(No Model.)

F. H. RICHARDS.

FEED MECHANISM.

No. 452,431. Patented May 19, 1891.

Fig. 4

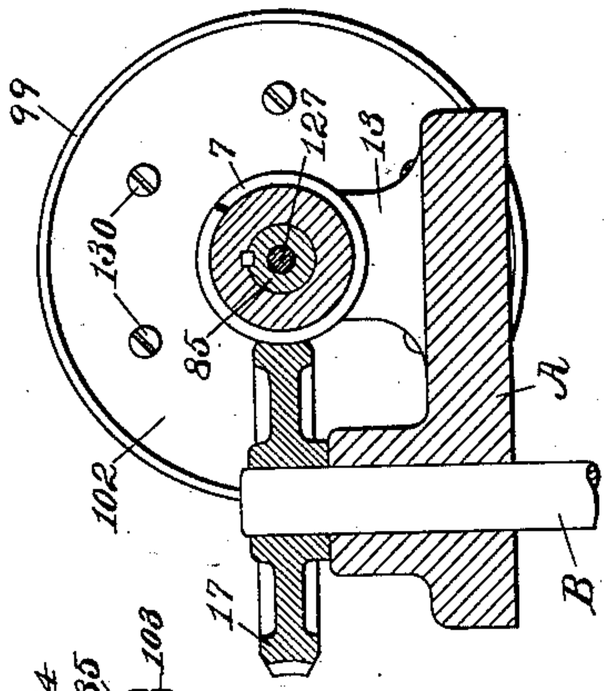

Fig. 5

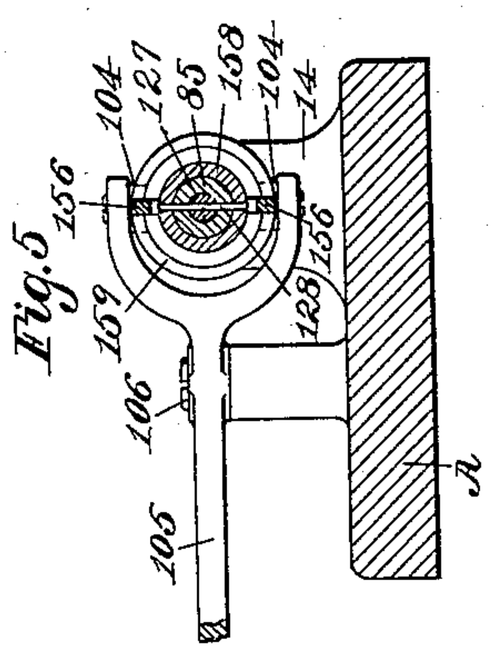

Fig. 1

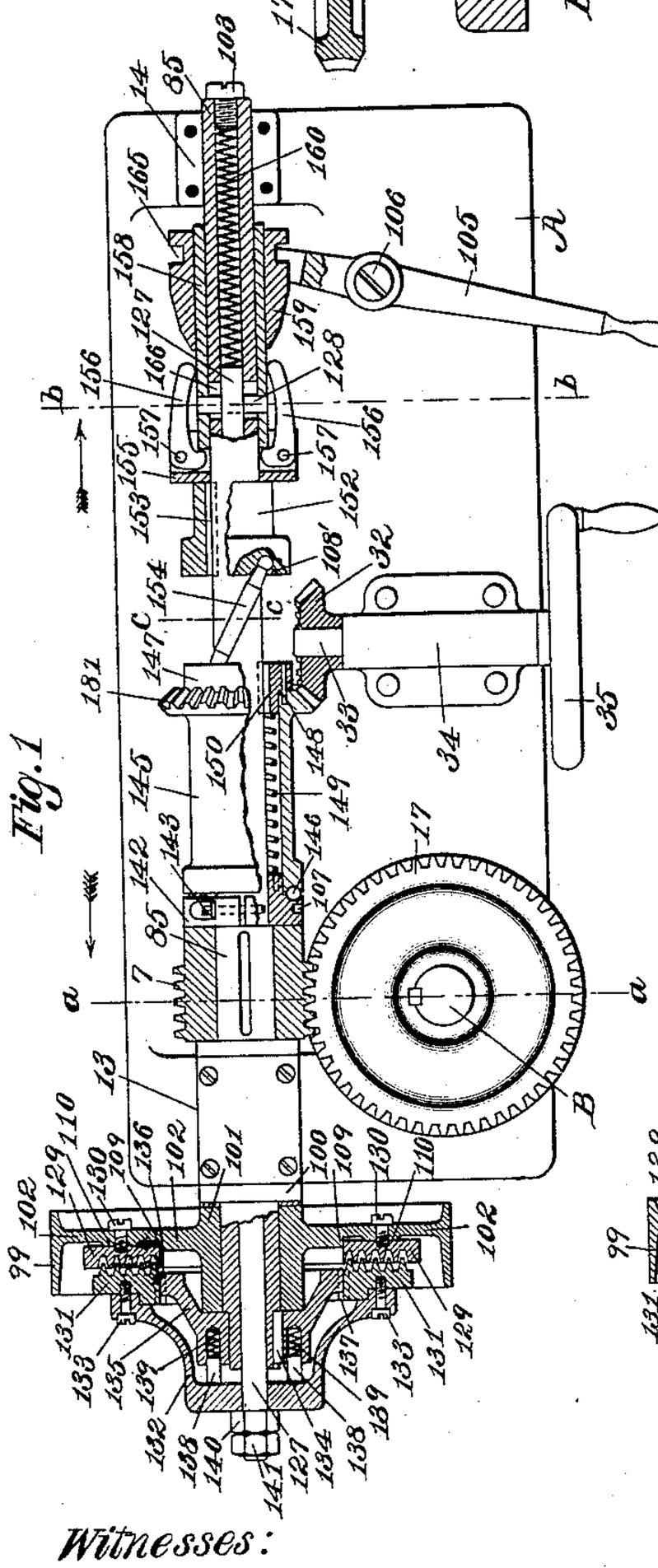

Fig. 2

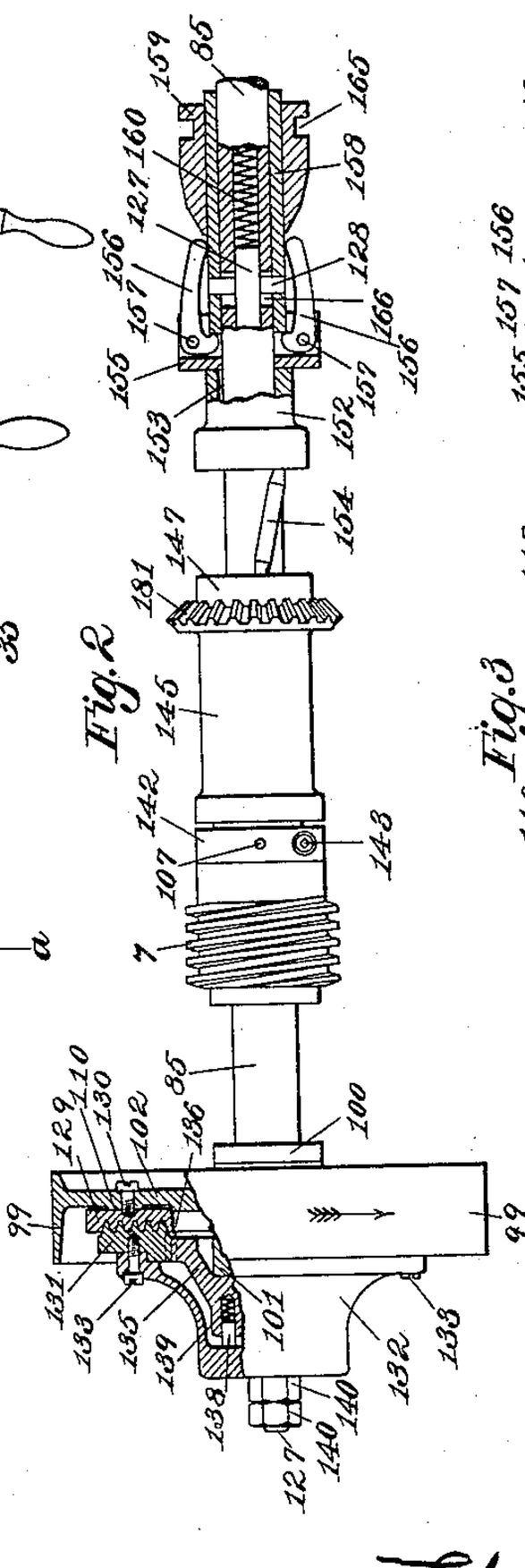

Fig. 3

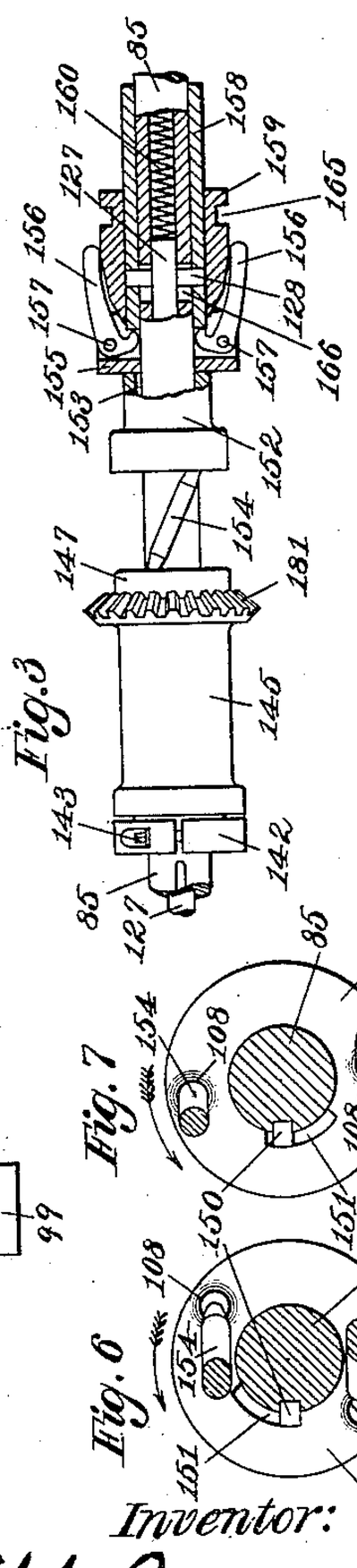

Fig. 7

Fig. 6

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UNITED STATES PATENT OFFICE.

FRANCIS H. RICHARDS, OF HARTFORD, CONNECTICUT, ASSIGNOR TO ECKLEY B. COXE, OF DRIFTON, PENNSYLVANIA.

FEED MECHANISM.

SPECIFICATION forming part of Letters Patent No. 452,431, dated May 19, 1891.

Application filed January 3, 1891. Serial No. 376,672. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS H. RICHARDS, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Feed Mechanism, of which the following is a specification.

This invention relates to feed mechanism for actuating by power the feed-shafts of heavy machines, such as large machine-tools and the like, wherein the movement of the shafts should be controlled by the hand of the operator. The invention is in part in the nature of an improvement on the feed mechanism described in Letters Patent of the United States No. 404,365, granted to me May 28, 1889.

