E. E. COGSWELL.

DRILL CHUCK.

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962,746.

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Fig. 1.

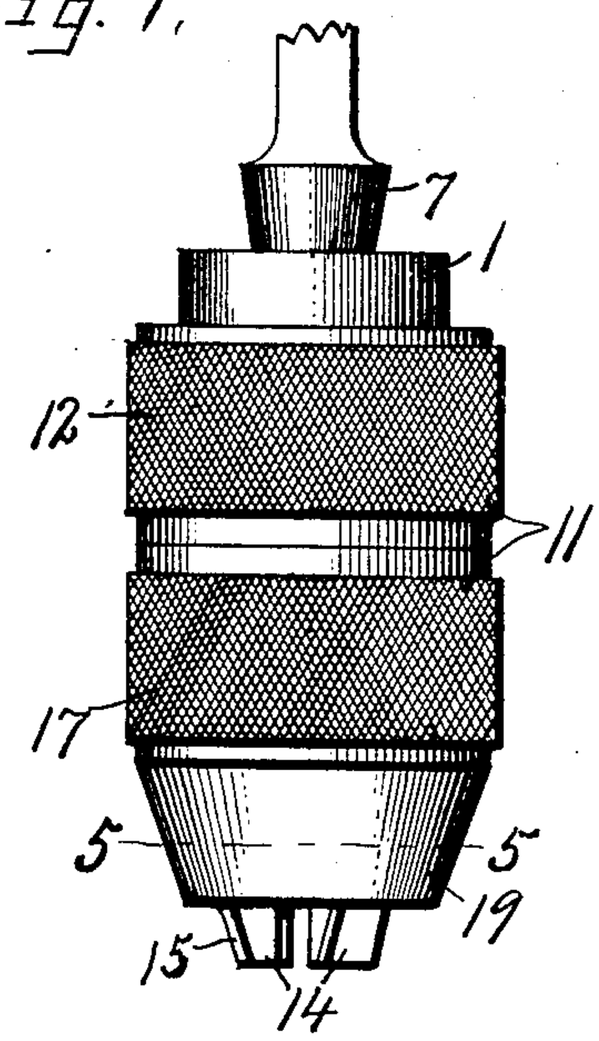


Fig. 2.

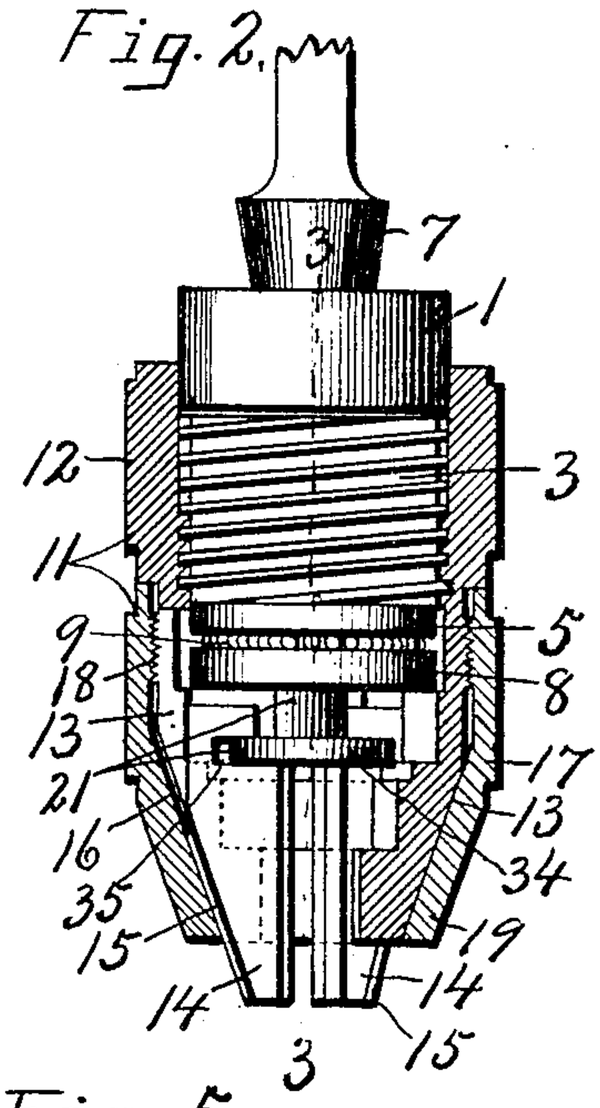


Fig. 3.

