July 15, 1924. 1,501,076

H. E. TOWNSEND

FOOTSTOCK

Filed May 31, 1923 2 Sheets-Sheet 1

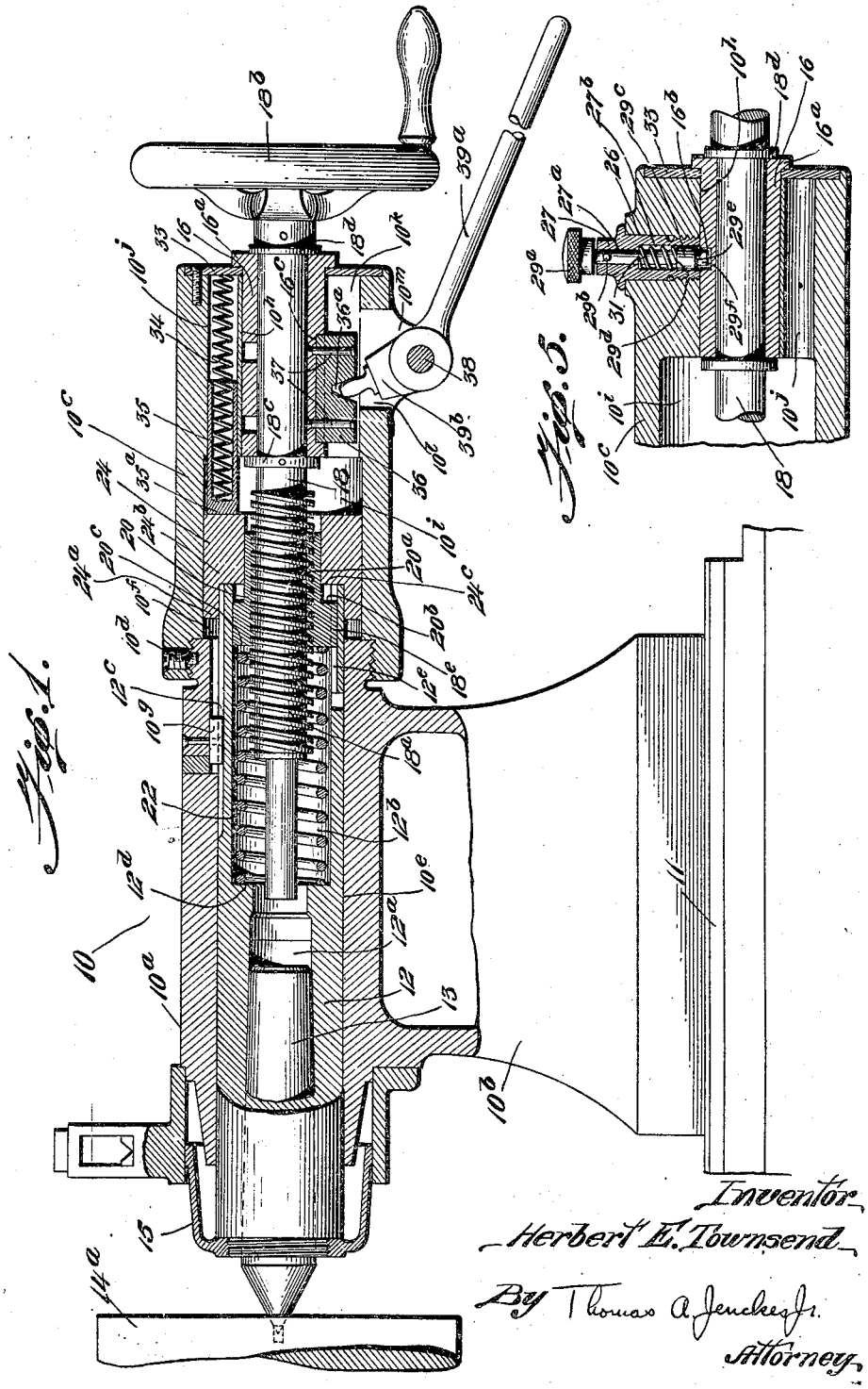


Fig. 1.

Fig. 2.

