W. H. LUTZ.

EXPANDING MANDREL.

APPLICATION FILED FEB. 21, 1916.

1,245,361.

Patented Nov. 6, 1917.

2 SHEETS—SHEET 1.

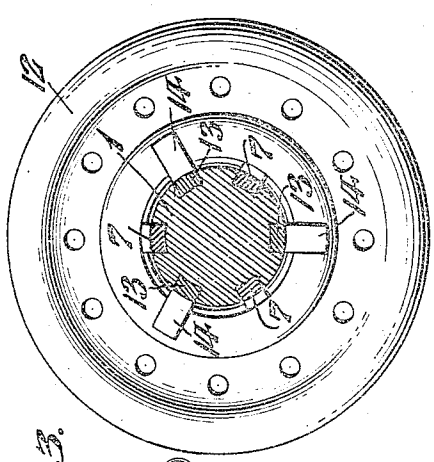


Fig. 3.

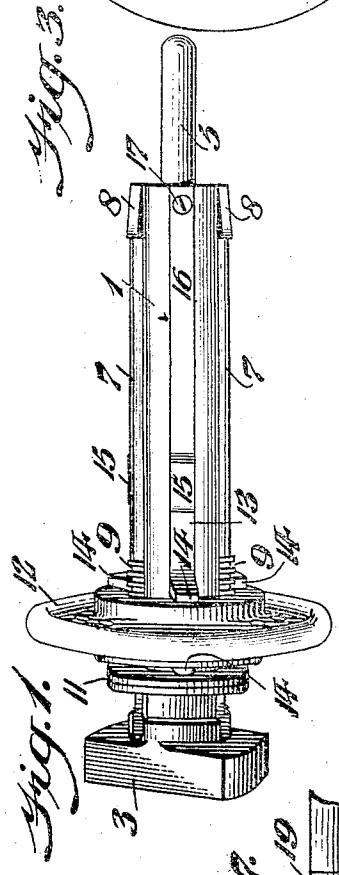


Fig. 1.

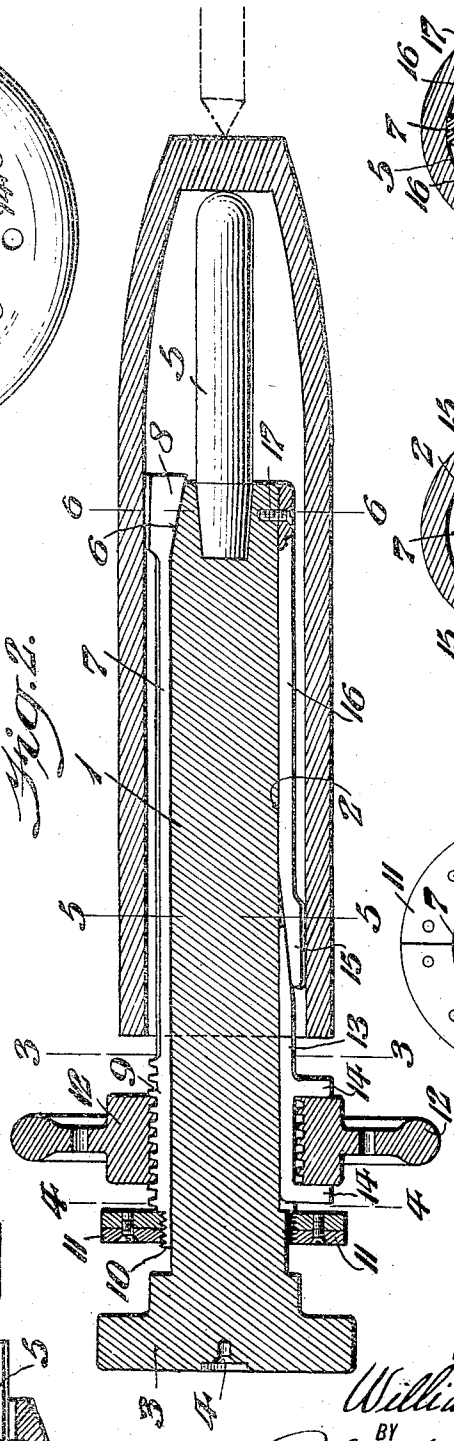


Fig. 2.

