Nov. 4, 1941. A. F. JELINEK ET AL 2,261,380

COLLET ACTUATING MECHANISM

Filed Oct. 25, 1940 4 Sheets-Sheet 1

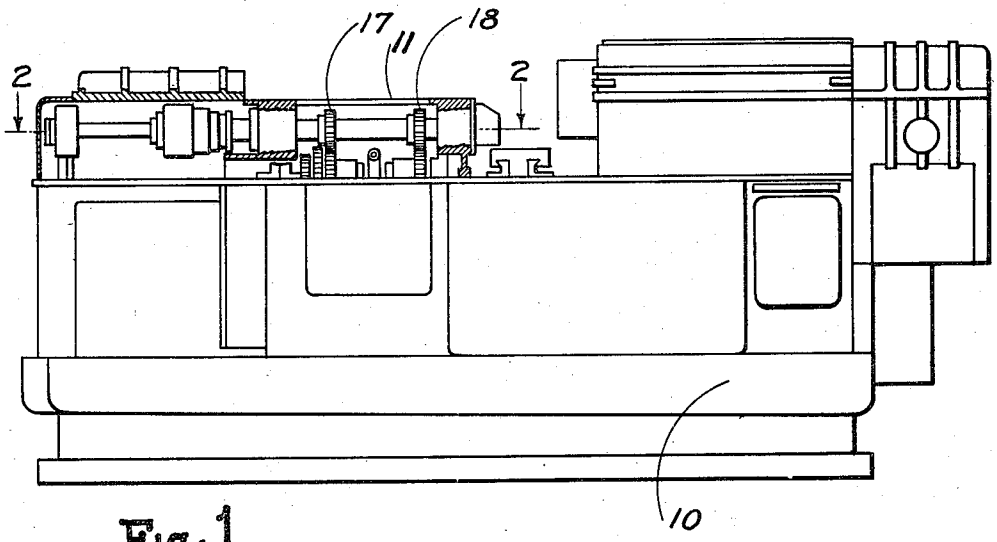



Fig. 1

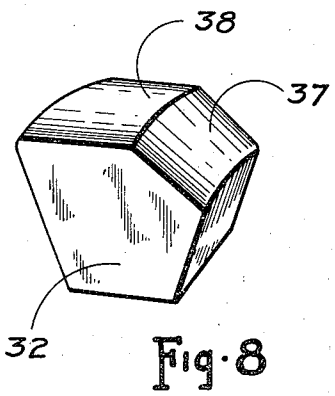



Fig. 8

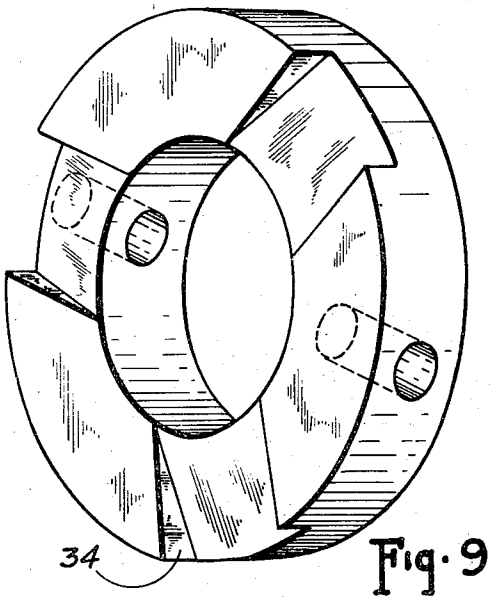



