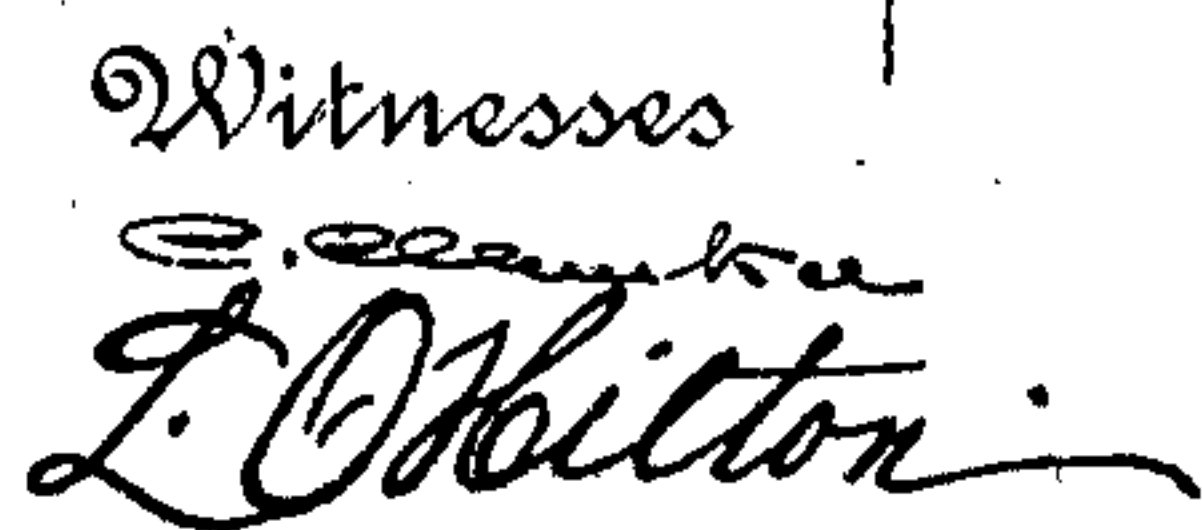


992,903.