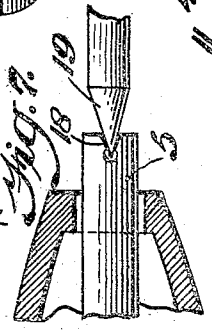


Fig. 7.

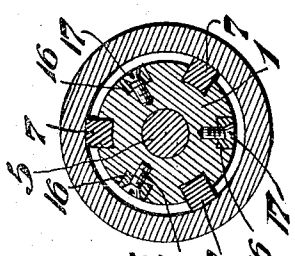


Fig. 6.

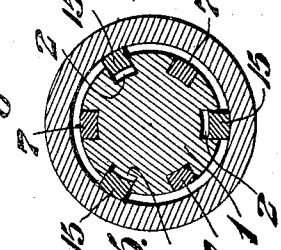


Fig. 5.

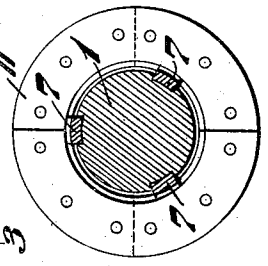


Fig. 4.

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2 SHEETS—SHEET 2.

Fig. 8.

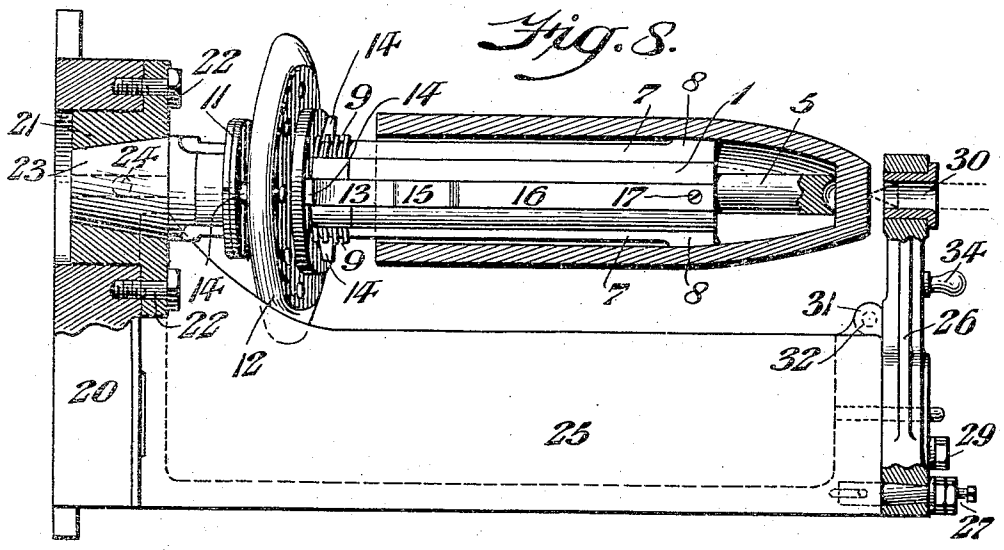
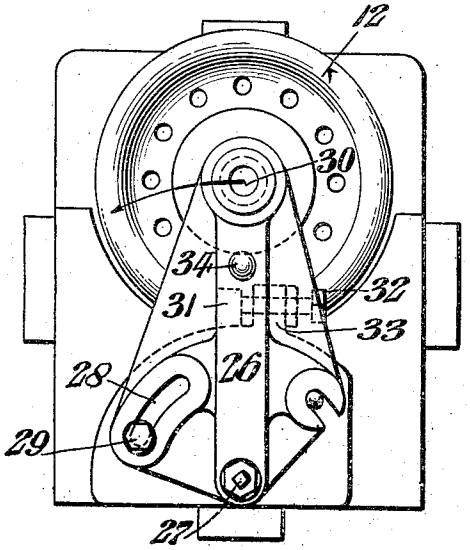


Fig. 9.