Fig. 9

INVENTORS
ALFRED F. JELINEK
WALTER E. GROSS

BY Ricking & Watts.
ATTORNEYS

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COLLET ACTUATING MECHANISM

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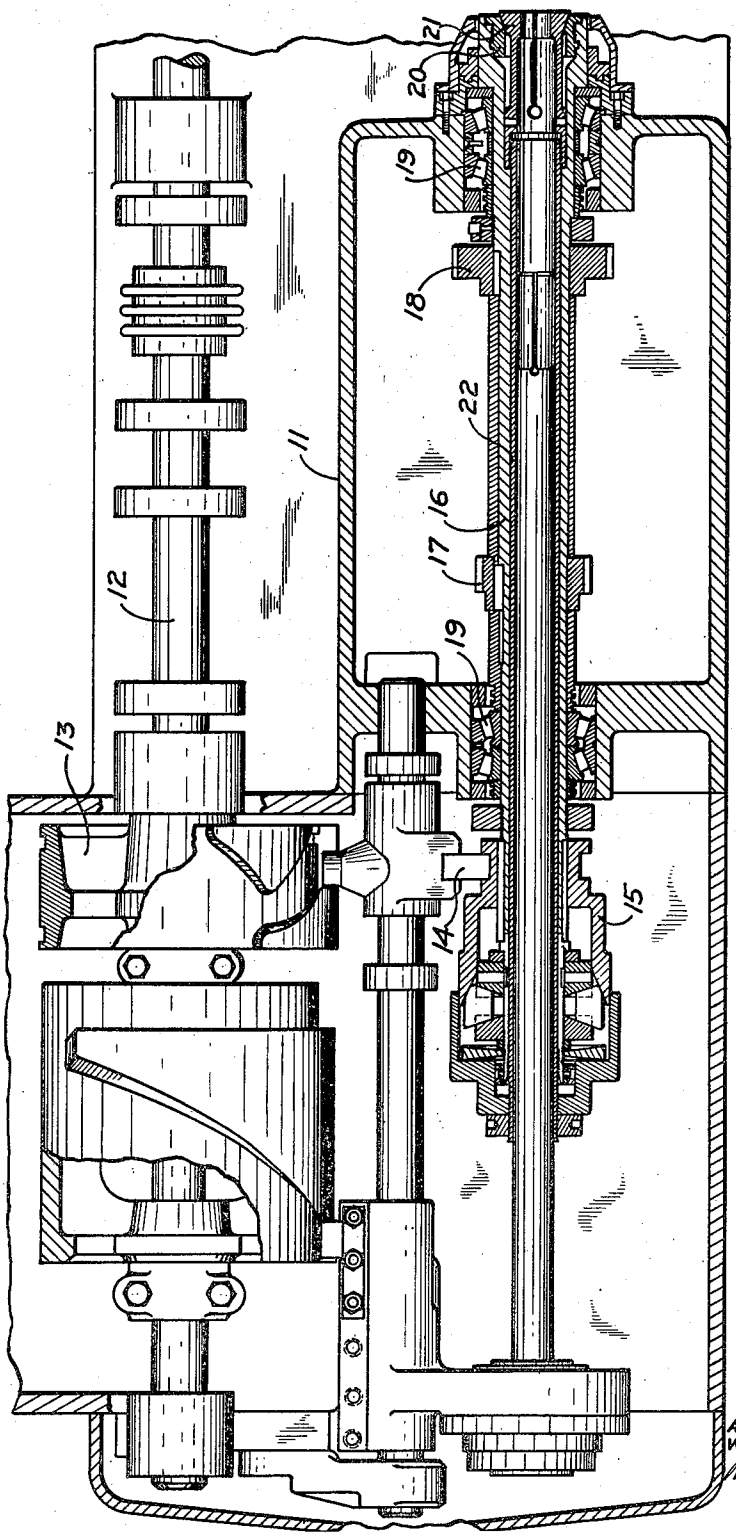