3 SHEETS--SHEET 1.



by *A. B. Wilson & Co*  
Attorneys

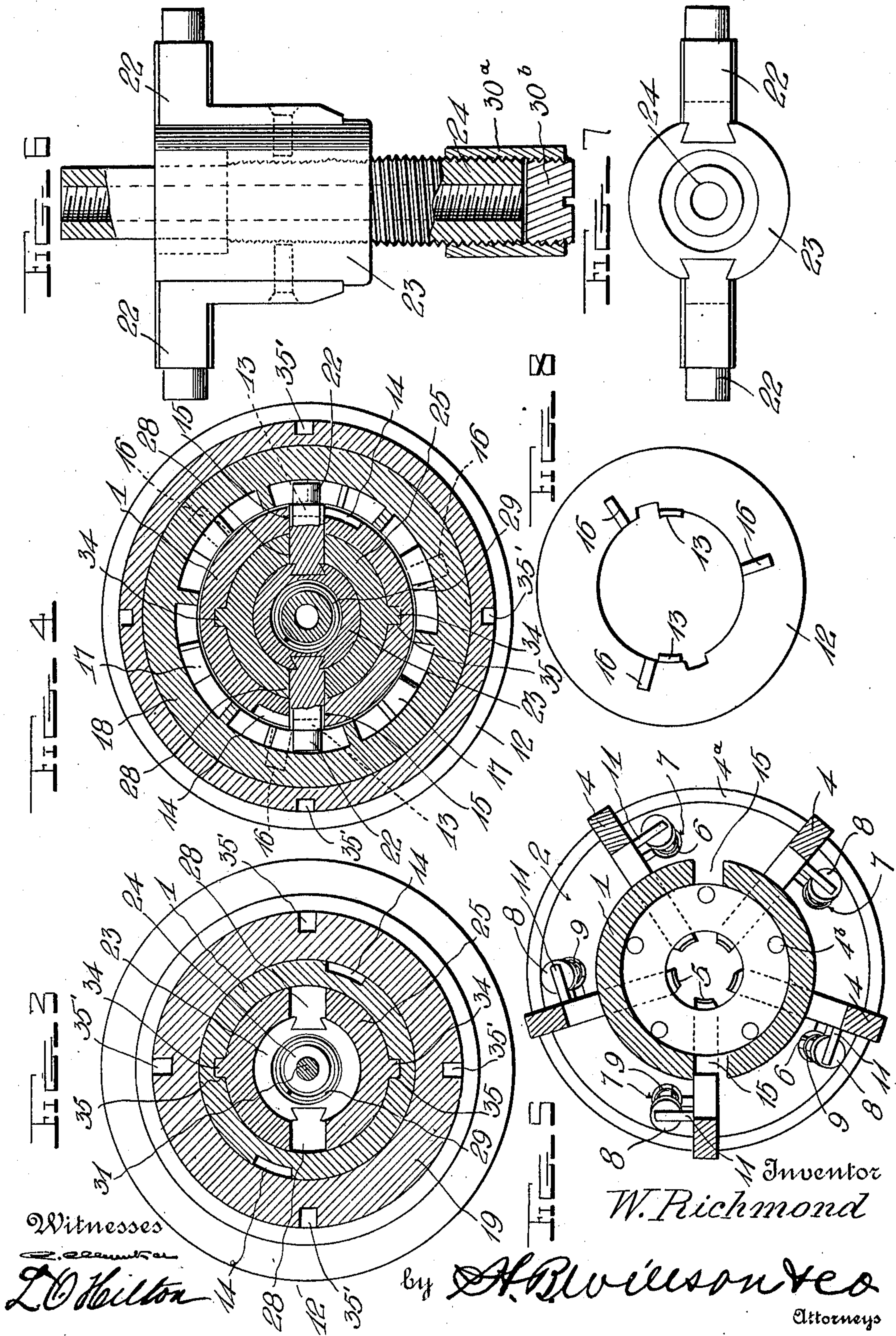


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 THREADING DIE.  
 APPLICATION FILED MAY 2, 1910.

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Patented May 23, 1911.

