

March 10, 1942.

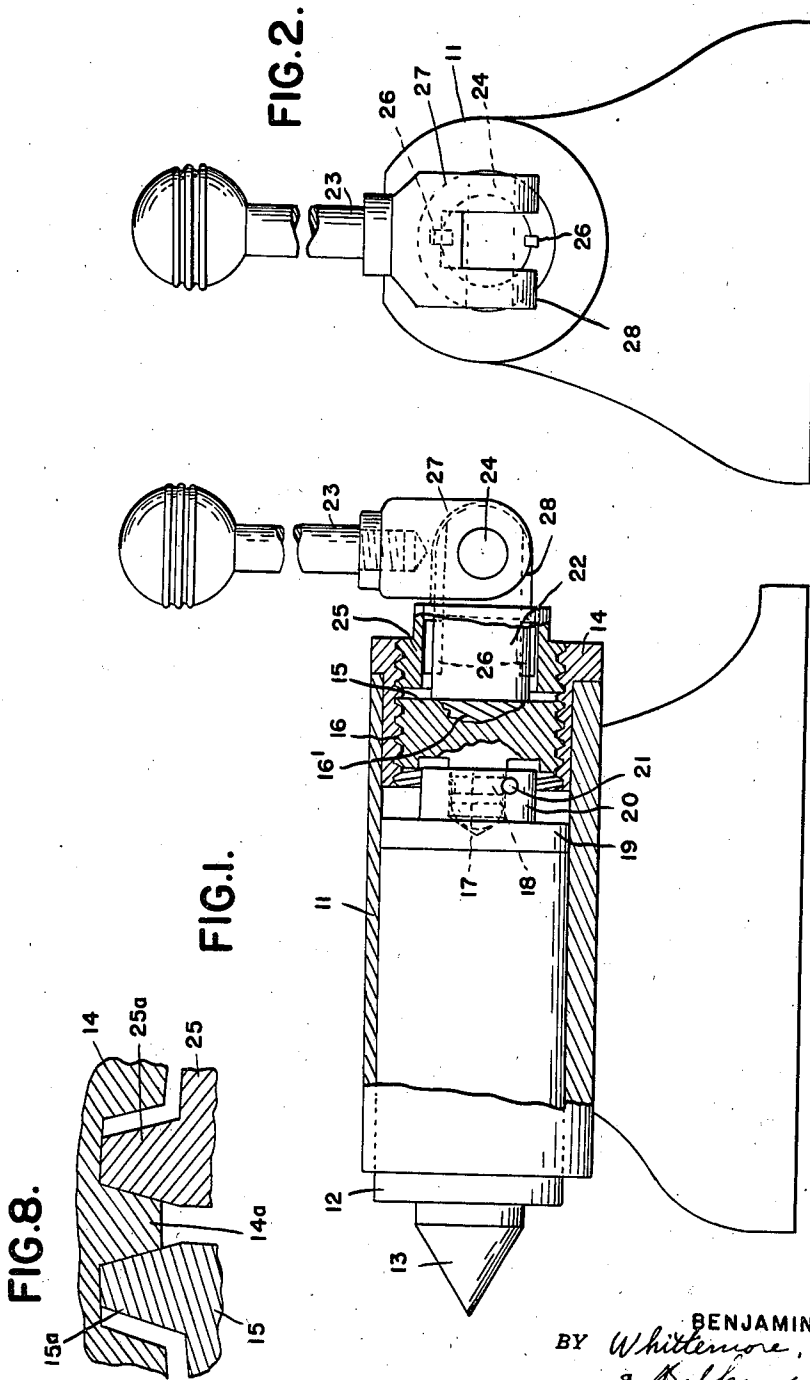
B. F. BREGI

2,275,723

HEADSTOCK

Filed May 6, 1940

2 Sheets-Sheet 1



INVENTOR.
BENJAMIN F. BREGI
BY *Whittemore, Hulbert*
& Belknap ATTORNEYS

March 10, 1942.

B. F. BREGI

2,275,723

HEADSTOCK

Filed May 6, 1940

2 Sheets-Sheet 2

FIG. 3.