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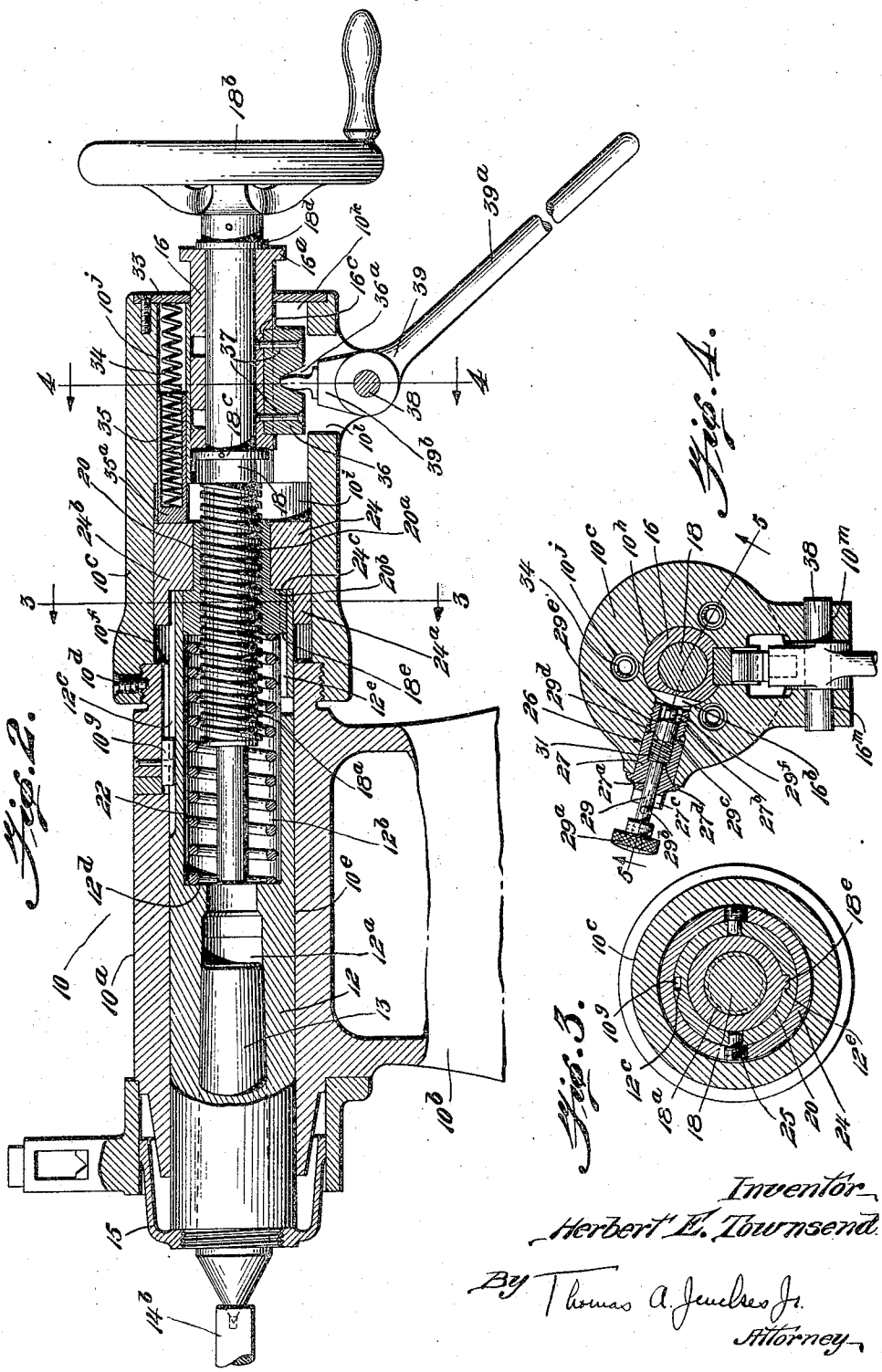


Fig. 2.

Fig. 4.

Fig. 3.

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Patented July 15, 1924. 1,501,076

UNITED STATES PATENT OFFICE.

HERBERT E. TOWNSEND, OF EAST PROVIDENCE, RHODE ISLAND, ASSIGNOR TO BROWN AND SHARPE MANUFACTURING COMPANY, OF PROVIDENCE, RHODE ISLAND, A CORPORATION OF RHODE ISLAND.