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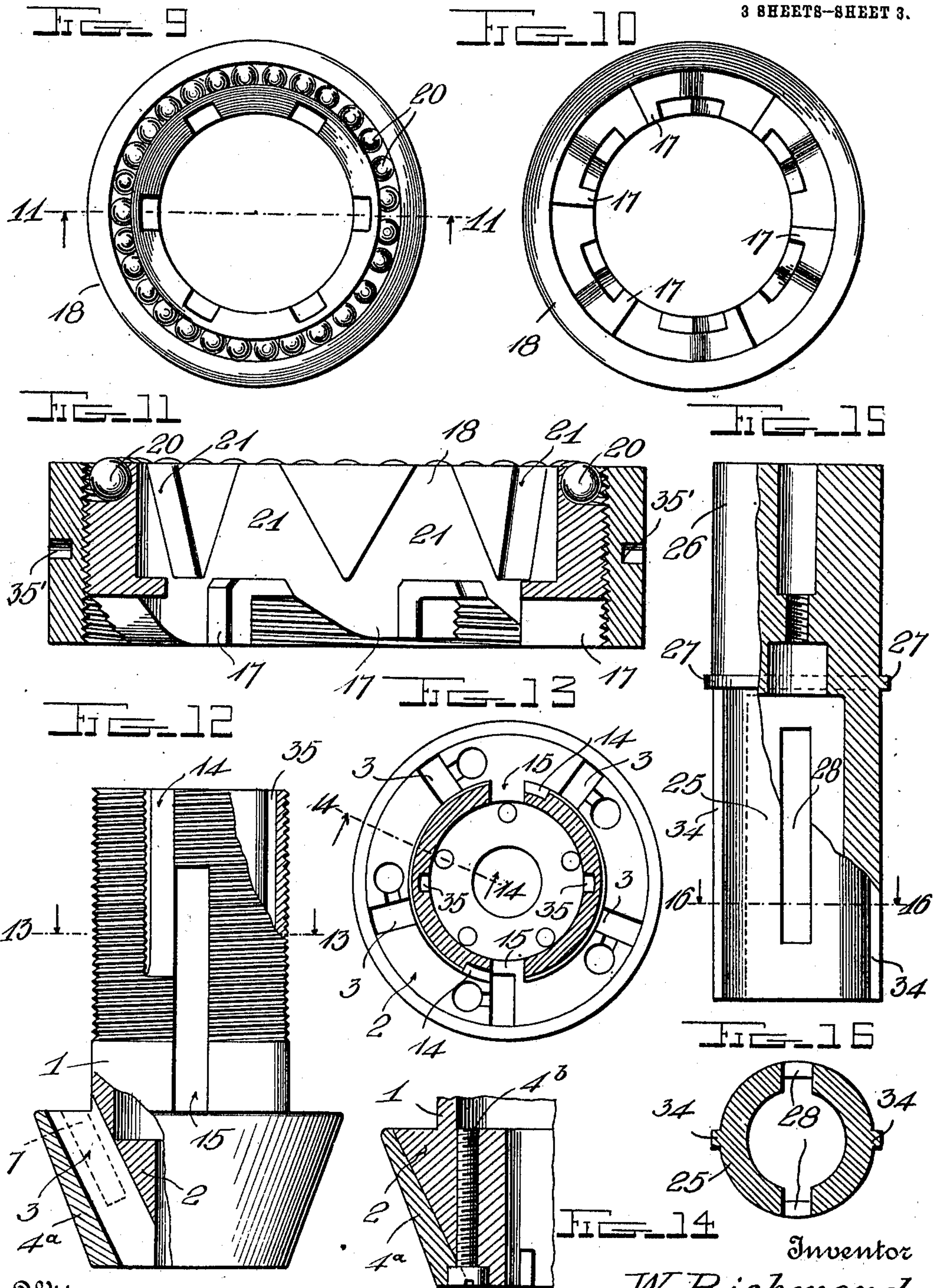


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3 SHEETS-SHEET 3.



Witnesses

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# UNITED STATES PATENT OFFICE.

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## THREADING-DIE.

992,903.

Specification of Letters Patent.

Patented May 23, 1911.

Application filed May 2, 1910. Serial No. 558,983.

*To all whom it may concern:*

Be it known that I, WILLIAM RICHMOND, a subject of the King of Great Britain, residing at London, in the Province of Ontario and Dominion of Canada, have invented certain new and useful Improvements in Threading-Dies; and I do declare the following to be 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.

This invention relates to improvements in threading dies and has special reference to the threading die disclosed in Letters-Patent No. 826610 granted to me July 24, 1906.

One object of the invention is to provide a threading die having an improved construction of opening mechanism whereby the cutters will be automatically released or disengaged from the work when a desired length of thread has been cut.

Another object is to provide a die of this character having an improved means for adjusting the cutter releasing mechanism whereby a thread of the desired length may be cut.

A further object is to provide an improved construction of cutters which may be repeatedly ground or re-cut without interfering with the usefulness of the same.

With the foregoing and other objects in view, the invention consists of certain novel features of construction, combination and arrangement of parts as will be more fully described and particularly pointed out in the appended claims.