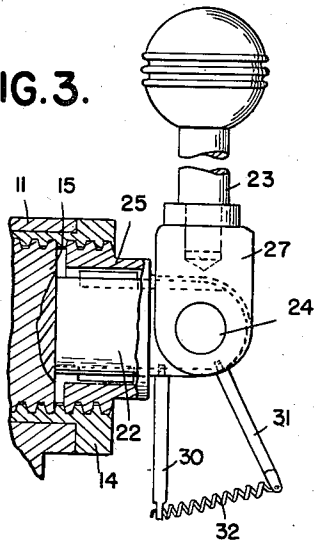


FIG. 4.

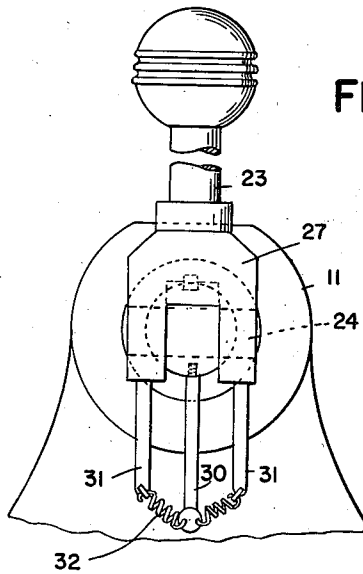


FIG. 5.

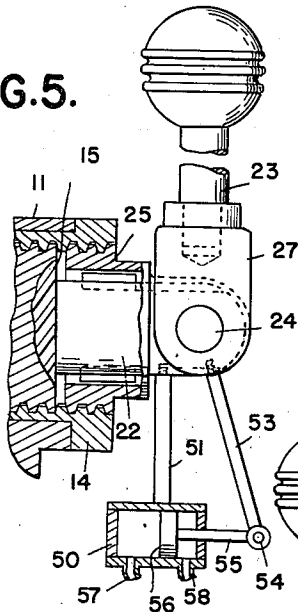


FIG. 6.

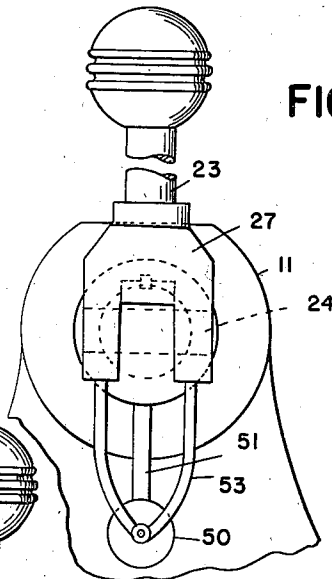
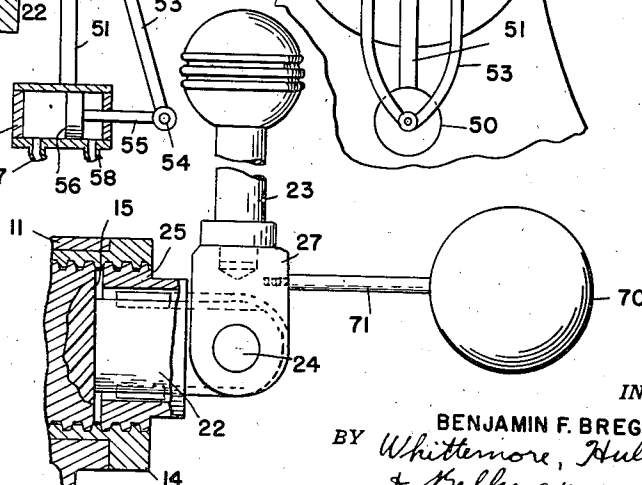


FIG. 7.



INVENTOR.