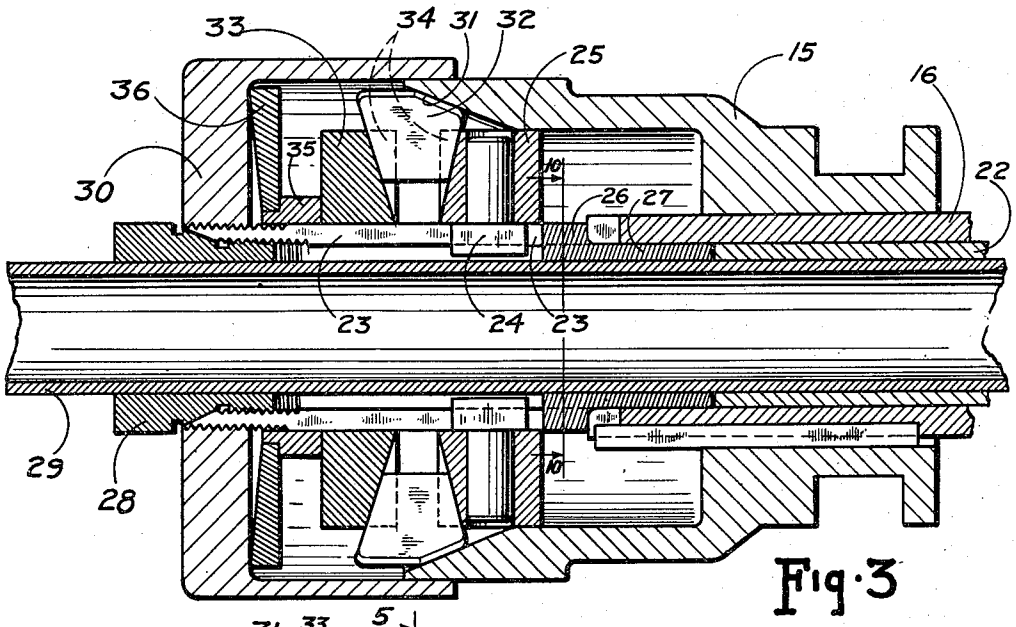

Fig. 2

INVENTORS
ALFRED F. JELINEK
WALTER E. GROSS
Pickney & Watts.
ATTORNEYS

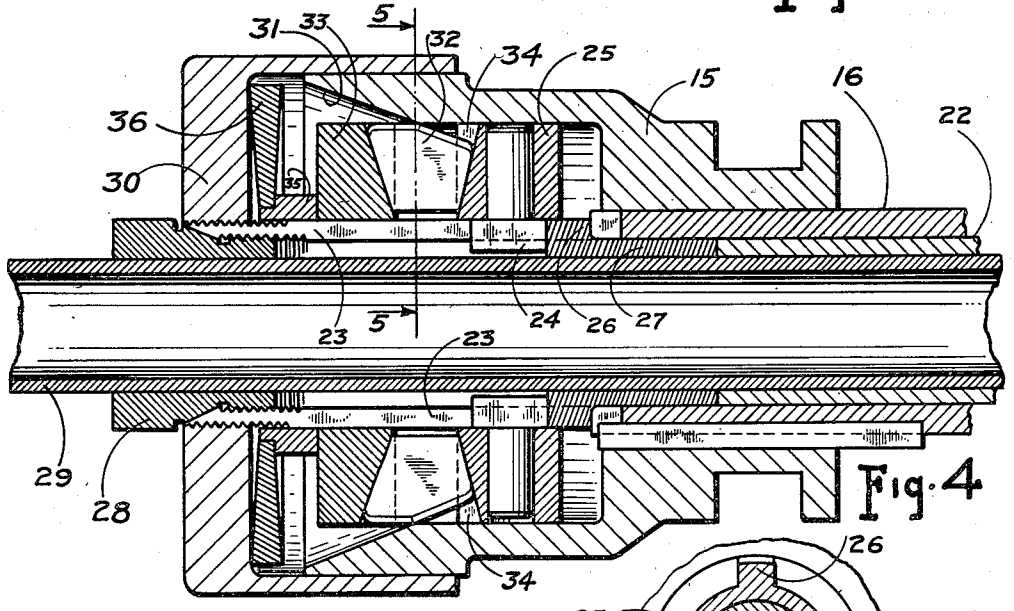
Nov. 4, 1941. A. F. JELINEK ET AL 2,261,380

COLLET ACTUATING MECHANISM

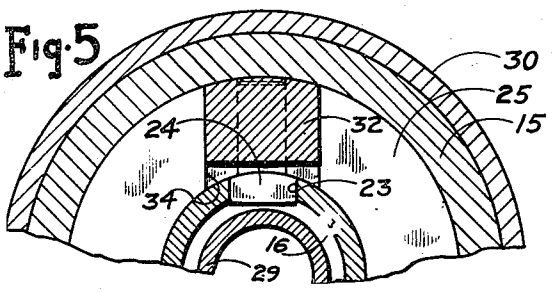
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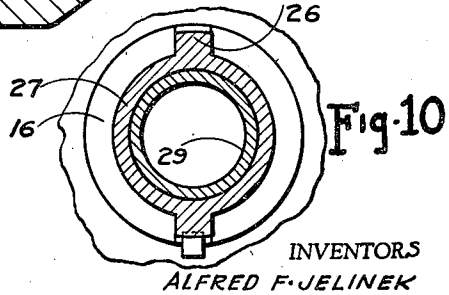