In the accompanying drawings, Figure 1 is a side view of a die constructed in accordance with the invention; Fig. 2 is a longitudinal sectional view of the same; Fig. 3 is a horizontal sectional view on the line 3—3 of Fig. 2; Fig. 4 is a similar view on the line 4—4 of Fig. 2; Fig. 5 is a similar view on the line 5—5 of Fig. 2; Fig. 6 is a detail side view partially in section of the trip plunger, its adjusting screw, and trip lugs; Fig. 7 is a top plan view of the same; Fig. 8 is a detail plan view of the cutter projecting plate; Fig. 9 is a top plan view of the ratchet ring showing the ball bearings arranged therein; Fig. 10 is a bottom plan view of the same; Fig. 11 is an enlarged vertical section thereof; Fig. 12 is a detail side view of the body portion of the die; Fig. 13 is a horizontal section of the same on the line 13—13 of Fig. 12; Fig. 14 is a fragmentary sectional

view of the head on the line 14—14 of Fig. 13; Fig. 15 is a side view partly in section of the tubular shank of the die. Fig. 16 is a horizontal sectional view of the same on the line 16—16 of Fig. 15; and, Fig. 17 is a detail perspective view of the ratchet ring.

Referring more particularly to the drawings, 1 denotes the body portion of the die on the lower end of which is formed a tapered head 2. The head and body portion of the die are of tubular construction and said body portion is exteriorly threaded as shown. In the head 2 is formed a series of radially projecting slots or passages 3 which communicate at their lower ends with the bore or interior of the die head. There may be any suitable number of slots or passages 3, five of the same being shown in the present instance as the preferred number. In each of the slots or passages 3 is arranged a cutter 4. The cutters 4 are held in oblique position or at a suitable angle by the slots or passages 3 and, when said cutters are forced downwardly to operative positions, the lower ends of the same project through the lower ends of the slots or passages 3 and into the bore of the die head. On the inner edges of the lower projecting ends of the cutters 4 are formed thread cutting teeth 5, which are cut or formed by a master tap to impart the correct pitch to the threads which are to be cut thereby. The cutters 4 are held in the slots or passages 3 by a frusto-conical shaped shell or band 4<sup>a</sup>, which is held in position on the head 2 by fillister head screws 4<sup>b</sup> which are screwed into the outer end of the die head 2, as shown.

The cutters 4 are automatically retracted to inoperative positions by means of cutter operating plungers 6 arranged in suitable sockets 7 formed in the upper portion of the head adjacent to each of the cutter slots 3. The plungers 6 are provided on their upper ends with enlarged heads 8 and on said plungers between the head 8 and the bottoms of the sockets are arranged coiled springs 9, the pressure of which is normally exerted to force the plungers upwardly above the upper end of the head.

In the upper portion of each of the cutters 4 is arranged a longitudinal series of apertures 10, in one of which is arranged a laterally projecting pin 11, which is engaged by the headed upper ends of the plungers 6, whereby said cutters are re-



tracted or forced upwardly by the springs 9. By providing a series of apertures 10 in the cutters, the pins 11 may be adjusted to compensate for the grinding or cutting away of the lower ends of the cutters when the latter are repeatedly sharpened.

The cutters 4 have their upper ends formed at a right angle to the body portion of the die, and said upper ends of the cutters are engaged by an annular cutter projecting plate 12, which is loosely mounted on the body portion of the die, as shown. The plate 12 has formed on its inner edge oppositely disposed inwardly and upwardly projecting guide lugs 13, which, when the plate is placed on the body portion of the die, engage vertically disposed grooves or channels 14 formed in the opposite sides of the upper portion of the body of the die. After the plate 12 has been lowered on the body portion of the die and into engagement with the upper ends of the cutters, said plate is turned a slight distance to bring the lugs 13 opposite to slots 15 formed at diametrically opposite points in the sides of the body portion of the cutter and extending downwardly therein to the upper end of the head 2.