BENJAMIN F. BREGI

BY *Whittemore, Hulbert*
+ Kelknap ATTORNEYS

UNITED STATES PATENT OFFICE

2,275,723

HEADSTOCK

Benjamin F. Bregi, Detroit, Mich., assignor to
National Broach & Machine Company, Detroit,
Mich., a corporation of Michigan

Application May 6, 1940, Serial No. 333,648

17 Claims. (Cl. 82—31)

The present invention relates to a quick-lock headstock in which the center is advanced and is locked in position by movement of a single manipulating instrumentality.

It is an object of the present invention to provide a headstock having an actuating lever associated with the center so that the center may be advanced and locked in place by a manipulation of a single lever.

It is a further object of the present invention to provide a headstock having an axially movable center, actuating and locking means for the center comprising a pair of threaded members and a lever for operating the actuating and locking means.

It is a further object of the present invention to provide a quick-lock headstock having means for advancing a center in combination with other means for locking the center in adjusted position without the introduction of lost motion.

It is a further object to provide a clamping element movable rapidly into clamping position and adapted to be locked in place without the introduction of lost motion by manipulation of a single actuating member.

Other objects of the invention will be apparent as the description proceeds, and when taken in conjunction with the accompanying drawings wherein:

Figure 1 is a side elevation, partly in section, of a headstock made according to the present invention;

Figure 2 is an end elevation looking to the left in Figure 1;

Figure 3 is a fragmentary side elevation, partly in section, illustrating a somewhat different embodiment of my invention;

Figure 4 is an end view looking to the left in Figure 3;

Figure 5 is a fragmentary side elevation, partly in section, illustrating a somewhat different embodiment of my invention;

Figure 6 is an end view looking to the left in Figure 5;

Figure 7 is a fragmentary side elevation, partly in section, illustrating yet another embodiment of my invention; and

Figure 8 is a fragmentary section illustrating the operation of my invention.

The headstock which forms the subject matter of the present invention comprises a base 10 of usual design. As a matter of common practice, headstocks of this type are ordinarily mounted on ways for adjustment toward and away from a cooperating tailstock. The head-

stocks are locked in adjusted position and work pieces are fastened in position or removed thereafter by advancing and retracting a longitudinally slidable center.

The headstock casting provides a housing 11 in which is slidably mounted a center assembly 12 having associated therewith a center 13. Suitable bearings are provided intermediate the center and the sleeve, but these form no part of the present invention and are not shown herein.

Suitably locked in place at one end of the housing 11 is an internally threaded sleeve member 14. A plug 15 having an exteriorly threaded portion 16 is located within the sleeve 14 and is adapted to be advanced or retracted in the sleeve by relative rotation. The threads have a relatively large lead for quickly advancing or retracting the center 13, and in Figure 1 the lead of the threads is indicated at 16'. By way of example, I have found that where the threads are provided with a two inch lead, and four threads are provided per inch, excellent results are obtained. Means are provided for interconnecting the plug 15 and the center assembly, and I have illustrated a projection 17 on the plug 15 having a concave groove 18 formed therein. The center assembly 12 has a base plate 19, which in turn is provided with a collar 20 adapted to receive the projection 17. A retaining element 21 is carried by the collar 20 and extends into the groove 18, thus retaining the center assembly and the plug together for axial movement, while at the same time permitting relative rotational movement.

If preferred, projection 17 could be shaped to function as a center without the interposition of the assembly. Or other types of clamping elements could be employed instead of a center for clamping a work piece between centers. Thus for example a clamping dog could be actuated by the mechanism disclosed herein.

Extending rearwardly from the threaded portion 16 of the plug 15 is an extension 22 which extends out of the housing 11. A manipulating lever 23 is secured to the extension 22, as indicated at 24, and is adapted to rotate the plug 15 to advance or retract the center assembly. The lever 23 is pivoted to the extension 22 about a pin 24 which extends transversely to the axis of the plug 15.

Intermediate the threaded portion 16 and the lever 23 I provide a threaded locking element 25 adapted to be threaded within the threaded sleeve 14. The locking member 25 is keyed to

the extension 22 as indicated at 26, and is movable axially thereof. The lever 23 includes a bifurcated element 27 having a rounded cam surface 28 which may be provided by locating the pivot pin 24 in a slightly eccentric position. The arrangement is such that movement of the lever 23 in a clockwise direction, as seen in Figure 1, cams the locking element 24 to the left, as seen in this figure, at the same time applying a force to the plug 15, tending to move the same to the right. As will be evident, this results in rigidly locking the plug and the locking element against rotation, thus definitely positioning the center 13 in adjusted position.