FOOTSTOCK.

Application filed May 31, 1923. Serial No. 642,495.

To all whom it may concern:

Be it known that I, HERBERT E. TOWNSEND, a subject of the King of Great Britain, residing at East Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Footstocks, of which the following is a specification.

My invention relates to foot-stocks.

The main object of my invention is to provide a foot-stock having resilient means for exerting pressure against the work holding member thereof, said means comprising two or more springs adapted to bear against said member successively. In the form shown these comprise a heavy spring for holding heavy work and a light spring for holding light work. It has been found in practice that the present standard types of springs are of not sufficient inherent adjustability to be adapted to hold all kinds of work. The ordinary foot-stocks will not hold very heavy work, and when called upon to hold a light rod will cause it to bend and buckle. My invention therefore makes possible a foot-stock adaptable to hold all kinds of work.

A further object of my invention is to provide a foot-stock with improved means for accurately varying the tension exerted thereby.

A further object of my invention is to provide a foot-stock of improved construction, simple and easy to manufacture.

These and such other objects of my invention as may hereinafter appear will be best understood from a description of one embodiment thereof such as is shown in the accompanying drawings.

In the drawings, Fig. 1 is a central longitudinal sectional view of my invention, parts being shown in elevation, showing the heavy spring in operative position when supporting some heavy work.

Fig. 2 is a view similar to Fig. 1, showing the light spring in operative position when supporting some light work.

Fig. 3 is a cross section taken along the lines 3—3 of Fig. 2.

Fig. 4 is a cross section taken along the lines 4—4 of Fig. 2.

Fig. 5 is a sectional view taken along the lines 5—5 of Fig. 4, showing the locking bolt in locking position.

In the drawings, wherein like characters of reference indicate like parts throughout, 10 is the foot-stock body portion, which in the embodiment shown comprises a portion 10^a integral with a supporting base portion 10^b, which is mounted as usual on the table 11 of whatever type of machine is used, and a breech or outer portion 10^c threaded thereto, and held in position by the locking screw 10^d. I employ the words inner and inward to mean near or towards the work, and the words outer and outwards to mean away from the work, the foot-stock being positioned relative to the center of the machine. Both said portions 10^a and 10^c are longitudinally bored to form the barrel 10^e of the body portion 10. Where the two portions 10^a and 10^c contact, a shoulder 10^f is formed on the inner periphery of the bored barrel 10^e. A spindle 12 is slidably mounted in the inner end of the barrel 10^e. The inner end of said spindle 12 is hollowed out as at 12^a to receive varying sizes of dead centers 13 for holding the work. Some heavy work 14^a is being held in Fig. 1, and some light work 14^b is being held in Fig. 2. A dust cap 15 is threaded on the inner end of the spindle 12. The outer end of the slidable spindle 12 is chambered as at 12^b for a purpose to be explained later. A groove 12^c (Fig. 3) is cut in the outer periphery of the outer end of the slidable spindle 12 to receive a spline 10^g raised on the adjacent portion of the inner periphery of the barrel 10^e to prevent rotation of the spindle 12 during its slidable longitudinal movement therein. The bore of the barrel 10^e is contracted as at 10^h at the outer end of the portion 10^c, as shown in Fig. 4. A bushing 16 is slidably mounted in said reduced bore 10^h, said bushing 16 having an integral collar 16^a raised at its outer end to limit its inward movement. The spindle adjusting screw 18 is revolvably seated in and slidable with said bushing. Its inner end is threaded as at 18^a and extends into the chambered outer end 12^b of the spindle 12. Its outer end is provided with a hand wheel 18^b and the collars 18^c and 18^d are secured thereon to enclose both ends of the slidable bushing 16. A T-shaped nut 20 internally threaded as at 20^a is adapted to travel on the threaded portion 18^a of the spindle adjusting screw 18. The outward movement of said T-shaped nut 20 is limited by the shoul-