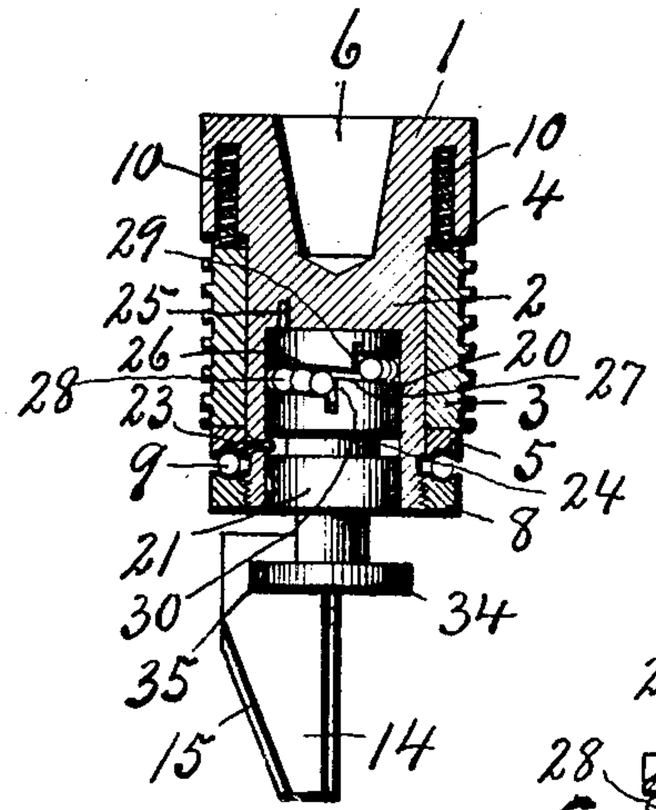


Fig. 4.

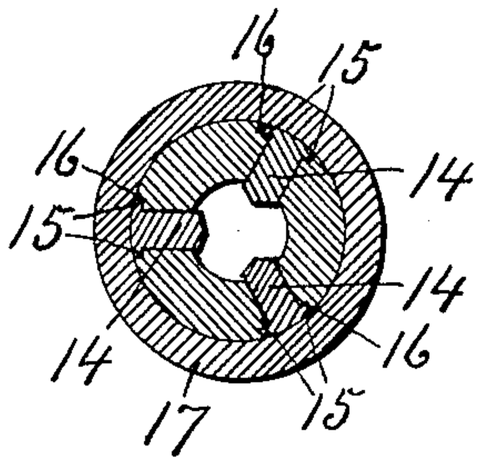
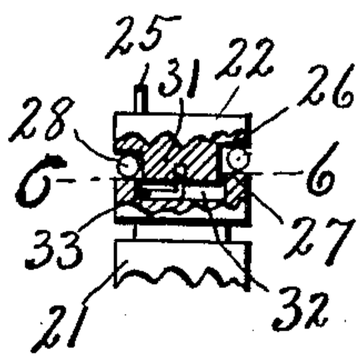
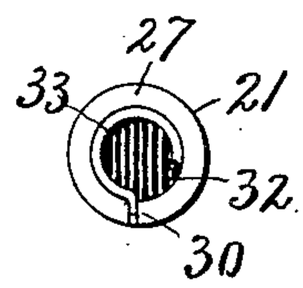


Fig. 5

Fig. 6





Witnesses

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DRILL-CHUCK.

962,746. Specification of Letters Patent. **Patented June 28, 1910.**

Application filed March 11, 1910. Serial No. 548,535.