It will be observed that the present construction avoids the introduction of any lost motion into the device. In positioning a work piece between centers the lever 23 is pivoted in a counter-clockwise direction, as seen in Figure 2, until the center 13 engages the work piece and moves the work piece firmly into contact with the opposite center. At this time, due to the reaction of the work piece, the plug member 15 tends to move to the right in the sleeve 14 so that whatever clearance may exist between the threads of the threaded portion 16 and the sleeve 14 will appear at the left-hand sides of the threads of the threaded portion 16. When the centers have been adjusted to the desired point, the lever 23 is then swung in a clockwise direction, as seen in Figure 1. The cam surface 28, engaging the locking element 25, tends to move the locking element to the left as seen in Figure 1, and also tends to move the plug 15 to the right, as seen in Figure 1. Since the plug 15 was already forced to the right, due to the reaction of the work piece, this locking takes effect without introducing any lost motion. To emphasize this advantage, it will be observed that if the locking took effect by reason of forcing the plug to the left in Figure 1, an undesirable condition would exist, due to introduction of lost motion in the threaded connections.

This operation is illustrated in Figure 8 which indicates the relationship between the threads of the various elements. In this figure I have shown a portion of the sleeve 14 having a thread 14a illustrated therein. A portion of the plug 15 is also shown, a tooth 15a thereof cooperating with the sleeve 14. A portion of the locking element 25 is also illustrated having a thread 25a cooperating with the teeth of the sleeve 14. Upon rotation of the lever 23 in a clockwise direction as illustrated in Figure 2, the plug 15 and the locking element 25 are turned in a direction to advance the center 13 to the left in Figure 1. When the center 13 has clamped a work piece against a cooperating center, the reaction of the work piece holds the plug 15 to the right as illustrated in Figure 8, and the lost motion or clearance in the threaded connection appears between the left side of the teeth 15a and the right side of the teeth 14a, as illustrated in Figure 8. When locking is to be effected, the locking element 25 is cammed or otherwise moved to the left as seen in Figure 8, the thread 25a thereof engaging the right-hand side of the teeth 14a of the right sleeve 14, and the clearance or lost motion between the threaded connection appearing between the right-hand side of the thread 25a and the left-hand side of the teeth 14a. It will be observed that motion of the locking element 25 to the left produces a reaction on the plug 15 which tends

to move the plug 15 to the right as seen in Figure 8. Since this reaction acts in the same direction as the reaction of the work piece, locking is effected without the introduction of lost motion.

In the modification illustrated in Figures 1 and 2, it is necessary for the operator to swing the lever counter-clockwise, as seen in Figure 1, to release the locking action, and then to rotate the lever about the axis of the plug 15 to effect advance or retraction of the center 13. When the center 13 has been advanced into center position with respect to a work piece, the operator then swings the lever 23 clockwise, as seen in Figure 1, which effects the locking of the center 13 in operative position without introducing any backlash or lost motion between the center 13 and the work piece. While this operation is relatively simple and enables loading a machine at a substantially increased rate, I contemplate a further improvement which generally takes the form of automatic means for insuring locking of the center 13 in position. This structure is illustrated in Figures 3 to 7.

Referring first to Figures 3 and 4, the sleeve 14 is secured in the housing 11 and has the plug 15 mounted therein in threaded relation. Locking member 25 is keyed or otherwise secured for relative axial motion to the projection 22, and is also threaded within the sleeve 14. The bifurcated element 27 is pinned as indicated at 24 to the projection 22, and has connected thereto the actuating lever 23. The lower surface of the bifurcations of the element 27 are cam surfaces to effect axial movement of the locking member 25 when the lever 23 is swung in a clockwise direction in Figure 3.