der 20^b thereof. A heavy helical spring 22 is loosely coiled around the inner end of the spindle adjusting screw 18, the inner end thereof being seated against the inner end 12^d of the chambered portion 12^b of the slidable spindle 12, and the outer end thereof being seated against the inner end 20^c of the slidable nut 20. A spline 18^e is raised on the outer periphery of the slidable nut adapted to register in a groove 12^e cut in the inner periphery of the chambered outer end 12^b of the slidable spindle 12 to prevent rotative movement of said nut 20. As explained, the bore of the inner end of the outer portion 10^c of the body portion 10 is larger than the bore 10^h at its outer end. Adapted to slide in said enlarged bore 10^i between the bore 10^h and the shoulder 10^f, is the sleeve 24. Said sleeve 24 surrounds said nut 20 which is slidable therein, and is provided with a forwardly projecting annular portion 24^a, which is attached by means of the screws 25 (Fig. 3) to the outer end 12^b of the spindle. The inner end of said portion 24^a contacts the shoulder 10^f, formed on the barrel 10^e as explained, and limits the inward movement of said sleeve 24 and attached spindle 12. Where the forward projection 24^a joins the body 24^b of the sleeve 24, an annular shoulder 24^c is thus raised on the inner periphery thereof. Said shoulder 24^c contacts the shoulder 20^b to limit the outward movement of said nut 20 as explained.

Means are provided to lock the slidable bushing 16 and enclosed spindle adjusting screw 12 to the breech of the barrel 10^e. The preferred embodiment of said means is shown in Figs. 4 and 5. A transverse segmental groove 16^b is cut in said bushing 16. A radial bore 26 is sunk in the outer portion 10^c of the body portion 10 from the outer periphery thereof through to the contracted bore 10^h, and a locking bolt bushing 27 is suitably secured therein. Said bushing 27 is provided with an internal bore contracted at the upper end 27^a and enlarged at the lower end 27^b thereof. The upper edge of said circular bushing is provided with slots 27^c which extend downwardly a short distance thereof for a purpose to be described. A locking bolt 29 is slidably mounted in the bore of said bushing 27. The upper end of said bolt 29 is provided with a knurled head 29^a for the turning thereof. Just below the knurled head 29^a, transverse locking pin 29^b is provided on said rod. The diameter of said bolt 29 is increased as at 29^c near the lower end thereof to form the upper shoulder 29^d and lower shoulder 29^e, whereas at the extreme end thereof it is again contracted to form the locking point 29^f. Coiled around the upper reduced portion of said rod 29 is the helical spring 31 seated against the upper end 27^d of the enlarged bore 27^b of the bushing 27, and the upper shoulder 29^d of the enlarged portion 29^c of said locking bolt 29. The operation of said locking means is obvious from the above description. When it is desired to lock the bushing 16 to the barrel 10^e, the groove 16^b being opposite the locking point 29^f, the knurled head 29^a is turned until the pin 29^b is positioned above the slots 27^c. The spring 31 will then push the locking bolt 29 down and the locking point 29^f thereof will register in the groove 16^b, thus locking the bushing 16 to the barrel 10^e against longitudinal movement therein (see Fig. 5). To free the bushing 16, pull up on the knurled head 29^a against the pressure of the spring 31. The locking point 29^f will be withdrawn from the locking groove 16^b on the bushing 16, and the locking pin 29^b from the slots 27^b. Turn the knurled head 29^a and integral rod 29 a part turn, and the pin 29^b then registering against the upper edge of the circular bushing 27 will retain the bolt 29 in unlocked position (Fig. 4).

Any type of suitable light spring means may be provided. In the embodiment shown, three longitudinal bores 10^j are cut in the enlarged annular portion of the barrel 10^e circumferentially of the reduced bore 10^h. An end plate 33 is secured to the outer end of the barrel 10^e. A coil spring 34 is placed in each bore 10^j, as shown in Fig. 4, and is seated against said end plate 33. Said springs are provided with the tubular caps 35 of the approximate length of said bores, adapted to slide in said bores 10^j and into the enlarged bore 10^i of the portion 10^c. The inner ends 35^a of said caps are adapted to contact the sleeve 24 and thereby axially actuate the attached spindle 12.