The application of my present improvements to the feeding of the movable drill-carrying beam of a large multiple drilling-machine is shown and described in my application, Serial No. 380,989, filed February 10, 1890.

In the drawings accompanying and forming a part of this specification, Figure 1 is a plan view of a feed mechanism embodying my present improvements. Fig. 2 is a plan view of the principal portions of the feed mechanism, showing the parts in a different relative position. Fig. 3 is a view similar to Fig. 2 of a portion of the mechanism, illustrating a further change in the relative position of the operative details. Fig. 4 is a section in line *a a*, Fig. 1. Fig. 5 is a section in line *b b*, Fig. 1. Figs. 6 and 7 are sectional views in line *c c*, Fig. 1, illustrative of the operation of certain details, hereinafter more fully set forth.

Similar characters designate like parts in all the figures.

The frame-work of my improved mechanism will in practice generally be some part of the frame-work of the machine in connection with which the mechanism may be employed; but the several operative details may be assembled upon a bed-plate A, provided with suitable bearings and supports for said operative parts. The feed-shaft 85 is carried in suitable bearings, as 13 and 14, and carries a worm 7, meshing with the worm-wheel 17 on the shaft B, which, in the form of the mechanism herein shown and described, is the shaft or machine element, for the actuating of which the feed mechanism is provided. For driving the feed-shaft 85 said shaft carries a driving-pulley 99, which is fitted to freely revolve on the shaft contiguous to the fixed collar 100. Fixed to the shaft immediately outside of the hub 101 of the pulley 99 there is a friction-ring-supporting disk 135, held in place on the shaft by a key, as 134, and engaging on its outer periphery within the sliding friction-ring 131, the engagement of said disk and friction-ring being effected by means of keys 136 and 137, fitted into one of said parts and sliding in keyways in the other of said parts. The friction-ring 131 corresponds to and engages with a similar friction-ring 129, which is secured to the web 102 of the wheel 99 by means of screws 130, or in some other suitable manner. The sliding friction-ring 131 is actuated for engaging and disengaging the ring 129 by means of the friction-ring disk 132, to the outer edge of which disk said ring is secured by screws 133.