In order to insure locking of the center in position, I provide a depending lever arm 30 rigidly carried by the projection 22, and a pair of depending lever arms 31 carried by the bifurcations of the element 27. Lever arms 30 and 31 are interconnected by tension spring 32 and, as will be readily observed in Figure 3, the spring 32 tends to swing the actuating lever 23 in a clockwise position, which is the position in which the center 13 is locked. Operation of this modification is substantially identical with that more fully described in Figures 1 and 2, with the exception that it is unnecessary for the operator to swing the lever 23 clockwise as seen in Figure 3. After the center has been advanced to operative position it is only necessary for the operator to release the lever 23 and the tension spring 32 will automatically swing the lever into locked position. In addition to thus providing for accelerated operation of the headstock assembly, this feature is also a safety feature since it insures that locking of the center 13 will take place.

In Figures 5 and 6 I have illustrated a similar but specifically different embodiment of my invention. In these figures the sleeve 14 is mounted in the housing 11, as in the preceding embodiments, and has associated therewith the threaded plug 15 having an extension 22. Keyed to the extension 22 for longitudinal sliding movement is the locking member 25, which is also threadedly received within the sleeve 14. Bifurcated element 27 is pinned as indicated at 24 to the projection 22, and carries the actuating lever 23. In this modification, instead of providing resilient means for automatically swinging the actuating lever 23 to locked position, I provide fluid pressure means which include a

cylinder 50 rigidly mounted by an arm 51 on the projection 22. A pair of rigidly mounted levers 53 are mounted on the bifurcations of the element 27, and are pivotally connected as indicated at 54 to a rod 55 connected to a piston 56. If desired, a suitable pin and slot connection may be provided at 54, although it is ordinarily sufficient to merely make this connection loose enough to permit straight-line reciprocation of the rod 55 and swinging movement of the lever 53 about the axis of the pin 24. I have indicated connections at 57 and 58 for supplying fluid pressure to the cylinder 50. In the simplest form the fluid pressure will be admitted continuously through the connection 58, thus continuously urging the piston 56 to the left in Figure 5, and also continuously urging the actuating lever 23 toward locking position. It is also contemplated that suitable controls may be provided to the connections 57 and 58 for controlling the application of fluid pressure there-through. Thus for example in an automatic machine, pressure may be automatically admitted through the connection 57 after completion of a working cycle, and pressure may be automatically admitted to the connection 58 just prior to initiation of a working cycle to insure that the center 13 is locked against accidental displacement during the working cycle.

In Figure 7 I have illustrated a somewhat different embodiment of my invention, in which the sleeve 14 is rigidly mounted within the housing 11 and receives the threaded plug 15 and the locking member 25. The locking member 25 is keyed to the projection 22, and is adapted to be actuated by a suitable cam surface on the bifurcated member 27, as in the preceding embodiments. The bifurcated member 27 has rigidly secured thereto an actuating member 23. In this modification I have indicated a gravity member 70 in the form of a weight of suitable mass rigidly secured to the bifurcated element 27 by a lever 71. As will be evident, the weight 70 continuously urges the lever 23 toward locking position, and is adapted to automatically lock the center 13 in operative position upon release of the lever 23 by the operator.

It will be understood that in the modifications of Figures 3 to 7, all parts of the headstock mechanism are identical with those more fully described in connection with Figures 1 and 2, with the exception of the means added thereto for effecting automatic locking of the center in operative position.

I have illustrated a simple manually operated form of my improved headstock, together with a number of specific embodiments of automatically or semi-automatically operated headstocks. I wish to emphasize the fact that all embodiments include certain features which I consider novel. One of these is the large lead threaded connection which provides for advancing or retracting the center assembly between its limits upon a limited motion of the operating handle. Constructions in use at the present time ordinarily involve a crank which must be turned a plurality of times to advance or retract the headstock between limiting positions. In the present construction it is necessary to swing the actuating lever 23 through only a limited arc. This rapid advance and retraction of the center assembly is also considered novel, in combination with the quick-locking arrangement, and particularly where the quick-locking means is actuated by selective movement of the actuating lever. In

the modifications where means are added for automatically locking the center assembly, it will be observed that the provision of large lead advancing and retracting means and the same specific locking means is employed.