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EXPANDING MANDREL.

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Application filed February 21, 1916. Serial No. 79,596.

To all whom it may concern:

Be it known that I, WILLIAM H. LUTZ, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a certain new and useful Expanding Mandrel, of which the following is a specification.

The present invention relates to mandrels and more particularly to the expanding type of mandrel and has for an object to provide a device adapted to be inserted within a tubular or hollow member and grip the inner walls, thereby supporting such member and causing it to become substantially an integral part of mandrel so that movement imparted to the mandrel will be likewise transmitted to the article or member carried by the mandrel.

It has for a further object to provide a mandrel of the expanding type wherein a hollow or tubular member is held internally at opposite ends with like pressures, thus eliminating any tendency of one end of the holding member to slip while the other remains in gripping relation.

A further object of the invention is to provide means employed in conjunction with a mandrel for making accurate measurements of the relative dimensions of one part of an article with respect to another used as a base for measurement.

The invention further comprehends as an object means for centering an article carried by the mandrel, whereby an accurate substantially automatic centering may be effected in a minimum of time.

It further consists of other novel features of construction, all as will be hereinafter fully set forth.

Referring to the drawings:

Figure 1 represents a perspective of an expanding mandrel embodying my invention.

Fig. 2 represents a longitudinal section of the same on a larger scale.

Fig. 3 represents a section on line 3—3 of Fig. 2 on a larger scale.

Fig. 4 represents a section on line 4—4 of Fig. 2 on a larger scale.

Fig. 5 represents a section on line 5—5 of Fig. 2 on a larger scale.

Fig. 6 represents a section on line 6—6 of Fig. 2 on a larger scale.

Fig. 7 represents a detail showing a modified form of distance plug.

Fig. 8 represents a side elevation of the mandrel and a centering device for the same, certain of the parts being shown in section.

Fig. 9 represents a plan of the parts shown in Fig. 8.

1 designates the body of the mandrel which is preferably provided with longitudinally disposed grooves or slots 2 arranged at suitably spaced intervals and extending substantially throughout the length of the said body. The case 3 of the mandrel is preferably made flat on two sides to fit freely into a fixed drive plate permanently attached to the lathe face plate so that a lathe dog may be dispensed with. It is also provided with a center opening 4 for the usual purpose of receiving the lathe center, while the opposite end is preferably formed with a tapered opening to receive a distance plug 5, the function of which will be later explained. In connection with the grooves 2, it will be noted that I have employed six as the preferred number and three of these have the end portions at one end of the mandrel provided with a bevel 6. The grooves having this end bevel 6 receive respectively movable blades 7, one end of each of which is formed as a jaw 8 having an inclined part seating upon the respective bevels 6. Adjacent the opposite end of the respective blades 7, there is a threaded portion 9 which serves to transmit proper movement to the said blades while the extreme end of each blade is of reduced diameter and threaded as shown at 10 for the purpose of receiving a collar 11. 12 designates an internally threaded hand wheel meshing with the threaded portion 9 of the blades 7 and serving as the means above referred to for producing relative sliding movement between the blades and the body of the mandrel. This movement is made possible, in the present instance, by providing a plurality of wedge members 13 which seat respectively in the end portion of the grooves, unoccupied by the blades 7, and each of which is provided with a pair of flanges 14 adapted to straddle the hand wheel and abut the sides of the same. The ends of the wedges 13 seat between the body 1 of the mandrel and the jaws 15 of the blades 16, these latter being located in the main portion of the grooves 2 occupied by the wedges 13 and held in place at one extremity by screws 17 or like fastening means. From the foregoing, it will be seen that any turn-

ing or rotating of the hand wheel 12 causes the blades 7 to be drawn toward one end of the mandrel body, while the wedges 13 travel in the opposite direction and spring the blades 16 outwardly with the result that both sets of blade jaws 7 and 15 are simultaneously moved outwardly so that whatever article is to be held by the mandrel is gripped uniformly at both ends.