The means I employ for bringing either the heavy spring 22 or the light spring 34 into operative position will now be described. A slotted longitudinal runway 10^k is cut the entire length of the enlarged annular portion of the barrel 10^e underneath the bushing 16. A transverse groove 16^c is cut in the bottom of said bushing 16, and the block 36 seated in said groove and secured to said bushing 16 by the pins 37. A transverse groove 36^a is cut in the bottom of said block 36. Opposite the central portion of the runway 10^k, a longitudinal slot 10^l is cut through to the outer periphery of the barrel, and the barrel portion 10^c is raised up on either side of said slot 10^l to form bearings 10^m to receive the pin 38 mounted therein transversely of the slot 10^l. On said pin 38 is pivoted the shifting lever 39. The power arm 39^a thereof extends obliquely outwardly and downwardly in the form of a handle, and the work arm 39^b thereof comprises a toothed projection adapted to register in the transverse groove 36^a cut in the bottom of said block 36.

The operation of my invention is obvious from the above description. It is apparent

that the bushing 16, spindle adjusting screw 18, nut 20, sleeve 24 and spindle 12 are all connected and are axially slidable in the barrel 10^e. When the foot-stock is empty, the light springs 34 will tend to force the sleeve 24, attached spindle 12, nut 20, threadedly attached spindle adjusting screw 18, and enclosed bushing 16 inwards, until the collar 16^a contacts the end plate 33 and limits the inward movements thereof. The pusher rod 29 will now be opposite the groove 16^b and the bushing 16 may be locked to the barrel 10^e as explained. This fixedly secures the spindle adjusting screw 18 to the body 10. The foot-stock is now in a position to hold some heavy work as indicated in Figs. 4, 5. The hand wheel 18^b is then turned to the left and the threads 18^a of the spindle adjusting screw 18 engaging the threads 20^a on the inner periphery of the nut 20, draw the nut 20 to its outermost position. The shoulder 20^b of the nut contacting the shoulder 24^c of the sleeve 24, draws the sleeve 24 and attached spindle 12 outwards against the pressure of the light springs 34 until the outward movement thereof is arrested by the sleeve 24 contacting the inwardly enlarged annular portion of the breech 10^c. The work 14^a is then placed in position in front of the dead center 13, and the hand wheel 18^b turned to the right. The work 14^a opposing the inward movement of the dead center 13 tends to force the spindle 12 outwards against the pressure of the springs 22 and 34. As the hand wheel 18^b is turned and the nut 20 is free to move inwards on the threaded portion 18^a of the spindle adjusting screw 18, the light spring 34 exerts its tension to force the sleeve 24 and attached spindle 12 inwards against the work. The tension of the light spring is usually insufficient to hold heavy work. However, my invention provides for this as follows: The spindle adjusting screw 18 being swivelled to the barrel 10^e, it is apparent that further turning of the hand wheel 18^b to the right will cause the nut 20 to move further inward on the threaded portion 18^a thereof, the spindle 12 bearing against the work. It is obvious that the nut 20 will now leave its enclosing sleeve 24 and will move inward compressing the spring 22, causing it to exert adjustably increasing tension against the spindle 12 and work 14^a. To remove the work, it is merely necessary to turn the hand wheel to the left and the heavy spring 22 will adjustably decrease its tension and permit withdrawal of the spindle 12 and attached sleeve 24 in the barrel 10^e, so that the work may then be readily removed from the front of the now retracted dead center 13. It is obvious that the inward movement of the spindle 12 is limited by the forwardly extending annular portion 24^a of the sleeve 24 contacting the shoulder 10^f on the inner periphery of the barrel 10^e, the spindle 12 being attached to said sleeve 24 by the screws 25. It is obvious that I have provided an inproved type of foot-stock, the tension exerted by which may be accurately adjusted without moving the foot-stock on the table or taking it apart to vary the position of a nut on the spindle adjusting screw as in former types.