The invention has been illustrated in connection with a headstock, and specifically, with a so-called "live center." Obviously it is capable of general application, and where applied to a "dead center" the center element could be formed as a part of the plug 15. In like manner, instead of employing a center as a clamping element, any other appropriately shaped element could be substituted, as for example, a clamping dog. Obviously, the advantages of a movable clamping element capable of being moved rapidly to clamping position and locked in place by movement of a single manual control lever without the introduction of lost motion are adapted for more or less general application.

While I have illustrated a limited number of forms of my improved headstock, the same have been illustrated and described only to enable those skilled in the art to practice the invention the scope of which is indicated by the appended claims.

What I claim as my invention is:

1. A quick-lock headstock comprising a housing; a center in said housing mounted for axial movement therein; shifting means for said center comprising a pair of cooperating members mounted for relative rotation and relative axial movement, said members having cooperating inclined surfaces effective on relative rotation to cause relative axial movement; one of said members being retained in said housing against axial movement, the other of said members being axially movable and connected to said center for shifting the same axially; one of said members being retained in said housing against rotation, the other of said members being rotatable and having an actuating lever carried thereby for rotating the same; and means operable by said actuating lever for locking said center in any position of axial adjustment.

2. A quick-lock headstock comprising a housing; a center in said housing mounted for axial movement therein; shifting means for said center comprising a pair of cooperating threaded male and female members, said female member being retained against movement in said housing, said male member being rotatable and axially movable, a connection between said male member and said center for shifting the same, a lever connected to said male member for rotating the same, and means operable by said lever for locking said center in any position of axial adjustment.

3. A quick-lock headstock comprising a housing; a center in said housing mounted for axial movement therein; shifting means for said center comprising a pair of cooperating, large lead, threaded male and female members, said female member being retained against movement in said housing, said male member being rotatable and axially movable, a connection between said male member and said center for shifting said center, a lever connected to said male member, and friction lock means operable by said lever for locking said threaded members against rotation in any position of adjustment.

4. A quick-lock headstock comprising a housing, a center axially movable in said housing, an internally threaded sleeve anchored in said housing, a threaded plug in said sleeve, a connection

between said plug and said center for shifting said center axially in response to rotation of said plug, a lever extending radially from said plug, a lever extending radially from said plug for rotating said plug, a locking member associated with said plug, and means operable by said lever for actuating said locking member to lock said plug against further rotation in any position of adjustment, said lever being pivoted to said plug and having a cam surface engageable with said locking member to actuate the same.

5. A quick-lock headstock comprising a support having an internally threaded sleeve fixed thereto, a center movable axially of said sleeve, a threaded plug in said sleeve, a connection between said plug and said center for shifting said center axially in response to rotation of said plug, a shank extending from said plug, a threaded locking member keyed to said shank for axial movement thereon, a lever pivoted to said shank about a transverse axis, said lever being effective to rotate said plug to shift said center, said lever having a cam surface effective upon pivoting said lever about said transverse axis to press said locking member axially of said shank to lock said plug against rotation in said sleeve.

6. A quick-lock headstock comprising a support having an internally threaded sleeve secured thereto, a center movable axially of said sleeve, a split threaded device in said sleeve, a connection between said device and said center for shifting said center axially, a lever for rotating said threaded device, said lever being pivoted for movement about an axis transverse to the axis of said threaded device, and cam means movable by said lever for actuating said split threaded device to frictionally lock said device against rotation.

7. A quick-lock headstock comprising a support having an internally threaded sleeve secured thereto, a center movable axially of said sleeve, a plug having a threaded portion in said sleeve and connected to said center, a lever pivoted to said plug about an axis transverse to the axis of said plug, a threaded locking member keyed to said plug for relative axial movement, and a cam surface on said lever adapted upon pivoting movement of said lever relative to said plug to force said locking member toward said threaded portion to lock said plug in said sleeve without the introduction of lost motion between said sleeve and plug.