In Fig. 2, the section shows the mandrel in position within a shell or shrapnel casing with the plug 5 resting against the inner nose of the shell and thus forming at all times a means whereby measurements may be taken upon the outer surface of the shell using the mandrel as a guide for the same. The collar 11 serves as a means to maintain the three blades 7 similarly positioned with respect to the body, that is with the blade ends in the same plane, since it locks or seats against the end portion or shoulder formed by the supplemental threaded part. In connection with this collar, it will be noted that the same is placed in position after the mandrel parts are assembled and for this purpose, it is preferably made of two disks, each of which is split diametrically and the parts doweled together as will be apparent.

In Fig. 7, the distance-plug of the mandrel is shown formed with a center 18 to receive the tail center 19 of the lathe, this form of distance plug being used where the nose-piece of the shell is formed with an opening therethrough.

In Fig. 8 a modification of the device is shown wherein a centering device is employed consisting of a base 20 suitably apertured to receive a flange bearing 21, which is fixed in position by suitable fastening devices 22 and retains the solid tapered end 23 of the mandrel body, thus holding the latter accurately in a vertical position. With the mandrel thus located in position, it is fixed by a set screw 24 or the like bearing against a suitable flat as will be apparent.

25 designates a standard rising vertically from the base 20 and carrying at its upper end a movable plate or arm 26, which is pivoted at 27 to the standard so that it may be swung horizontally over the end of the shell or other article carried by the mandrel. The arm 26 is preferably slotted as shown at 28 to receive a fastening bolt 29 by which the parts are locked in adjusted position. In order to accurately position the bushed opening 30 above the shell end so that a drill passing through said opening 30 may strike the exact center, I provide an abutment 31 in the path of a stud or bolt 32 threaded through a boss 33 of the plate 26. By this means, the arm is definitely located as to central position and the stud 32 set so that the arm can be always brought back to the same place. A suitable handle 34 is carried by the arm 26 to shift it from one position to another.

In describing the operation and use of the mandrel of my invention, I shall consider the article carried thereby as a shell or shrapnel casing as that is the use to which the mandrel is more generally put at the present time though I wish it understood that my invention is not to be restricted in any particular to shell or shrapnel holding means, since obviously it is equally well adapted to support a tubular or hollow member of substantially any form which is to be machined. Normally the hand wheel member 12 is in such a position that the blades 7 and 17 are relaxed, that is, both sets of jaws are in position where the radius of the respective jaws is the shortest, considering the axis of the mandrel body to be the center of circles passing through the respective jaws. The mandrel body with its adjuncts is now passed within the shell casing until the distance plug 5 contacts with the end of the shell or passes through the nose as the case may be, whereupon the hand wheel 12 is properly turned to produce the relative sliding movement between the blades 7, wedges 13 and mandrel body 1. This movement causes the blades 7 to be drawn simultaneously toward the base of the body and of course, the jaws 8 ride along the beveled faces 6, thereby being forced outwardly to engage the inner surface of the shell at one end. Coincident with this movement, the wedges 13 move the same distance in the opposite direction and spring the blades 6 outwardly so that the jaws 15 bite or grip the inner surface of the shell, at the opposite end from the jaws 8 with the same pressure as do the jaws 8. The shell casing is thus held suspended by a three point contact at each end, said points of contact being substantially one hundred and twenty degrees apart and the set at one end staggered substantially sixty degrees with respect to the set at the opposite end. This arrangement is merely by way of example as showing the preferred form and I do not wish to be limited or restricted in any manner to this exact construction.

The mandrel is particularly effective in use with the machining of shells, since the shell may be accurately centered and the outside diameter machined concentric with the rough or unfinished bore. In using the centering device, it is preferable to combine two of these machines so that while one shell is being centered in one machine, another is being replaced for the centering operation.

After the centering operation, the shell is removed from the centering mandrel and placed upon another mandrel, the latter being inserted within the shell until the distance plug or inside shoulder of a projecting tail center touches the inside of the nose

and, when this occurs the mandrel is expanded to gripping position. The fact that a definite part of the mandrel engages the wall of the shell makes a gage of the device since measurements may be taken from the outer portion of the center bearing on the tail stock center.

