Jan. 12, 1960 C. L. HUTSON 2,920,665

CLAMPING DEVICE WITH SELECTIVELY YIELDABLE OR NON-YIELDABLE PRESSURE MEANS

Filed March 30, 1956 2 Sheets-Sheet 1

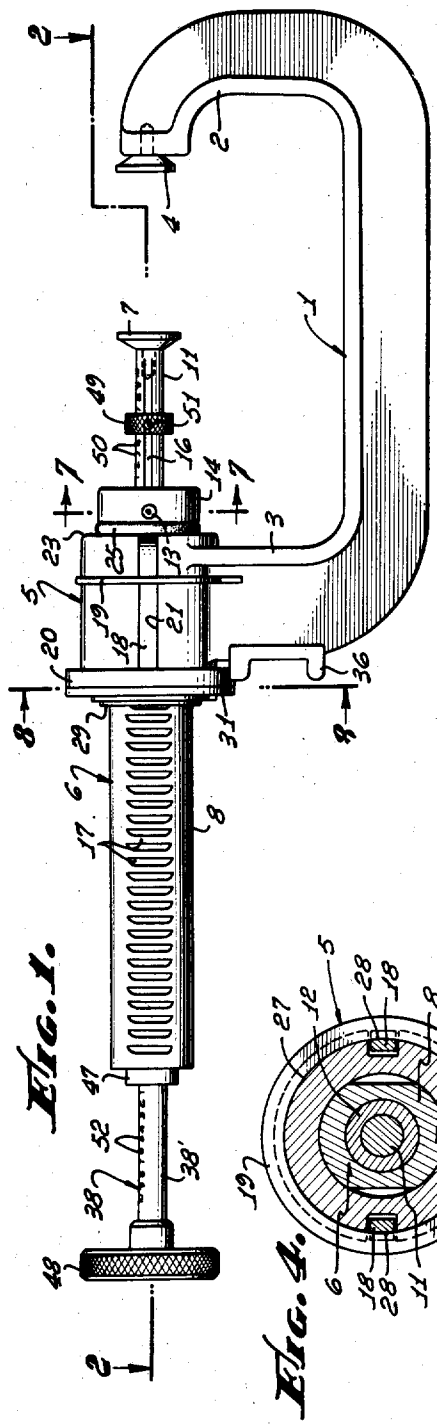


Fig. 1.

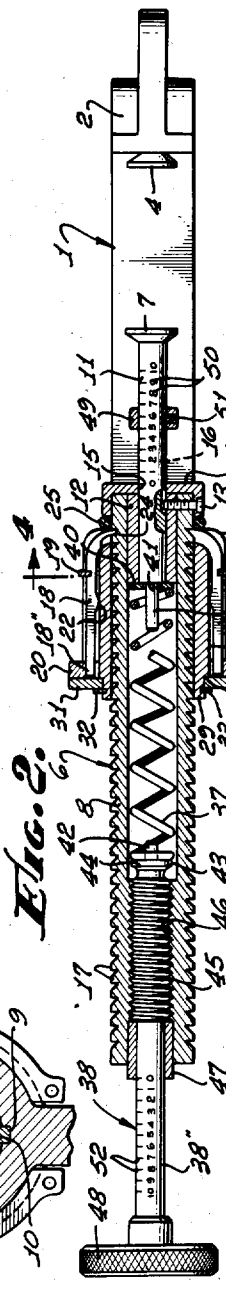


Fig. 2.

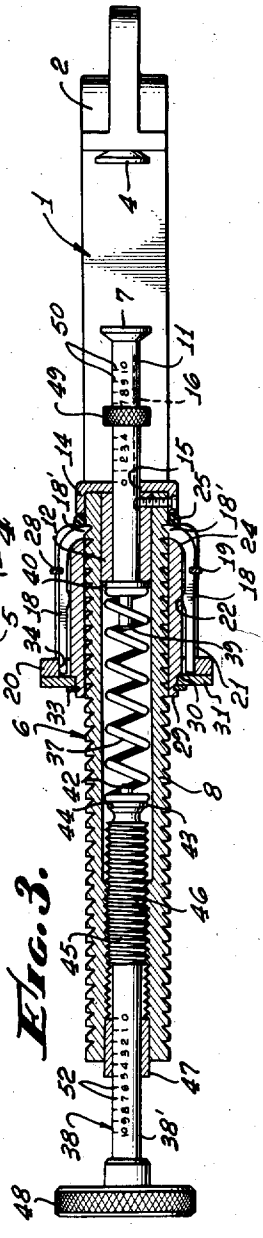


Fig. 3.

