig. 3 and 6—6, Fig. 4.

This chuck comprises a main head —1— having a reduced portion —2— upon which is loosely mounted for independent rotary movement and slight axial movement an externally threaded sleeve —3—, the latter being interposed between a shoulder —4— on the head —1— and a nut —5— which is screwed upon the outer end of the reduced portion —2— at the opposite end of the sleeve.

The reduced portion —2— of the head —1— is provided at one end with a tapering socket —6— for the reception of a correspondingly tapered drill spindle —7—, the opposite end of said reduced portion extending some distance beyond the adjacent end of the threaded sleeve —3— and is threaded externally for receiving the nut —5—.

The nut —5— is rigidly secured to the head —1— and therefore becomes a part thereof, while the sleeve —3— is free to rotate relatively to and upon the reduced portion of the head —1— and is spring pressed axially against the nut —5— by a circular flat spring —10— which is interposed between the annular shoulder —4— and adjacent end of the sleeve —3—. Another object of this spring is to afford a limited resistance to the independent rota-

tion of the sleeve —3— upon the head —1— and at the same time permitting such independent rotation during the final tightening and initial releasing of the jaws upon and from the work in a manner hereinafter more clearly described.

An internally threaded casing section —12— is screwed upon the externally threaded sleeve —3— and embraces or surrounds the main portion of the head —1— and is provided at its lower end with radial slots or ways —13— for the reception and guidance of radially movable jaws —14—. The outer edges of these jaws are tapered and provided with laterally projecting ribs —15— which ride in corresponding grooves —16— opening from the outer faces of the casing section —12—, the adjacent portion of which is tapered to correspond to the taper of the jaws.

An additional sleeve section —17— is threaded internally near its upper end at —18— and engaged with a correspondingly threaded portion upon the casing section —12—, the lower end of the section —17— being tapered at —19— and engaged with the outer tapering edges of the jaws —14—, thereby holding the jaws against outer displacement and at the same time coacting with the guide ways —13— of the section —12— to effect the opening and closing of the jaws as the casing is rotated in opposite directions upon the head —1—.

The reduced portion —2— of the head —1— is provided with a lengthwise socket —20— opening from its lower end in which is mounted for independent rotary and axial movement an auxiliary head —21— together with a cam disk —22—, which constitute a part of the mechanism for effecting the final tightening and initial releasing of the jaws upon and from the work independently of the relative movement of the casing or head one upon the other.

The auxiliary head —21— is held against undue axial movement or displacement by means of a pin or key —23— secured tangentially to and projecting inwardly from one side of the socket —20— and into an annular groove —24— in said head, the vertical width of the groove being slightly greater than the diameter of the pin —23— to permit a limited axial movement of the head.

The disk —22— is seated in the upper end of the socket —20— and held against rotation by a suitable stud or pin —25— which is fitted in a corresponding socket in the adjacent portion of the head —1—.

The lower end of the disk —22— is provided with an inclined spiral cam face —26— and coöperates with a similar inclined spiral cam face —27— on the adjacent end of the head —21—, said cam faces being normally spaced a uniform distance apart to form a ball race for the reception of anti-friction roller bearings —28—.

The high points of the cam faces —26— and —27— preferably overlap and constitute abutments or shoulders —29— and —30— forming the ends of the ball race which is therefore of slightly less length than the circumference or periphery of the parts upon which the inclined cam faces are formed.

The auxiliary head —21— is yieldingly connected to the main head —1— by a segmental spring —33— located in the groove —24— and having one end interlocked with the auxiliary head —21— and its other end similarly interlocked with the head —1—. The object of this spring —33— is to retract the head —21— after being shifted from its normal position during the final operation of tightening the jaws upon the work and immediately following the operation of releasing the jaws.

The anti-friction balls or rollers —28— are arranged in close proximity, side by side, in such manner as to normally fill the ball race and thereby limit the return of the auxiliary head —21— so that when the head —21— is in its normal position the end balls butt against their respective shoulders —29— and —30—.

The lower end of the head —21— extends some distance beyond the corresponding end of the head —1— and terminates in an annular flange —34— upon which the jaws —14— are mounted for radial movement, said jaws being provided with transverse slots —35— opening from their inner edges for receiving the flange —34— and permitting the rotation of the jaws relatively thereto as the casing —11— is rotated upon the head —1—.

It will be observed upon reference to Fig. 2 that the intermeshing threads of the sleeve —3— and casing section —12— are of comparatively coarse pitch to produce a rapid opening and closing of the jaws by the rotation of the casing upon said sleeve.

As previously stated, the sleeve —3— is frictionally held against rotation by the spring —10— but it is clearly apparent that if the friction between the threads of the casing section —12— and said sleeve is sufficient to overcome the resistance offered by the spring —10—, said sleeve will rotate with the casing relatively to the head —1—, thereby preventing excessive friction between said threads when the jaws are firmly tightened upon the work, as will hereafter be pointed out in the description of the operation.