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 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 of my present invention 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 reduce the resistance to opening the jaws when once set upon the work or rather to relieve the threaded elements from excessive friction between the threads in tightening the jaws upon such 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.

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 lines 5—5, Fig. 1 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 collar —5— which is loosely mounted on 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 collar —5— and is threaded externally for receiving a correspondingly threaded collar —8—. The collars —5— and —8—, which are conical and are spaced a slight distance apart, are grooved in their adjacent faces for receiving anti-friction endthrust bearings —9—. The collar —8— is therefore rigidly secured to the head —1— and therefore becomes a part thereof, while the sleeve —3— and collar —5— abut end to end and are free to rotate relatively to and upon the reduced portion of the head —1— and are spring pressed axially to keep the collar —5— in contact with the endthrust bearings —9— by suitable coil springs —10— which are seated in sockets opening from the annular shoulder —4— and bear against the upper end of the sleeve —3—. Another object of these springs is to afford a limited resistance to the independent rotation 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 stud or screw —23— secured 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 screw or stud —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 meeting ends of the disk —22— and auxiliary head —21— are provided respectively with an axially projecting boss or hub —31— and socket —32— fitting one into the other and yieldingly connected by a segmental spring —33— having one end interlocked with the head —21— and its other end similarly interlocked with the cam disk —22—. 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 substantially fill the ball race, 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 compression springs —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 springs —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 corresponding 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—, thus rotating said head in the same direction and causing the rollers —28— to ride up their respective inclines and move 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 springs —10—, thereby slightly rotating the head —21— to cause

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 also tend to rotate said sleeve 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 raise, 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 the excessive friction between the threads of the casing —11— and sleeves —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.

What I claim is:

1. A drill chuck comprising a main head, a cam on the head, an auxiliary head coaxial with and rotatable relatively to the main head, a cam on the auxiliary head, roller bearings between the cams for moving the auxiliary head endwise as the latter is rotated, jaws interlocked with the auxiliary head and movable radially relatively thereto, a sleeve rotatably mounted on the main head and provided with external threads of coarse pitch, a casing having internal threads of the same pitch engaged with the threaded sleeve, said casing being provided with tapering guides engaging the jaws for moving the same radially as the casing is rotated.

2. A drill chuck comprising a main head, a cam on the head, an auxiliary head coaxial with and rotatable relatively to the main head, a cam on the auxiliary head, roller bearings between the cams for moving the auxiliary head endwise as the latter is rotated, jaws interlocked with the auxiliary head and movable radially relatively thereto, a sleeve rotatably mounted on the main head and provided with external threads of coarse pitch, a casing having internal threads of the same pitch engaged with the threaded sleeve, said casing being provided with tapering guides engaging the jaws for moving the same radially as the casing is rotated, and yielding means for frictionally holding the sleeve against undue rotation upon the main head and at the same time permitting such rotation when the friction between the threads of the casing and sleeve is sufficient to overcome that of the yielding means.

3. In a drill chuck, a main head, an externally threaded sleeve rotatable on said head but yieldingly engaging therewith, an auxiliary head rotatable relatively to and coaxial with the main head, means brought into action by the rotation of said auxiliary head for moving the auxiliary head axially, jaws engaged with the auxiliary head, an internally threaded casing engaging the threaded sleeve and jaws to move the latter radially, and means brought into action by the tightening of the jaws upon an object for frictionally locking the sleeve and casing to rotate together relatively to the main head.

4. In a drill chuck, a main head, a threaded sleeve journaled on the head, means for frictionally retarding the rotary movement of the sleeve on the head, a threaded casing screwed upon the sleeve, an auxiliary head journaled in the main head, said heads having relatively movable cam faces for moving the auxiliary head axially, jaws connected to and movable axially with the auxiliary head, and means on the casing for moving said jaws radially.

In witness whereof I have hereunto set my hand on this fourth day of March 1910.

ELMER E. COGSWELL.

Witnesses:

CHARLES O. BYRNE,

GEO. L. DAVIS.