Fig·3




Fig·4




Fig·5




Fig·10

INVENTORS
ALFRED F. JELINEK
WALTER E. GROSS
BY Ridley & Watts
ATTORNEYS

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COLLET ACTUATING MECHANISM

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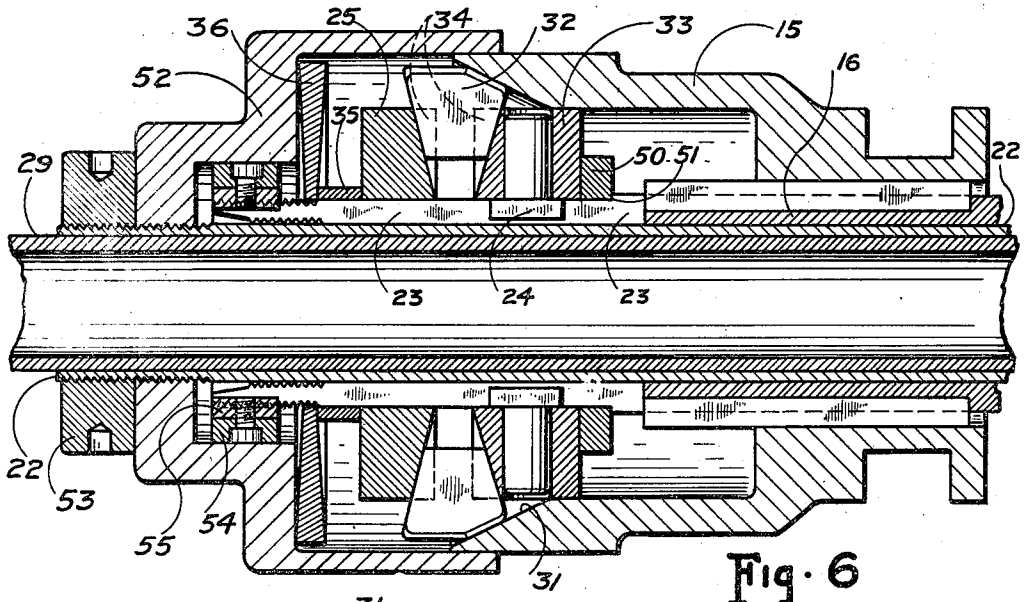