Fig. 4.

INVENTOR.
CLIFFORD L. HUTSON
BY
Paul A. Weilein
ATTORNEY.

Jan. 12, 1960 C. L. HUTSON 2,920,665

CLAMPING DEVICE WITH SELECTIVELY YIELDABLE OR NON-YIELDABLE PRESSURE MEANS

Filed March 30, 1956 2 Sheets-Sheet 2

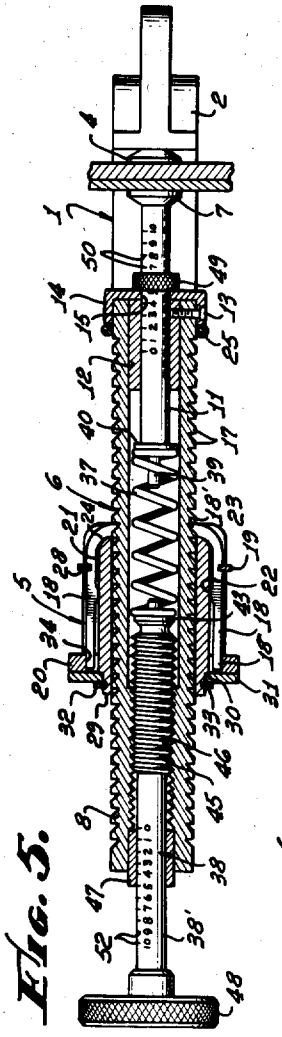


Fig. 5.

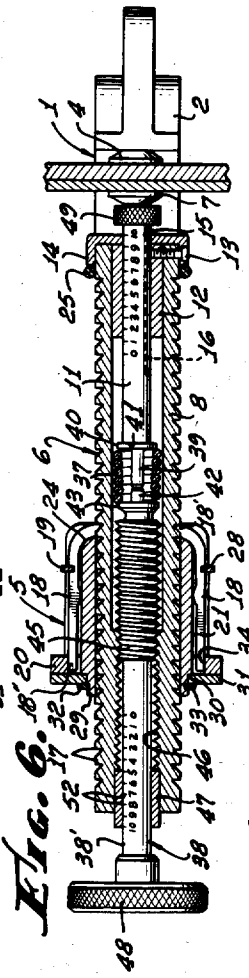


Fig. 6.

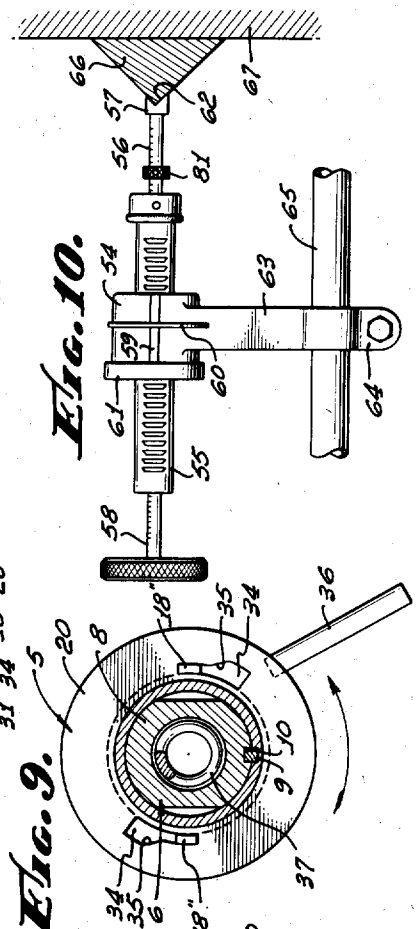


Fig. 10.

Fig. 9.