The cutter projecting plate 12 has formed on its upper side and adjacent to its inner edge a series of three upwardly projecting radially disposed stop lugs 16, which are engaged by a series of internal ratchet teeth 17 formed on the inner side of a ratchet ring 18, which is loosely mounted on the upper portion of the body of the die, as shown. The ratchet ring is held down in operative engagement with the lugs 16 on the cutter projecting plate 12 by an adjusting nut 19, which has a screw-threaded engagement with the threaded upper portion of the die body and bears against the upper end of the ratchet ring, as shown. The ratchet ring 18 is preferably provided in its upper edge with a ball-race in which are arranged anti-friction bearing balls 20 with which the lower end of the nut 19 is engaged, said balls thus forming an anti-frictional engagement between the nut 19 and the ratchet ring 18. The balls 20 are engaged with the ball-race in the upper edge of the ratchet ring, preferably by forming said ring in separable inner and outer sections which have a screw threaded engagement with each other, as shown. By thus forming the ring 18, the inner portion of the same may be screwed outwardly a sufficient distance to permit the engagement of the balls with the race, after which said inner portion of the ring is again screwed inwardly, thus bringing the reduced or overhanging upper edge of the inner portion of the ring into alinement or on a level with the adjacent end of the outer portion of the ring thereby permitting the balls to project

a sufficient distance beyond the end of the ring to form an anti-frictional bearing for the nut 19. By screwing the nut 19 downwardly or outwardly on the threaded portion of the body, the ratchet ring and cutter projecting plate are forced outwardly, thus projecting the dies to a greater or less extent, and adjusting the same for cutting the threads on work of different size or diameter.

Each alternate ratchet tooth 17 on the ratchet ring 18 is preferably made about one-thirty-second of an inch shorter than the adjacent tooth so that by turning the ratchet ring in position to engage the shorter tooth with the lugs 16 on the cutter projecting plate, a rough or primary cut of the threads may be made after which, by turning the ratchet ring to bring the longer ratchet teeth into engagement with the lugs 16, a second finishing cut may be given to the thread.

On the inner side of the ratchet ring 18 is formed a series of V-shaped grooves or recesses 21, with which are engaged the cylindrical outer ends of trip lugs 22, which project laterally from and are secured to a trip plunger 23 having a screw threaded engagement with a tubular interiorly and exteriorly threaded adjusting screw 24, which is arranged in the tubular lower end 25 of a shank 26 which projects beyond the end of the die body. The shank 26 has formed thereon a stop flange 27 which engages the outer end of the die body, as shown. The inner tubular portion 25 of the shank is provided with longitudinally disposed diametrically arranged slots 28 through which the trip lugs 22 project. The lugs 22 are held in yielding engagement with the lower ends of the slots 28 by a coiled spring 29, which is arranged in the tubular inner portion 25 of the shank and bears against the trip plunger, as shown.

The cylindrical outer ends of the lugs 22 project into the V-shaped grooves or recesses 21 in the inner side of the ratchet ring, and, when the trip plunger 23 and trip lugs 22 are retracted against the tension of the spring 29, said cylindrical portions of the trip lugs will bear against the inclined walls of the V-shaped grooves, thereby turning the ratchet ring in the proper direction for disengaging the ratchet teeth 17 from the lugs 16, thus releasing the cutters and permitting the spring actuated plungers 6 to retract the cutters and thus disengage the same from the work. The trip plunger 23 and trip lugs 22 may be automatically retracted to operate the ratchet ring and release the cutter projecting plate and cutters by arranging a suitable work engaging stop on or in the threaded outer end of the plunger adjusting screw 24, which projects into the bore of the head. In Fig. 2 is shown a stop in the form



of a screw 30 arranged in the screw 24 and held in place by a jam nut. In Fig. 6 is shown another form of stop consisting of an internally threaded sleeve 30<sup>a</sup> screwed on the screw 24 and held in position by a jam screw 30<sup>b</sup>.

The screw 24 may be adjusted in the trip plunger to bring the stop 30 on said screw to any desired position in the bore of the head according to the length of thread it is desired to cut so that, when a thread of the desired length has been cut, the inner end of the work will be engaged with the stop, thereby retracting or forcing the trip plunger and trip lugs 22 inwardly, thus causing said lugs to turn the ratchet ring, thereby disengaging the teeth thereon from the lugs 16 on the cutter projecting plate 12 and releasing said cutters in the manner described.