It will now be apparent that I have devised a complete unitary mandrel construction wherein all parts coöperate to hold a shell or like member rigidly and with an equalized gripping pressure at all points of contact. Furthermore, all parts are designed with regard to extreme accuracy as to fit and movement of one part with respect to another and while the entire device is simple and easily manipulated, its efficiency is particularly high.

It will now be apparent that I have devised a novel and useful construction which embodies the features of advantage enumerated as desirable in the statement of the invention and the above description and while I have in the present instance shown and described the preferred embodiment thereof which has been found in practice to give satisfactory and reliable results, it is to be understood that the same is susceptible of modification in various particulars without departing from the spirit or scope of the invention as expressed in the claims or sacrificing any of its advantages.

What I claim is:

1. In a device of the character stated, a body adapted to be inserted within a hollow member and provided with a plurality of longitudinally disposed grooves, a blade slidably mounted in each alternate groove, a blade of spring material mounted in each of the remaining grooves and fixedly held at one end, jaws upon the respective blades, means for respectively causing each jaw to move outwardly with respect to said body and common means for actuating said jaw operating means, whereby all the jaws move outwardly and grip the interior of said hollow body with substantially the same pressure.

2. In a device of the character stated, a body adapted to be inserted within a hollow member and provided with a plurality of longitudinally disposed grooves, certain of said grooves terminating in a beveled portion adjacent one end of the body, blades slidingly mounted respectively in the grooves having the beveled portion, each blade being provided with a jaw having a beveled part contacting with the beveled portion of its groove, a screw-threaded part on the opposite end of each of said blades, blades of spring material located in the remaining grooves and fixed at one end to said body, a jaw upon the opposite end of each fixed blade, wedge members adapted to respectively engage between the jaw of each fixed blade and said body and means coöperating with both the screw-threaded portion of the blades and the wedge members for causing the movable blades to move in one direction and the wedge members to move in the opposite direction, whereby all of said jaws are forced outwardly to grip the interior of said hollow member with substantially the same pressure.

3. In a device of the character stated, the combination of a body adapted to be inserted within a hollow member, two sets of jaws carried by said body, means for causing outward movement of both sets of said jaws with respect to said body and a plug or extension member carried by one end of said body and adapted to contact with a portion of the interior of said hollow member.

4. In a device of the character stated, a body adapted to be inserted within a hollow member, two sets of jaws carried by said body, one of said sets being mounted for sliding movement longitudinally of said body, means in the path of movement of said jaws for causing said jaws to move outwardly with respect to said body, the other set of said jaws being adapted to be sprung outwardly, means for forcing said latter jaws outwardly, and common means for simultaneously causing said movable jaws to move in one direction and the operating means for the other jaws to move in the opposite direction.

5. In a device of the character stated, the combination of a body adapted to be inserted within a hollow member, two sets of jaws carried by said body, one of said sets being mounted for sliding movement longitudinally of said body, means in the path of movement of said jaws for causing said jaws to move outwardly with respect to said body, a second set of jaws secured to said body and adapted to be sprung outwardly, means for forcing said latter jaws outwardly, common means for simultaneously causing said movable jaws to move in one direction and the operating means for the other jaws to move in the opposite direction and a member projecting from the end of said body for engagement with a portion of the interior of said hollow member.

6. In a device of the character stated, a body adapted to be inserted within a hollow member, means carried by said body for gripping the interior of said hollow member in combination with a base adapted to support said body in a suitable position and means carried by said base for centering a tool with respect to the hollow member.

7. In a device of the character stated, a body adapted to be inserted within a hollow

member, means carried by said body for gripping the interior of said hollow member in combination with a base adapted to support said body in a suitable position, an arm pivoted for swinging movement in a plane above said hollow member, said arm having a centering opening therethrough and means to lock said arm in centering position, whereby said hollow member is accurately centered for machining operations.

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Witnesses:
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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."