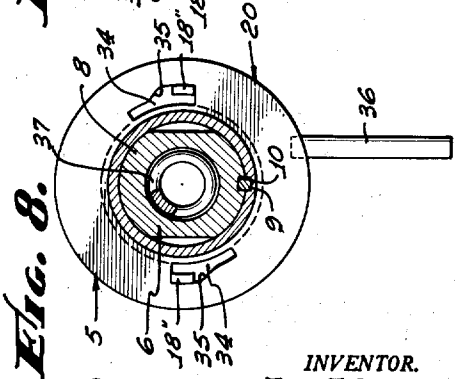


Fig. 8.

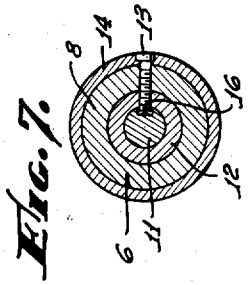


Fig. 7.

INVENTOR.
CLIFFORD L. HUTSON
BY
Paul A. Weilein
ATTORNEY.

United States Patent Office 2,920,665 Patented Jan. 12, 1960

2,920,665

CLAMPING DEVICE WITH SELECTIVELY YIELDABLE OR NON-YIELDABLE PRESSURE MEANS

Clifford L. Hutson, Glendale, Calif.

Application March 30, 1956, Serial No. 575,190

8 Claims. (Cl. 144—305)

This invention relates to clamping devices of the type in which a jaw may be moved into engagement with the work with a free-sliding action and then tightened by a screw-threaded adjustment of the clamp. A clamping device of this type forms the subject matter of my application for U.S. Letters Patent, Serial No. 476,119, filed December 20, 1954, which matured into Patent No. 2,812,789.

It is an object of the present invention to provide an improved clamping device of the character described, wherein the movable work-engaging jaw optionally may be yieldably or non-yieldably clamped against the work, whereby the one device may be used to hold work of a nature best suited to a yieldable clamping action as well as work requiring a non-yieldable clamping action.

It is another object of this invention to provide a clamping device in which the work-engaging jaw may be pre-loaded selectively to apply a predetermined yieldable clamp force against the work.

It is an additional object of this invention to provide a clamping device such as described wherein the yieldable clamping force of the pre-loaded jaw readily may be increased or decreased over a wide range best to suit the particular work, before or after the jaw engages the work.

This invention possesses many other advantages and has other objects which may be made more easily apparent from a consideration of several embodiments of the invention. For this purpose there are shown two forms in the drawings accompanying and forming part of the present specification. These forms will now be described in detail, illustrating the general principles of the invention; but it is to be understood that this detailed description is not to be taken in a limiting sense, since the scope of the invention is best defined by the appended claims.

Referring to the drawings:

Fig. 1 is a side elevation of a clamping device embodying the present invention;

Fig. 2 is a longitudinal sectional view taken substantially on the line 2—2 of Fig. 1;

Fig. 3 is a view corresponding to Fig. 2, but showing the spring adjustment means as adjusted to compress the spring from the position of the spring shown in Fig. 2;

Fig. 4 is a sectional view, on an enlarged scale, taken on the line 4—4 of Fig. 2;

Fig. 5 is a longitudinal section similar to Fig. 3, showing the device adjusted to yieldably clamp work;

Fig. 6 is a view corresponding to Fig. 5, showing how the device is adjusted to non-yieldably clamp work;

Fig. 7 is a cross sectional view taken on the line 7—7 of Fig. 1;

Fig. 8 is a cross sectional view, on an enlarged scale, taken on the line 8—8 of Fig. 1;

Fig. 9 is a cross sectional view corresponding to Fig. 8, showing the cam means of Fig. 8 in pawl-releasing position; and

Fig. 10 is a side elevation of a modified form of this invention.

As shown in Figs. 1 to 9, the present invention is embodied in a C-clamp. Such a clamp includes an elongated frame 1 provided with opposed legs 2 and 3. The leg 2 supports a stationary work-engaging jaw 4. The leg 3 is provided with a tubular bearing or support 5 for actuating means generally designated 6, constructed and operated in a manner hereinafter described, for moving a work-engaging jaw 7 toward and away from the jaw 4.