In addition, I have provided a foot-stock equipped with light spring tensioning means for holding light work, the use of which is more particularly illustrated in Figs. 2 and 4. To bring said means into operative position, unlock the locking bolt 29 (Figs. 4 and 5) as explained, leaving the bushing 16, the enclosed spindle adjusting screw 18, the threadedly attached nut 20, the nut abutting shouldered sleeve 24 and the attached spindle 12 all free to slide axially in the bore 10^e against the pressure of the light spring 34. Position the foot-stock on the table 11, so that the dead center 13 slightly overlaps the light work 14^b, and press down on the handle 39^a of the shifting lever 39 as far as it will go. The toothed work arm 39^b thereof registering in the groove 36^b in the block 36 keyed to the bushing 16, will axially withdraw the bushing 16, enclosed spindle adjusting screw 18, threadedly attached nut 20, the nut abutting shouldered sleeve 24, attached spindle 12 and dead center 13 to the extreme outermost position thereof in the barrel 10^e. The work 14^b may then be positioned in front of the dead center 13, and the handle 39^a gently released. The spring 34 will force the aforementioned slidable attached parts inwards until the dead center 13 is properly positioned against the light work 14^b, the spring 34 exerting sufficient tension to hold the light work. The sliding parts will position and exert tension according to the position of the foot-stock on the table 11 as in former types. To remove the work 14^b, it is merely necessary to pull down on the handle 39^a and the contacting parts will axially slide outward in the barrel 10^e, as explained, withdrawing the dead center 13 from the work 14^b. After removing the work 14^b gently release the handle 39^a, and the contacting parts will axially slide inwards to their former position. It is obvious that I have provided a foot-stock, equipped with adjustable spring means for holding all kinds of work.

It is understood that my invention is not limited to the specific embodiment shown, and that various deviations may be made therefrom without departing from the spirit and scope of the appended claims.

What I claim as new and desire to secure as Letters Patent is:—

1. In a foot-stock, in combination with a work-holding member axially slidable on the foot-stock body, adjustable heavy resilient means to actuate said member for exerting comparatively heavy pressure when holding heavy work, and light resilient means to actuate said member for exerting comparatively light pressure when holding light work.

2. In a foot-stock, in combination with a work-holding member axially slidable on the foot-stock body, heavy resilient means to actuate said member for exerting comparatively heavy pressure when holding heavy work, and light resilient means to actuate said member for exerting comparatively light pressure when holding light work.

3. In a foot-stock, in combination with a work-holding member axially slidable on the foot-stock body, adjustable heavy resilient means to actuate said member, light resilient means to actuate said member, and means to vary the pressure exerted by both said resilient means from the comparatively light pressure exerted by the light resilient means when in a substantially distended position to the comparatively heavy pressure exerted by the heavy resilient means when in a substantially contracted position.

4. In a foot-stock, in combination with a work-holding member axially slidable on the foot-stock body, heavy resilient means to actuate said member, light resilient means to actuate said member, and means to vary the pressure exerted by both said resilient means from the comparatively light pressure exerted by the light resilient means when in a substantially distended position to the comparatively heavy pressure exerted by the heavy resilient means when in a substantially contracted position.

5. In a foot-stock, the combination of a work-holding member axially slidable on the foot-stock body, adjustable heavy resilient means seated in said body adapted to exert comparatively heavy pressure against said member when holding heavy work, light resilient means seated in said body adapted to exert comparatively light pressure against said member when holding light work, and means to shift either the light or heavy resilient means as desired into operative action against said member.

6. In a foot-stock, the combination of a work-holding member axially slidable on the foot-stock body, heavy resilient means seated in said body adapted to exert comparatively heavy pressure against said member when holding heavy work, light resilient means seated in said body adapted to exert comparatively light pressure against said member when holding light work, and means to shift either the light or heavy resilient means as desired into operative action against said member.

7. In a foot-stock, the combination of a center holding spindle axially slidable on the foot-stock body, a spindle adjusting screw seated in said body, a nut travelling on said screw, heavy resilient means contacting said spindle and nut adjustable on turning of the screw and resultant axial movement of the nut, a sleeve attached to said spindle, light resilient means seated in said body and contacting said sleeve, and means effective to shift said spindle, screw, sleeve and nut to permit the light or heavy resilient means as desired to bear against said spindle and work.

8. In a foot-stock, the combination of a center-holding spindle axially slidable on the foot-stock body, a spindle adjusting screw seated in said body, a nut travelling on said screw, heavy resilient means contacting said spindle and nut adjustable on turning of the screw and resultant axial movement of the nut, light resilient means seated in said body and contacting said spindle, and means effective to shift said spindle, screw and nut, to permit the light or heavy resilient means as desired to bear against said spindle and work.

9. In a foot-stock, the combination of a work-holding member axially slidable on the foot-stock body, and adjustable resilient means for exerting pressure against said member to hold the work, comprising spring members of different resiliency and means to cause said spring members to exert their pressure successively.