In addition to the automatic plunger retracting mechanism, the cutters may be manually released at any desired time when the die is used in a horizontal position as in a lathe by simply pulling back the turret slide of the lathe, thus retracting the shank 26 which will pull back or retract the trip plunger and trip lugs, causing the latter to act on the ratchet ring to release the cutters in the manner described.

The trip plunger 23 and trip lugs 22 may be adjusted in the tubular inner portion 25 of the shank by means of an adjusting screw 31, which is arranged in a passage 32 in the outer end of the shank 26 and has a screw threaded engagement at its inner end with the interiorly threaded bore of the adjusting screw 24 of the trip plunger. The passage 32 in the shank 26 has a reduced inner end whereby a shoulder is formed which is engaged by the head of the screw 31, as shown. When the die is used in a vertical position, as on a drill press, the shank 26 is secured against movement in the body portion 1 of the die by means of a cap nut 33, which is screwed onto the threaded upper end of the die body and engages the flange 27 on the shank, as shown. When the die is used in this position, the adjusting screw 31 is removed and a stop suitable for the class of work to be operated on is engaged with the opposite end of the screw 24, whereby when the work has been threaded the desired distance, said stop will be engaged by the work and the trip plunger and lugs retracted to release the cutters in the manner described.

The tubular inner portion 25 of the shank is preferably provided at diametrically opposite points on its outer side with longitudinally disposed ribs 34, which engage guide grooves 35 formed in the inner wall of the upper portion of the die body, as shown. The ratchet ring 18 and adjusting nut 19 are preferably provided in their outer sides with

a series of radial sockets 35', with which is adapted to be engaged a spanner wrench whereby said parts may be readily turned when desired.

From the foregoing description taken in connection with the accompanying drawings, the construction and operation of the invention will be readily understood without requiring a more extended explanation.

Various changes in the form, proportion and the minor details of construction may be resorted to without departing from the principle or sacrificing any of the advantages of this invention as defined in the appended claims.

Having thus described my invention, what I claim is:—

1. A threading die comprising a tubular body, a head formed on one end thereof, said head having formed therein a series of cutter-receiving slots, a series of cutters slidably mounted in said slots, an annular cutter-projecting plate slidably and non-rotatably mounted on said body and bearing on said cutters and provided with a plurality of lugs on its upper face, a ring mounted on the body and having internal ratchet teeth to engage said lugs, and means carried by the body to automatically release said ratchet ring from the cutter projecting plate when a thread of the desired length has been cut.

2. In a threading die, the combination of a tubular interiorly threaded body portion, a head arranged on the outer end thereof, a series of cutters slidably mounted on said head, means to retract said cutters, a ratchet ring having internal teeth adapted to force the cutters outward, the alternate teeth being of different depth whereby said cutters may be adjusted to make an initial cut and a finishing cut, and means whereby said ring is operated.

3. In a threading die, a tubular exteriorly threaded body portion, a head formed on one end thereof, a series of cutters slidably mounted in said head, means to automatically retract said cutters, a cutter projecting plate loosely mounted on the body portion of the die, a series of lugs formed on said plate, a ratchet ring loosely mounted on the body, a series of ratchet teeth formed in said ring and adapted to engage the lugs on said plate, an adjusting nut adapted to be screwed on the threaded body of the die and having an anti-frictional engagement with said ratchet ring, a shank slidably mounted in the body of the die, said shank and die body having formed therein aligned longitudinal slots, a trip plunger arranged in said shank, trip lugs carried by said plunger and projecting through the slots in said shank and body of the die, said lugs having an operative engagement with said ratchet ring whereby, when the plungers and lugs are retracted, said lugs will turn said ratchet ring



in the proper direction to disengage the teeth thereof from the lugs on said cutter projecting plate thereby releasing said plate and permitting the cutters to retract, a  
 5 spring to yieldingly hold said trip plungers and trip lugs in operative position, and means whereby said plunger is automatically operated to release the cutter project-  
 10 ing plate when a thread of the desired length has been cut.