It is desired that the movable jaw 7 be operable to yieldably engage the work in some instances and to non-yieldably engage the work in other instances. It is also desired that the yieldable clamping action of the jaw 7 may be varied over a wide range subject to change at will before or after engaging the work. Again, in some instances, pre-loading of the jaw 7 is desired so that it will exert a predetermined pressure against the work, such pressure being subject to increase or decrease after the jaw engages the work. Accordingly, the actuating means 6 is constructed and arranged to provide for a yieldable or a non-yieldable work-engaging action of the jaw 7. The yieldable action is provided through the medium of resilient means, for example, a spring which may or may not be utilized to spring-load the jaw. The force of this resilient means may be varied before or after the jaw engages the work as well as before and after the jaw engages the work. With this arrangement small parts of a fragile nature or such that they may be marred or damaged by a non-yielding or too great a yielding pressure, may be held as desired with the clamping device of this invention. Moreover, in work where a non-yielding clamping action is desired, the actuating means is operated without spring-loading the jaw 7.

Referring more specifically to the means 6 for actuating the jaw 7, it will be seen that it includes an elongated jaw-supporting member 8 in the form of a sleeve axially adjustably supported in the bearing or support 5 and held against turning about its axis by means of a key 9 on the support 5 engaged in a keyway 10 on the sleeve (see Fig. 4).

The jaw 7 is fixed on the outer end of a rod 11 axially movable through a bushing 12 in one end of the bore of the sleeve 8. A screw 13 holds a flanged cap 14 on the outer end of the sleeve 8, the cap having a central opening 15 therein through which the rod 11 is slidable. The screw 13 extends into a keyway 16 on the rod 11 to prevent the rod from turning about its axis and limit the axial movement of the rod 11 toward the jaw 4.

As the sleeve 8 is slidable freely in the bearing support 5 to move the jaw 7 toward the work, means are provided to releasably lock the sleeve against retrograde movement. As here shown, this means includes ratchet teeth 17 on opposite sides of the exterior of the sleeve 8, pawls 18 mounted on the support 5, a spring 19 for urging the pawls against the ratchet teeth, and a cam ring 20 operable on the support 5 to move the pawls out of engagement with the teeth and to release the pawls for engaging the teeth.

The pawls 18 are mounted in grooves 21 extending longitudinally of the exterior of the bearing or support 5. Each pawl has a fulcrum portion 22 bearing against the bottom of the groove 21 in which the pawl is mounted, whereby the pawl may be tilted into and out of engagement with the ratchet teeth 17. The grooves 21 open through the rounded end 23 of the support 5 so that the inwardly curved teeth-engaging ends 18' of the pawls 18 will be countersunk in the ends of the grooves and abut shoulders 24 on the member 5. The shoulders 24 act as stops to prevent dislodgement of the pawls from the ratchet teeth under forces developed axially in the sleeve 8 during the clamping of the jaw 7 against the work.

When the sleeve 8 is fully retracted, a cushioning ring 25 on the sleeve abuts the rounded end 23 of the support 5.

The spring 19 is in the form of a resilient split ring which embraces the pawls 18 somewhat forwardly of the fulcrum portions 22 and extends around the support 5. This spring is seated in an arcuate groove 27 in the support as well as in transverse grooves 28 in the pawls, thereby being held in place and in turn holding the pawls in place as well as urging the pawls against the ratchet teeth.

The cam ring 20 is mounted to turn on the reduced end 29 of the support 5, being confined between a shoulder 30 on the support 5 and a washer 31. This washer is held on the end 29, by means of a snap ring 32 seated in a groove 33. The ends 18' of the pawls 18 extend into cam openings 34 in the cam ring 20 so as to engage cam surfaces 35 formed by said openings. Appropriate turning of the cam ring 20, by means of a handle 36 thereon will move the pawls 18 out of engagement with the ratchet teeth 17 whereby the sleeve 8 is free to be retracted axially in the bearing 5. Movement of the cam ring 20 in the opposite direction permits the spring 19 to return the pawls 18 into engagement with the teeth 17.

The means 6 for actuating the movable jaw 7 includes resilient means, for example, a coiled spring 37 carried by the sleeve 8 for yieldably urging the jaw 7 against the work. The spring 37 is confined between the rod 11 and an adjusting screw 38 threadedly coupled to the sleeve 8 whereby the tension of the spring may be varied to increase or decrease the yieldable clamping action of the jaw 7. When the spring 37 is fully compressed, the rod 11 and the screw 38 will abut one another whereby a positive and non-yieldable clamping action of the jaw 7 may be effected upon further turning of the screw 38 in the appropriate direction.