10. In a foot-stock, the combination of a work-holding member axially slidable on the foot-stock body, and resilient means for exerting pressure against said member to hold the work, comprising spring members of different resiliency and means to cause said spring members to exert their pressure successively.

11. In a foot-stock, in combination, a foot-stock body having a hollow barrel, a spindle axially slidable within said barrel and splined thereto having an inner end hollowed out to seat a work holding dead center and a chambered outer end, a bushing slidable in the outer end of said barrel, a spindle adjusting screw revolubly seated in and slidable with said bushing having a threaded portion extending into the chambered outer end of the spindle and a hand wheel at its outer end, a nut travelling on said spindle adjusting screw internally threaded to co-act with the threaded portion of said screw, a heavy spring coiled around the threaded portion of said screw and seated between the inner end of the chambered portion of said spindle and said nut, a sleeve surrounding said nut in said hollow barrel having a forwardly projecting annular portion keyed to the outer end of the spindle and adapted to contact a shoulder on the

foot-stock barrel to limit the inward movement of the said spindle forming an annular shoulder on its inner periphery to contact an annular shoulder on the nut to limit the outward movement of said nut, means comprising a locking bolt resiliently seated in said barrel adapted to register in a hole in the bushing, to lock the slidable bushing to said barrel whereby turning of the screw hand wheel will move the nut inwards to compress the heavy spring to exert greater inward pressure on the work-holding spindle, a light spring seated against an end plate attached to the outer end of the barrel and adapted to contact the slidable sleeve and spindle keyed thereto, and means comprising a lever mounted on said foot-stock body the work arm thereof projecting into a slot in said bushing adapted when the slidable bushing is unlocked to shift over in said barrel said bushing, enclosed screw, nut, sleeve and spindle to permit the light spring to exert comparatively light pressure against said sleeve, spindle and work.

12. In a foot-stock, in combination, a foot-stock body having a hollow barrel, a spindle axially slidable within said barrel and having an inner end hollowed out to seat a work-holding dead center and a chambered outer end, a bushing slidable in the outer end of said barrel, a spindle adjusting screw revolubly seated in and slidable with said bushing and having a threaded portion extending into the chambered outer end of the spindle and a hand wheel at its outer end, a nut travelling on said spindle adjusting screw internally threaded to co-act with the threaded portion of said screw, a heavy spring coiled around the threaded portion of said screw and seated between said slidable spindle and nut, means to lock the slidable bushing to said barrel whereby turning of the screw hand wheel will move the nut inwards to compress the heavy spring to exert greater inward pressure on the work-holding spindle, a light spring seated against the base of the barrel and adapted to contact the spindle, and means adapted when the slidable bushing is unlocked from said barrel to shift over said bushing, enclosed screw, nut and spindle to permit the light spring to exert comparatively light pressure against said spindle and work.

13. In a foot-stock, in combination, a foot-stock body having a hollow barrel, the inner periphery of which is provided with an annular shoulder approximately mid-way, a spindle slidable within said barrel and splined thereto having an inner end hollowed out to seat a work-holding dead center and a chambered outer end having an annular shoulder raised on the outer periphery thereof to contact said annular shoulder on the barrel to limit the inward movement of said spindle, a spindle adjusting screw revolubly seated in said barrel having a threaded portion extending into the chambered outer end of the spindle and a hand wheel at its outer end, a nut travelling on said spindle adjusting screw internally threaded to co-act with the threaded portion of said screw, a spring coiled around said threaded portion of said screw and seated between the inner end of the chambered portion of said slidable spindle and said nut, whereby turning of the hand wheel may compress the spring to adjustably vary the tension exerted by said work-holding spindle.

14. In a foot-stock, in combination, a foot-stock body having a hollow barrel, a spindle slidable in said barrel having an inner end hollowed out to seat a work-holding dead center and a chambered outer end, a spindle adjusting screw revolubly seated in said barrel having a threaded portion extending into the chambered outer end of the spindle and a hand wheel at its outer end, a nut travelling on said spindle adjusting screw internally threaded to co-act with the threaded portion of said screw, and a spring coiled around the threaded portion of said screw and seated between said slidable spindle and said nut whereby turning of the hand wheel may compress the spring to adjustably vary the tension exerted by said work-holding spindle.

In testimony whereof I affix my signature.

HERBERT E. TOWNSEND.