Fig. 6

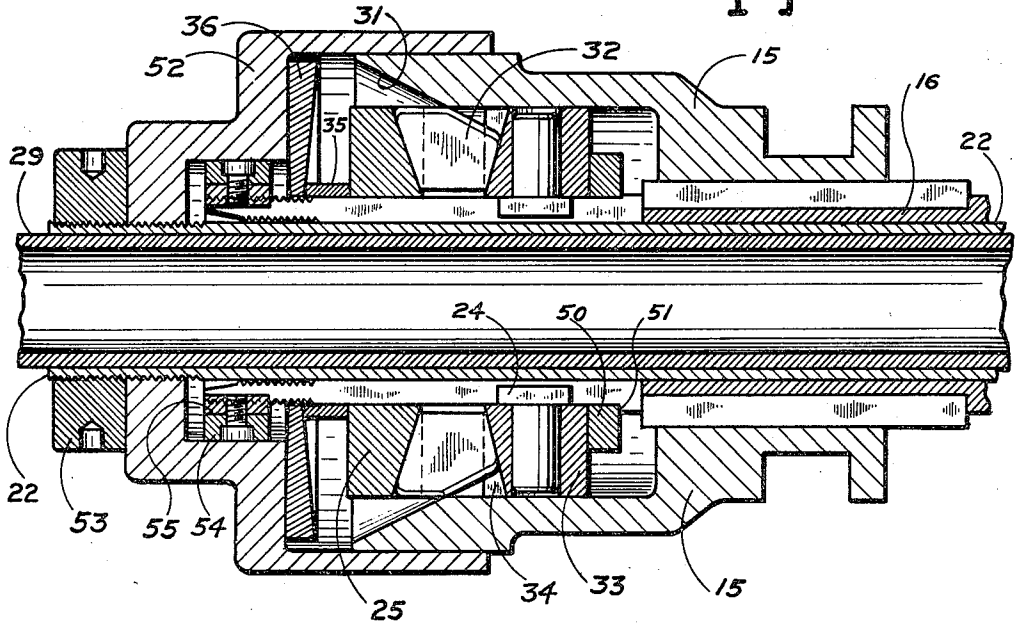



Fig. 7

INVENTORS
ALFRED F. JELINEK
WALTER E GROSS

BY Richey & Watts
ATTORNEYS

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# UNITED STATES PATENT OFFICE

2,261,380

## COLLET ACTUATING MECHANISM

Alfred F. Jelinek and Walter E. Gross, Cleveland, Ohio, assignors to The Cleveland Automatic Machine Company, Cleveland, Ohio, a corporation of Ohio

Application October 25, 1940, Serial No. 362,742

4 Claims. (Cl. 279—1)

This invention relates to automatic screw machines and more specifically to improvements in collet actuating mechanisms therefor.

In detail the invention pertains to a collet actuating device embodying generally a series of wedge members disposed between the inclined faces of a pair of opposed cones, the wedges effecting the separation of the cones and consequent operation of the actuating mechanism when forced radially inward under the influence of an internally tapered sleeve arranged for reciprocative movement over the wedges. Heretofore some efforts have been directed to collet actuating mechanisms of the above type though in such embodiments balls or rollers were employed which, in practice, have been found unsatisfactory, since such wedging members either grooved the cones and sleeve or were so readily worn out of round as to necessitate constant adjustment of the take-up member coordinated therewith.

The actuating device embodying the present invention contemplates a plurality of wedge members designed for surface engagement, as distinguished from the point or line contact, with the parts of the actuating device associated therewith, the object of such structure residing in the provision of a design which will eliminate the cutting, grooving or scoring of the sleeve and cones or the ready destruction of the wedge members.

Another object of the invention is to provide an improved thrust member which is capable of effecting the operation of the collet without undue lost motion yet subject to slight yieldability under the thrust imposed thereon when out of round or over size work pieces are fed into the machine.

Another object of the invention resides in the provision of a device which is sensitive of operation, capable of ready adjustment and susceptible of economic manufacture.

Other objects and advantages more or less ancillary to the foregoing and the manner in which all the various objects are realized will appear in the following description, which considered in connection with the accompanying drawings, sets forth the preferred embodiment of the invention.

Referring to the drawings wherein the preferred embodiment of the invention is illustrated:

Fig. 1 is a front elevational view of an automatic screw machine typical of one of the types of machines in which the present invention may be embodied;

Fig. 2 is a horizontal section through the spindle head illustrating the improved collet operating mechanism, and the control members therefor, the section being taken on a plane indicated by the line 2—2 in Fig. 1;

Fig. 3 is an enlarged sectional view of the actuating mechanism shown in Fig. 2;

Fig. 4 is a similar sectional view of the actuating device, the parts thereof being illustrated in their actuated position;

Fig. 5 is a transverse sectional view through the collet spindle and a fragmentary portion of the actuating mechanism, the section being taken on a plane indicated by the line 5—5 in Fig. 4;

Fig. 6 is a vertical section of a modified form of the collet actuating device, the parts being arranged for operation of a collet of the type in which the closure thereof is effected by the retraction of the collet tube;

Fig. 7 is a similar section to that illustrated in Fig. 6, the parts thereof being illustrated in their actuated position;

Fig. 8 is a view in perspective of one of the improved wedge blocks;

Fig. 9 is a view in perspective of a modified form of one of the wedge supporting rings; and

Fig. 10 is a transverse sectional view through a portion of the spindle, the section being taken on a plane indicated by the line 10—10 in Fig. 3.