As here shown, the spring 37 is mounted in the bore of the sleeve 8 with one end embracing the reduced inner end 39 of the rod 11 and abutting a washer 40 confined on the rod between a shoulder 41 and the spring. The other end of the spring 37 embraces the reduced end 42 of the screw 38 and abuts a washer 43 confined between the spring and the shoulder 44 on the screw. The screw 38 has a screw threaded portion 45 engaged with a screw threaded portion 46 of the bore of the sleeve 8. A non-threaded portion 38' of the screw 38 extends through a bushing 47 secured in any suitable manner in the outer end of the bore of the sleeve 8. A knurled handle 48 is provided on the outer end of the screw 38 to facilitate manipulation of the screw for adjusting the spring 37 as well as for effecting the sliding movement of the sleeve 8.

Figs. 1 and 2 show the sleeve 8 and the screw 38 fully retracted. The spring 37 is under light compression, for example, just sufficient to fully extend the rod 11. This is the normal position of the parts of the clamp such that maximum spacing is afforded between the jaws 4 and 7.

Means are provided for predetermining the yieldable clamping force of the jaw 7 for a particular kind of work to be held between the jaws under a pressure calculated to prevent marring or injury of the work. This means includes a stop collar 49 axially adjustable on the rod 11 between the jaw 7 and the cap 14 on the sleeve 8. The portion of the rod 11 on which the stop collar 49 is adjustable is graduated, as at 50, with the graduations numbered from zero to 10, the numbers increasing toward the jaw 7. These graduations may indicate pounds, ounces or other units of force. When the stop collar 49 is set by means of the set screw 51 thereon, for example, at the graduation which is numbered 5, as shown in Fig. 2, the device is set to provide a clamping force of five force units (pounds, ounces or similar units). The sleeve 8 may now be pushed forwardly to engage the jaw 7 with the work positioned between jaws 7 and 4, the pawls 18 then engaging the teeth 17 to prevent retrograde movement of the sleeve 8. When the jaw 7 contacts the work, the forward movement of the sleeve 8 is continued until the cap 14 on the sleeve contacts the stop collar 49, the pawls 18 again preventing retrograde movement of the sleeve 8. During this advance of the sleeve 8, the spring 37 is compressed between the screw 38 and the rod 11 so that when the stop collar 49 is encountered by the cap 14, a predetermined spring load is applied to the jaw 7. With this arrangement it will be seen that the yieldable clamping force of the jaw 7 may be varied over a wide range according to the setting of the stop collar 49 on the rod 11.

The screw 38 also provides for pre-loading the spring 37. Inward axial movement of the screw will compress the spring, whereas outward axial movement of the screw will relieve the tension of the spring. The portion 38' of the screw may be provided as here shown, with graduations 52 numbered from zero to ten, with the numbers increasing toward the knurled handle 48. The graduations 52 may be calibrated in units of force corresponding to those represented by the graduations on the rod 11.

With reference to Fig. 3, it will be seen that the screw 38 has been screwed inwardly to compress the spring 37, for example, an extent for applying to the jaw 7 a force of "5" units, the outer end of the bushing 47 serving as an indexing point. The stop collar 49 has also been set at the "5" unit graduation on the rod 11. Upon now moving the sleeve 8 forwardly to engage the jaw 7 with the work and then continuing this forward movement until the cap 14 contacts the stop collar 49, as shown in Fig. 4, the spring 37 will be compressed 5 units in addition to the preloading of five units effected by the adjustment of the screw 38, whereby the jaw is yieldably engaged with the work under a clamping force of ten units.

It should be noted that after the jaw 7 is yieldably engaged with the work under a load as effected by the setting of the stop collar 49 or under the setting of the screw 38 or a setting of the collar and the screw, the clamping force readily may be decreased or increased either by axial adjustment of the ratchet sleeve 8 or by axial adjustment of the screw 38 or by both such adjustments.

If desired to non-yieldably engage the work with the jaw 7, the screw 38 may be adjusted inwardly the maximum extent, for example as shown in Fig. 6, whereby the ends of the screw 38 and the rod 11 will abut one another. This adjustment may be effected before or after the jaw 7 engages the work and the clamping action of this jaw against the work may be varied by continued adjustment of the screw 38 after the screw and the rod 11 abut one another.