In tightening the jaws upon the work by the rotation of the casing to the right, the tapering ways —13— coacting with the cor-

responding tapering faces of the jaws serve to force the jaws inwardly and to exert an upward pressure thereon, thereby frictionally binding them to the flange —34— of the auxiliary head —21— and rotating said head in the same direction which causes the rollers —28— to ride up their respective inclines and moves the auxiliary head —21— axially or downwardly. This downward axial movement of the head —21—, although slight, causes the jaws to ride downwardly and inwardly against the tapering sides of the casing to more firmly grip the jaws upon the work. During this final tightening operation and while the jaws are being frictionally bound against the head —21—, the resistance offered thereby tends to draw the casing —11— downwardly with sufficient force to frictionally bind the threads of the casing upon the threads of the sleeve —3—, so that any further effort to tighten the jaws by the rotation of the casing will turn the sleeve against the frictional resistance of the spring —10—, thereby slightly rotating the head —21— against the action of the spring —33— and causing the rollers to ride up the inclines of the cam faces and thus additionally tighten the jaws upon the work independent of the relative movement of the casing upon the sleeve. In releasing the jaws, these operations are reversed, that is by the rotation of the casing to the left its frictional grip upon the sleeve will cause said sleeve to rotate slightly against the resistance of the springs —10—, while the jaws —14— which are at this time frictionally bound to the head —21— operate to slightly rotate said head in the same direction, thus causing the rollers to ride down the incline of the cam faces and allowing said head to slightly rise, by which operation the jaws will of course be moved upwardly and outwardly just sufficient to relieve their grip upon the work, all of which is easily accomplished without excessive binding of the casing and without relative movement of the casing upon the sleeve. The return movement of the head —21— to its starting position with the end balls in engagement with the shoulders —29— and —30— is effected by the spring —33—.

It is evident from the foregoing description that as soon as the grip of the jaws upon the work is relieved the excessive friction between the threads of the casing —11— and sleeve —3— is also relieved thus permitting the casing to be rotated upon said sleeve for rapidly opening and closing the jaws from and upon the work.

When the jaws are not engaged with the work, the casing —11— is free to rotate upon the threaded sleeve —3— relatively to the head —1—, thereby initially moving the jaws around and radially of the auxiliary head, the spring —10— serving to frictionally hold the sleeve —3— against rotation while the spring —33— yieldingly holds the auxiliary head in its normal position.

As the jaws are tightened upon the work they tend to rise by reason of their engagement with their tapering seats on the casing which also tends to draw the casing downward thereby frictionally locking the casing to the threaded sleeve —3— whereupon the casing and sleeve rotate together relatively to the head —1—, while at the same time the jaws become frictionally locked to the auxiliary head so that the further rotation of the casing, jaws and sleeve relatively to the main head produces a slight rotation of the auxiliary head against the action of the spring —33—. This slight rotation of the auxiliary head causes the balls to ride up the inclines of the cams —26— and —27— and thereby force the auxiliary head and jaws downwardly to increase the grip of the jaws upon the work.

In releasing the jaws assuming that they are tightly set upon the work the casing will be rotated to the left and by reason of its frictional engagement with the sleeve —3— and also the tight frictional engagement of the jaws with the auxiliary head —21—, said sleeve, auxiliary head and jaws will be similarly rotated relatively to the main head —1— thereby causing the rollers —28— to ride down the inclines of the cams —26— and —27— and permitting the auxiliary head to rise slightly to release the jaws from their tight grip on the work whereupon the spring —33— immediately retracts the auxiliary head to its normal position and permits the outer casing to rotate freely upon the threaded sleeve —3—. This threaded sleeve therefor constitutes an important feature of the final tightening and initially releasing the jaws, the spring —33— also constituting an important feature of the invention in assuring the return of the auxiliary head to its starting position after the initial releasing of the jaws from the work.

What I claim is:

A drill chuck comprising a main head having an annular shoulder on one end and a nut on its opposite end, an externally threaded sleeve rotatably mounted upon the head between said shoulder and nut, a circular spring surrounding the head between said shoulder and adjacent end of the sleeve and normally pressing said sleeve endwise against the nut to frictionally hold the sleeve against undue movement, a cam on the head, an auxiliary head coaxial with and rotatable relatively to the main head and provided with an annular groove, a cam on the auxiliary head, roller bearings between

the cams for moving the auxiliary head endwise as the latter is rotated, jaws engaged with and movable radially of the auxiliary head, an internally threaded casing engaged with the threaded sleeve and jaws for moving the latter radially as the casing is rotated, and a retracting spring in the groove of the auxiliary head for returning said auxiliary head rotarily to its normal position when the jaws are loosened.

In witness whereof I have hereunto set my hand on this 11th day of April 1910.

ELMER E. COGSWELL.

Witnesses:
H. E. CHASE,
H. L. HUMPHREY.