8. A quick-lock device comprising a housing, a clamping element movable longitudinally in said housing, combined shifting and locking means for said clamping element including relatively rotatable members having cooperating camming surfaces effective on partial relative rotation to shift said clamping element between extreme limits of movement, a lever extending laterally from one of said members to provide for manual rotation of said member, said lever being pivotally secured to said one member for relative movement and effective upon such relative movement to actuate said locking means.

9. A quick-lock device comprising a housing, a clamping element movable longitudinally in said housing, combined shifting and locking means for said clamping element including relatively rotatable shifting members having cooperating camming surfaces effective on partial relative rotation to shift said clamping element between extreme limits of movement, a locking member effective to lock said relatively rotatable shifting members together, and a single manually oper-

able lever for selectively relatively rotating said shifting members or actuating said locking member.

10. A quick-lock device comprising a housing, a clamping element axially movable therein, means for shifting said clamping element between limits and for locking said clamping element in any position between said limits, an actuating member selectively movable between predetermined limits in one path to effect shifting of said clamping element and selectively movable in another path from any point between said predetermined limits to lock said clamping element against shifting.

11. A quick-lock device comprising a housing, a clamping element axially movable therein, means for shifting said clamping element between limits and for locking said clamping element in any position between said limits, an actuating member selectively movable between predetermined limits in one path to effect shifting of said clamping element and selectively movable in another path from any point between said predetermined limits to lock said clamping element against shifting, and automatic means constantly biasing said actuating member toward locking position.

12. A quick-lock device comprising a housing, a clamping element axially movable therein, means for shifting said clamping element between limits and for locking said clamping element in any position between said limits, an actuating member selectively movable between predetermined limits in one path to effect shifting of said clamping element and selectively movable in another path from any point between said predetermined limits to lock said clamping element against shifting, and resilient means constantly biasing said actuating member toward locking position.

13. A quick-lock device comprising a housing, a clamping element axially movable therein, means for shifting said clamping element between limits and for locking said clamping element in any position between said limits, an actuating member selectively movable between predetermined limits in one path to effect shifting of said clamping element and selectively movable in another path from any point between said predetermined limits to lock said clamping element against shifting, and fluid pressure means constantly biasing said actuating member toward locking position.

14. A quick-lock device comprising a housing, a clamping element axially movable therein, means for shifting said clamping element between limits and for locking said clamping element in any position between said limits, an actuating member selectively movable between predetermined limits in one path to effect shifting of said clamping element and selectively movable in another path from any point between said predetermined limits to lock said clamping element against shifting, and gravity means constantly biasing said actuating member toward locking position.

15. In a device of the character described, an internally threaded sleeve, an externally threaded plug received therein, an externally threaded locking member in said sleeve, said locking member being axially movable relative to said plug, manually operable means including a lever for simultaneously rotating said plug and locking member and camming means operable by said lever effective to move said locking member ax-

ially of said sleeve to provide a friction lock between the threads of said sleeve, plug, and locking member.

16. In a device of the character described, an internally threaded sleeve, an externally threaded plug received therein, an externally threaded locking member in said sleeve, said locking member being axially movable relative to said plug, manually operable means including a lever for simultaneously rotating said plug and locking member, and camming means operable by said lever effective to move said locking member axially of said sleeve to provide a friction lock between the threads of said sleeve, plug, and locking member, said locking member being spaced axially from said plug in the direction which causes the friction lock to take effect on the side of the threads of said plug which are engaged

by reason of the external load or resistance present.

17. A quick-lock headstock comprising an internally threaded sleeve, a center assembly in said sleeve including an externally threaded plug and an externally threaded locking member keyed together for simultaneous rotation and for relative axial movement, a lever extending transversely from said plug for rotating said plug and locking member, said lever being pivoted to said plug for selective pivotal movement relative thereto, and cam means effective on said selective pivotal movement of said lever relative to said plug to relatively move said locking member and plug axially to effect locking of said plug in said sleeve.

BENJAMIN F. BREGI.