A modified form of this invention, as shown in Fig. 10, provides a support or bearing 54, a ratchet sleeve 55, a spring-loaded rod 56 for a movable jaw 57, an adjusting screw 58, pawls 59, spring 60 for actuating the pawls, a cam means 61 for moving the pawls out of engagement with the ratchet sleeve, and an adjustable collar 81 on the rod 56. These parts are identical with like parts shown in Figs. 1–9, except as to the V-shaped notch 62 in the jaw 57. The bearing 54 is mounted on an arm 63 on which a clamp 64 is operable to detachably and adjustably mount this modified form of the invention on a support, for example, on a rod or bar 65. The jaw 57 with the notch 62 therein is adapted to hold work 66 of the form here shown, or similarly shaped work, against a surface or member 67. However, any other form of jaw may be used. In some instances this modified form having the one arm 63 and clamp 64 thereon may be preferable to the first described C-clamp form of the invention, although this modified form is operable in the same manner as the the C-clamp form, to yieldably or non-yieldably engage the work for the purposes and with the advantages, hereinbefore noted.

Another advantage of this clamping device is that the jaw 7 will be quickly released from the work responsive to movement of the pawls 18 out of engagement with the teeth on the sleeve 8. This release of the sleeve 8 relieves the spring pressure from the jaw 7 which then moves by inertia clear of the work.

I claim:

1. In a clamping device having a support for pressure applying means, said means comprising: an elongated member mounted on said support for axial adjustment relative thereto; elements on said support and said elongated member respectively, cooperable to releasably hold said elongated member in axially adjusted position; a rod supported by said elongated member for movement therewith as well as axial movement relative thereto; a work-engaging jaw on said rod; an adjusting member connected with said elongated member for axial adjustment relative thereto in opposed relation to said rod; a compression spring interposed between said rod and said adjusting member yieldably resisting axial movement of said rod toward said adjusting member, said rod and said adjusting member each having graduated markings thereon; means on said elongated member disposed in indicating relation to said markings; and said adjusting member and said rod being of such a length and the graduations being placed thereon so that said spring is substantially fully compressed when said indicating means is disposed adjacent to the highest graduated marking of said adjusting member and said rod.

2. In a clamping device having a support for pressure applying means, said means comprising: an elongated member having a through bore mounted on said support for axial adjustment relative thereto; means on said support and said elongated member respectively, cooperable to hold said elongated member in axially adjusted positions; a rod having one end slidable in said bore; a work engaging jaw on said rod; a coiled spring in said bore having one end engaged with said rod to urge the rod outwardly relative to said elongated member; means on said rod and said elongated member respectively cooperable to limit outward movement of said rod; spring adjusting means operatively connected with said elongated member and said spring respectively, operable for varying the tension of said spring; a stop member on said jaw-supporting member for engaging said elongated member to limit inward movement of said jaw-supporting member relative to said elongated member; and means providing for adjustment of said stop member relative to said rod and said jaw.

3. In a clamping device having a tubular support for pressure applying means, said means comprising: a sleeve slidably mounted in said support; ratchet teeth on the sleeve; a pawl on said support; spring means urging said pawl into engagement with said teeth; means operable on the support for releasing the pawl from engagement with the teeth, a rod having one end slidably mounted in the bore of said sleeve; a work-engaging jaw on the other end of said rod; an adjusting screw having a screw threaded portion mounted in the bore of said sleeve with one end opposed to said one end of said rod; said bore having internal screw threads engaged with said threaded portion; a coiled spring in the bore of said sleeve having its ends engaged with said rod and said screw respectively, said spring yieldably urging said rod outwardly; elements on said rod and said sleeve respectively cooperable to limit said outward movement of said rod; and a stop member axially adjustable on said rod for abutting an end of said sleeve to limit inward movement of the rod relative to the sleeve.

4. In a clamping device having a support for pressure applying means, said means comprising: an elongated member mounted on said support for axial adjustment relative thereto; means on said support and said elongated member respectively, cooperable to hold said elongated member in axially adjusted position; a rod having one end slidably supported by said elongated member; a work-engaging jaw on said rod; a coiled spring in said elongated member having one end engaged with said rod to urge the rod outwardly relative to said elongated member; means on said rod and said elongated member respectively cooperable to limit outward movement of said rod; adjusting means operatively connected with said elongated member and said spring respectively, operable for varying the tension of said spring; a stop member axially adjustable on said rod for engaging said elongated member to limit inward movement of said rod relative to said elongated member; said rod having graduations axially spaced thereon to indicate positions to which said stop member may be adjusted; and means for releasably holding said stop member in registration with any one of said graduations.