Referring first to Figs. 1 and 2, the screw machine 10 embodies a spindle head 11 having a cam shaft 12 therein intergeared, in the usual manner, with driving mechanisms to effect the rotation of a track cam 13 for reciprocating a yoke 14 and a sleeve 15 engaged thereby. The sleeve is keyed upon a work holding spindle 16 rotatively driven through the gears 17 or 18, the spindle being preferably mounted in anti-friction bearings in the spindle head 11. The end portion of the spindle 16 is enlarged for the reception of an adapter 20 constructed for operative engagement with a spring collet 21, which as illustrated in Fig. 2, is of the "draw in" type. The collet 21 is threaded upon a reciprocatable tube 22 which effects the closure of the collet upon the work upon retraction of the tube through the engagement of the tapered end of the collet with the adapter 20. Collets of the "push out" type may be readily substituted for the device illustrated in Fig. 2 by substituting an adapter formed with a reverse taper in the throat thereof.

The actuating mechanism for the push out collet, illustrated in Fig. 3, is mounted upon the spindle 16, the end portion thereof being milled to provide slots 23 for the reception of pins or keys 24 mounted in a ring 25 and also keys or

tongues 26 formed on the periphery of a thimble 27 which is disposed within the spindle 16 and adapted for abutting engagement with the end of the tube 22. The outer end of the spindle 16 is machined with an internal thread for the support of a bushing 28 constituting a bearing for the stock feed tube 29 and forming in addition a locking mechanism for a guide member 30 threaded upon the periphery of the spindle 16. The bushing 28 is formed with a conical land intermediate its ends engageable with the chamfered end portion of the spindle 16 to effect the expansion thereof and consequent securement of the guide member in place.

The sleeve 15 is formed for telescopic engagement with the ring 25, the outer end of the sleeve being machined with a tapered internal bore 31 arranged for engagement with the arcuate end surfaces of a plurality of wedge blocks 32 disposed between the ring 25 and a thrust collar 33. The wedge blocks are seated for sliding movement within radial grooves 34 milled in contiguous faces of the ring and collar, the bottom walls of the grooves being tapered rearwardly in complemental configuration with the end walls of the wedge blocks. Upon the periphery of the spindle 16, in abutting relation with the thrust collar 33, there is a sleeve 35 formed with a reduced end portion constituting a seat for an annular plate 36 bearing against the end wall of the guide member 30. The plate 36 is formed of spring steel, the opposed faces thereof being dished or tapered inwardly to afford a limited degree of flexibility under application of pressure upon the central or hub portion thereof.

The wedge blocks, as will be seen in Figs. 5 and 8, are formed with an inclined arcuate face 37 adapted for surface engagement with the tapered bore 31 in the sleeve 15 and an arcuate face 38 adapted for surface contact with the cylindrical bore in the inner end of the sleeve. The side walls of the wedges are formed for sliding engagement within the grooves 34 in the ring 25 and thrust collar 33, the wedge blocks thus retaining the ring and collar from rotative movement relative to each other.

In operation, when the cam 13 effects the movement of the yoke 14 and the outward translation of the sleeve 15 the tapered bore 31 therein will force the wedge blocks 32 inwardly as shown in Fig. 4, thus causing the longitudinal movement of the ring 25, the engagement of the keys 24 with the thimble 26 and the consequent translation of the collet tube 27. As the tube is moved inwardly the tapered head of the spring collet is impinged upon its conical seat, thus effecting the closure of the collet upon the work. Slight variations in the diameter of the stock supported in the collet are compensated through the yieldable thrust plate 36, which, as designed will facilitate the movement of the collet tube 22 but flex under abnormal collet loads imposed thereon.

As shown in Figs. 6 and 7, the actuating mechanism of the "draw in" type of collet embodies generally the same structural elements as the mechanism heretofore described save that the collar 33 is restrained from movement inwardly by a ring 50 seated against a shoulder 51 formed in the spindle 16. The guide member 52 in this embodiment is threaded upon the end portion of the collet tube 22, being locked thereon by a jam nut 53. The outer end of the guide member is counter bored for the reception of a pilot ring 54 retained against rotation upon the end of the spindle by keys 55 mounted within the ring and engaged within the slots in the end portion of the spindle 16.