The disengagment of the friction-ring 131 from the ring 129 is effected by means of springs 139 and plugs 138, which are carried in the hub of the disk 135 and bear against the hub or central portion of the friction-ring carrier 132, as will be understood from the sectional portion of Fig. 1. The engagement of said friction-rings is effected by the shipper-rod 127, which is carried within the hollow feed-shaft 85, and has at the left-hand end thereof the adjusting-nuts 140 and 141, said rod being actuated by clutch-rod, actuating devices for imparting suitable longitudinal movements thereto within said hollow feed-shaft.

For actuating the shipper-rod to engage the described friction-rings or friction-clutch two apparatuses are employed, one for effecting the firm or "permanent" engagement thereof, and the other for controlling said engagement by hand. The first of said apparatuses is shown in sectional view at the right hand of Figs. 1, 2, and 3. For the purposes of this rod-shifting apparatus the collar 152 may be considered as fixed on the shaft 85, being splined thereto by the key or spline 153 and

prevented by suitable means from longitudinal movement. The sliding sleeve 158, carried on the shaft 85, is connected with the rod 127 by means of a key 128, working in the slot 166, formed in said shaft 85. A spring 160, carried in the bore of said shaft at the right hand of the rod 127 and reacting against the plug or screw 103, serves to throw the said rod toward the left hand. Between the normally-fixed collar 152 and the sliding sleeve 158 there is firmly mounted on the shaft 85 a carrier 155, in which is pivoted at the points 157 the pair of clutch-dogs or levers 156 156, whose shorter arms engage the left-hand end of the sleeve 158, and whose longer arms extend toward the right hand over said sleeve 158. The conical sleeve or "wedge" 159 is fitted to slide freely on the sleeve 158, and has a circumferential groove 165 for receiving the blocks, as 104, of a suitable wedge-actuating lever 105, which lever is pivoted at some suitable point, as 106, on the frame-work, and has a handle for operating the same. In Fig. 1 said wedge is shown in its idle position on the right-hand end of the sleeve 158, the friction-rings 129 and 131 being disengaged. In Fig. 3 the wedge is shown driven toward the left hand between the longer arms of the dogs or levers 156, the sleeve 158 being forced toward the right hand by the shorter arms of said dogs, as will be understood by comparison of Figs. 1 and 3. This, acting through the key 128 and the rod 127, draws the carrier 132, together with the ring 131 thereon, toward the right hand and brings said ring 131 into engagement with the driving friction-ring 129.

As shown in Fig. 1, the friction-rings stand apart, the wedge 159 is at the right hand, and the clutch dogs or levers 156 stand with their long arms bearing against the outside of the sleeve 158, while the short arms of said levers bear, as is shown, against the end of said sleeve. If now said collar 152, instead of being fixed on the shaft 85, should by any means be forced toward the right hand, it is obvious said collar would then act, through the carrier 155, the levers 156, the sleeve 158, and key 128, to draw the rod 127 toward the right hand, and thus bring the friction-rings into engagement, as in Fig. 2. It will also be evident that if said sliding movement of the collar 152 be suitably effected by hand power, the clutch will thereby come under hand control and will be actuated independently of the above-described clutch-actuating apparatus. For actuating the sliding collar as aforesaid, and thus operating the clutch, I employ devices wherein the connection between the hand-wheel and said collar is made through a part whose motion is a resultant of two motions, one being communicated from the hand-wheel and the other from the driven mechanism. Said devices, in their preferred form shown in the drawings, consist of the sleeve 145, having thereon the gear 181, which meshes with the pinion 32, fixed on a hand-wheel shaft 33, that is carried by the bearing 34, and is provided with the wheel 35 for operating said sleeve by hand. The sleeve 145 reacts against the collar 142, and in practice a series of anti-friction rollers or balls, as 146, may be placed in suitably-formed grooves, substantially as indicated in Fig. 1, for lessening the frictional resistance at that point. The collar 142 is or may be clamped to the shaft 85 by the clamp-screw 143, by which means and by the aid of a pin or lever engaging suitable holes at 107 in the periphery of the collar said collar may be turned on the shaft and set thereon in any required position in a well-known manner. The collar 142 should enter a short distance, as indicated in Fig. 1, within the sleeve 145, thus furnishing a bearing for said sleeve, which at its right-hand end is carried by the revoluble collar 147. The torsion-spring 149, carried (preferably as shown) within the sleeve 145, engages at one end the collar 142 and at the other end the collar 147, the torsional tension of said spring being regulated by adjusting the collar 142 on the shaft 85.