4. In a threading die, a tubular body portion, a head formed on one end thereof, a series of cutters having a sliding engagement with said head, means to automatically  
 15 retract said cutters, a cutter projecting plate mounted on the body portion of the die and having an operative engagement with said cutters, a series of lugs formed on said  
 20 plate, a ratchet ring loosely mounted on the body of the die, a series of ratchet teeth formed in said ring, each alternate tooth of said series being of slightly less length than the adjacent teeth, said teeth having an op-  
 25 erative engagement with the lugs on said plate whereby the latter is forced downwardly to hold the cutters in operative position, an adjusting nut arranged on said body portion and having an operative engagement with said ratchet ring, a shank having a  
 30 tubular inner end slidably engaged with the body of the die, said shank and die body having formed therein longitudinally disposed alined slots, a plunger adjusting screw arranged in said shank, a trip plunger ad-  
 35 justably mounted on said screw, trip lugs carried by said plunger and projecting through the slots in said shank and die body, said lugs having an operative engagement with said ratchet ring whereby when said  
 40 plunger and lugs are retracted, said ring will be turned to disengage the teeth thereon from the lugs on said cutter projecting plate, thereby releasing said plate and cutters, a spring in said shank to hold said trip plun-  
 45 ger and lugs in operative position, a work engaging stop adapted to be arranged on the outer end of said plunger adjusting screw whereby said plungers and lugs are automatically operated by the work when a  
 50 thread of the desired length has been cut, an adjusting screw arranged in said shank and having a threaded engagement with the opposite end of said plunger adjusting screw, and a cap nut arranged on the end  
 55 of the die body and adapted to rigidly secure said shank in engagement with the die body.

5. The combination of a tubular body having a head and provided with longitudi-  
 60 nal slots, a plurality of cutters slidably mounted on the head, means for retracting said cutters, a cutter-projecting plate bear-

ing on said cutters and having lugs on its inner edge engaging the slots in the body, a ring mounted on the body and provided  
 65 with means to engage and project the said plate, and means carried by the body to automatically actuate said ring to release said plate.

6. The combination of a tubular body, a  
 70 head formed on one end thereof, a series of cutters slidably mounted on said head, means to automatically retract said cutters, a cutter-projecting plate loosely mounted on the body, a series of lugs formed on said plate,  
 75 a ratchet ring loosely mounted on the body, a series of ratchet teeth formed in said ring and adapted to engage the lugs on said plate, a shank mounted in the body, said shank and body having alined longitudinal slots,  
 80 a trip plunger arranged in said shank, trip lugs carried by said plunger and projecting through the slots in the shank and the body, said lugs having an operative engagement with the ratchet ring whereby the ratchet  
 85 ring will be turned when the plunger and lugs are retracted to disengage the ratchet teeth from the lugs on the cutter projecting plate, and means for yieldingly holding the trip plunger in operative position.  
 90

7. The combination of a tubular body, a head on one end thereof, a series of cutters slidably mounted in said head, means to au-  
 95 tomatically retract said cutters, a cutter-projecting plate mounted on the body and bearing on said cutters, a ratchet ring loosely mounted on the body and engaging the plate to force the plate downwardly and hold the cutters in operative position, a shank having a tubular inner end fitted  
 100 within the body, said shank and body having formed therein longitudinal alined slots, a plunger adjusting screw arranged in said shank, a trip plunger adjustably mounted on said screw, trip lugs carried by said  
 105 plunger and projecting through the slots of said shank and body, said lugs engaging the ratchet ring to turn the same when the plunger and lugs are retracted, a spring mounted in the shank and bearing on the trip plunger  
 110 to hold the same in operative position, and a work engaging stop on the outer end of the plunger adjusting screw whereby the plunger is automatically operated by the work when a thread of the desired length  
 115 has been cut.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

WILLIAM RICHMOND.

Witnesses:

BEATRICE I. M. BARTRAM,  
 W. G. R. BARTRAM.