In operation as the sleeve 15 is advanced from the position illustrated in Fig. 6 to that shown in Fig. 7, the wedge blocks force the ring 25 outwardly, movement thereof being transmitted through the collar 35, the plate spring 36 and the guide member 52 which effectuates the retraction of the collet tube 22. As the tube is moved outwardly the tapered head of the collet is impinged within its tapered seat, thus effecting the closure of the collet upon the work. In this embodiment as in the structure illustrated in Figs. 3 and 4, the movement of the wedge blocks 32 is cushioned by the resilient plate 36, thus when the stock within the collet 21 is slightly over size sufficient compensative movement of the assembly is afforded to avoid breakage of parts or the galling of the stock within the collet.

It will be readily recognized from the foregoing that since the wedge blocks are formed with liberal surfaces of engagement with the ring, thrust collar and reciprocating sleeve the possibility of scoring, abrading or grooving such parts of the assembly is eliminated. Moreover, that since the ring and collar are keyed against rotative movement relative to each other and such assembly is keyed to the spindle 15 and the sleeve 16 is keyed to the spindle, no relative rotative movement can occur between the sleeve and wedge blocks 32. Thus as the sleeve is moved over the wedge blocks translation of the ring during successive reciprocative movements of the sleeve will be uniform since the wear occasioned by the engagement of the wedge blocks with the sleeve is confined to the same path of travel.

Although the foregoing description is necessarily of a detailed character, in order that the invention may be completely set forth, it is to be understood that the specific terminology is not intended to be restrictive or confining, and that various rearrangements of parts and modifications of detail may be resorted to without departing from the scope or spirit of the invention as herein claimed.

We claim:

1. In an automatic screw machine embodying a rotatively driven spindle, and a collet operating tube, mechanism for actuating said tube comprising a reciprocatively driven sleeve keyed to said spindle and having a tapered bore therein, a ring slidably mounted on said spindle and having radial tapered grooves therein, a key in said ring, a thrust collar on said spindle and having radial tapered grooves therein, tapered wedge blocks intermediate said ring and said collar slidably mounted in said grooves, a sleeve guide member constituting an abutment affixed upon said spindle, a spring intermediate said thrust collar and said abutment and a thimble on said spindle intermediate said key and the collet operating tube.

2. In an automatic screw machine embodying a rotatively driven spindle and a collet operating tube, mechanism for actuating said tube comprising a reciprocatively driven sleeve keyed to said spindle and having a tapered bore therein, a ring slidably mounted on said spindle and having radial tapered grooves therein, a thrust collar on said spindle and having radial tapered grooves therein, a key in said thrust collar, tapered wedge blocks intermediate said ring and collar slidably mounted in said grooves, a sleeve

guide member constituting an abutment affixed upon said collet operating tube, a plate spring supported on said spindle within said abutment and a sleeve on said spindle intermediate said ring and spring for urging said spring against said abutment.

3. In an automatic screw machine embodying a rotatively driven spindle and a collet operating tube, mechanism for actuating said tube comprising a reciprocative sleeve having a tapered bore therein, a collar having rectangular tapered radial grooves therein, a ring having rectangular tapered grooves therein, rectangular tapered wedge blocks seated in the tapered grooves in said collar and said ring, keys in said sleeve and in said collar to retain the sleeve and collar against rotative movement relative to each other, said wedge blocks constituting keys to retain the collar and ring against rotative movement relative to each other, a spring resisting the movement of said wedge blocks and a member for moving the collet tube upon actuation of said wedge blocks by said sleeve.

4. In an automatic screw machine embodying a rotatively driven spindle and a collet operating tube, mechanism for actuating said tube comprising a reciprocatively driven sleeve keyed to said spindle and having a tapered bore therein, a sliding member keyed to said spindle and having radially disposed tapered keyways therein, a thrust ring having radially disposed tapered keyways therein, rectangular wedge blocks seated in said keyways, a spring plate constituting an annular disc formed with centrally convergent faces, a supporting member therefor mounted on said spindle, a collar disposed in abutting relation with said thrust ring and with the central portion of said spring plate and an abutment associated with said sliding member for moving the collet tube.

ALFRED F. JELINEK.
WALTER E. GROSS.