5. In a clamping device having a support for pressure applying means, said means comprising: an elongated member mounted on said support for axial adjustment relative thereto; elements on said support and said elongated member respectively, cooperable to releasably hold said elongated member in axially adjusted positions; a rod supported by said elongated member for movement therewith as well as axial movement relative thereto; a work-engaging jaw on said rod; an adjusting member connected with said elongated member for axial adjustment relative thereto in opposed relation to said rod; a stop member adjustable axially on said rod between said jaw and said elongated member to limit inward movement of said rod and jaw relative to said elongated member; and resilient means on said rod between said adjusting member and said rod for resisting inward movement of said adjusting member and said rod axially of said elongated member; said adjusting member having graduations axially spaced thereon to indicate the force of the spring according to axial adjustment of said adjusting member.

6. In a clamping device having a support for pressure applying means, said means comprising: an elongated member mounted on said support for axial adjustment relative thereto; elements on said support and said elongated member respectively, cooperable to releasably hold said elongated member in axially adjusted positions; a rod supported by said elongated member for movement therewith as well as axial movement relative thereto; a work-engaging jaw on said rod; an adjusting member connected with said elongated member for axial adjustment relative thereto in opposed relation to said rod; a stop member adjustable axially on said rod between said jaw and said elongated member to limit inward movement of said rod and jaw relative to said elongated member; resilient means on said rod between said adjusting member and said rod for resisting inward movement of said adjusting member and said rod axially of said elongated member; said adjusting member having graduations axially spaced thereon to indicate the force of the spring according to axial adjustment of said adjusting member; said rod having graduations axially spaced thereon to indicate different positions to which said stop member may be adjusted; and means on said stop member operable to releasably hold the stop member at any of said different positions.

7. In a clamping device having a support for pressure-applying means, said means comprising: an elongated member mounted on said support for axial adjustment relative thereto; elements on said support and said elongated member, respectively, cooperable to releasably hold said elongated member in axially adjusted positions; a rod supported by said elongated member for movement therewith as well as axial movement relative thereto; a work-engaging jaw on said rod; an adjusting member connected with said elongated member for axial adjustment relative thereto in opposed relation to said rod; a compression spring interposed between said rod and said adjusting member yieldably resisting axial movement of said rod toward said adjusting member; and said adjusting mem-

ber having a length of adjustment such that optionally it may be adjusted axially in one direction for rendering said spring inoperable to yieldably resist axial movement of said rod toward said adjusting member.

8. In a clamping device having a support for pressure-applying means, said means comprising: an elongated member mounted on said support for axial adjustment relative thereto; elements on said support and said elongated member, respectively, cooperable to releasably hold said elongated member in axially adjusted positions; a rod supported by said elongated member for movement therewith as well as axial movement relative thereto; a work-engaging jaw on said rod; an adjusting member connected with said elongated member for axial adjustment relative thereto in opposed relation to said rod; a compression spring interposed between said rod and said adjusting member yieldably resisting axial movement of said rod toward said adjusting member; and means embodied in said adjusting member and said elongated member cooperable to provide for a length of axial adjustment of said adjusting member such that said spring optionally may be rendered inoperable to yieldably resist axial movement of said rod toward said adjusting member; said adjusting means being operable to increase the clamping force of said jaw after said spring has been rendered inoperable to resist axial movement of said rod toward said adjusting member.

References Cited in the file of this patent

UNITED STATES PATENTS

1,433,076	Green	Oct. 24, 1922
1,445,344	Moltrup	Feb. 13, 1923
1,749,491	Kokay	Mar. 4, 1930
2,082,364	Store	June 1, 1937
2,210,435	Ruf	Aug. 6, 1940
2,384,437	Boynton	Sept. 11, 1945
2,472,658	Gilbert	June 7, 1949
2,602,358	Lile	July 8, 1952
2,812,789	Hutson	Nov. 12, 1957