A limited rotary movement of the sleeve 145 (including of course the gear 181 and the collar 147) on the shaft 85 is provided for by making a notch or keyway 151 in the collar 147, that is fixed to said sleeve and gear by suitable means—as, for instance, the pins 148—or may be formed integral therewith, the movement being limited by a key 150 fixed in the feed-shaft. (See Figs 6 and 7.) In the face or right-hand end of the collar 147 are sockets, as 108, and in the face or left-hand end of the aforesaid sliding collar 152 are corresponding sockets, as 108′, Fig. 1. Thrust rods or braces 154 154 are set between said collars 147 and 152, being seated at opposite ends in said sockets, respectively. The construction and organization of the apparatus are such that when the collar 147 stands relatively to the key 150, as shown in Fig. 6, the thrust-rods 154 stand considerably oblique to the feed-shaft, as indicated in Fig. 1; but the movement on the feed-shaft of said collar 147 is such that on turning forward the collar by hand (the shaft 85 not being revolving) said thrust-rods 154 are carried to the position shown in Fig. 2, nearly parallel with the feed-shaft, thereby forcing the collar 152 toward the right hand, and through the connections hereinbefore described engaging the friction-ring 131 with the friction-ring 129 on the driving-pulley. The collar 147 is normally held in engagement against the key 150, as shown in Fig. 6, by the spring 149, said spring being under suitable tension therefor. On turning forward the collar 147 to the position indicated in Fig. 7, the adjustment of the parts is such that the friction-rings become firmly engaged before or as soon as the key 150 comes to the opposite side of the aforesaid keyway 151. If now the collar 147 be actuated by hand, as here set forth, while the pulley 99 is revolving in the direction of the arrow in

Fig. 2, it is evident that on the first engagement with the friction-rings 131 129 the shaft 85 will be revolved in the same direction as that in which said collar 147 was turned; the result of this will be to carry forward the right-hand end of the thrust-rods 154 toward their positions in Figs. 1 and 3, thus immediately releasing said friction-ring engagement. If, however, during such movement of the shaft the movement of the collar be followed up or maintained by hand, as set forth, it is obvious that the engagement of the friction-rings will be maintained, notwithstanding the movement of the shaft 85. Thus the extent of movement of the shaft 85 is limited to and follows the movement of the collar 147, since any movement of said collar in advance of the shaft movement engages the clutch for turning forward the shaft, and since, vice versa, any movement of the shaft in advance of the movement of said collar disengages the clutches and retards the movement of the shaft. By this means a perfect hand control of the feed-shaft is obtained, while the movement of the shaft is effected by power.

When the sleeve and the revoluble collar 147 stand in the positions shown in Figs. 1 and 6, said collar bearing firmly against the stop-key 150, the collar 152 is, as above stated, normally fixed on the shaft 85, since this collar is splined to the shaft and rests against the thrust-rods 154, which are seated in said collar 147. Said parts therefore furnish, when in the position stated, a proper abutment against which to operate the first-described clutch-rod-actuating apparatus.

One feature of my present improvements relates to the construction and organization of the driving-pulley and its clutches, whereby proper action of the clutch-rings is obtained, notwithstanding slight imperfections of construction. For this purpose the friction-ring 129 is seated on the web 102 of the driving-pulley in a peculiar manner, being centered or held in proper position diametrically of the wheel by the shoulder 109, and being supported opposite to the friction-rings on a narrow seat 110. This construction and mode of supporting said ring 129 makes available the elasticity of the ring for securing perfect engagement thereof with the ring 131. The form adopted for the carrier 135 permits the use of a long hub for the pulley 90, and at the same time permits the friction-rings to be both supported within the rim of said pulley, thereby securing a more compact organization. The ring 131 being fitted to slide in like engagement with the periphery of the carrier 135, the pressure on the splines or keys 136 137 is reduced to the least practicable quantity, since the radius of the key-surfaces is then the greatest practicable. The carrier 132, being formed dish-shaped, substantially as described, outside of the carrier 135, is adapted to be slightly sprung by the tension of the rod 127, so as to bring the ring 131, throughout the length thereof, firmly into contact with the corresponding ring 129, notwithstanding the natural planes of revolution of said rings may for some reason—as, for instance, imperfect construction—be slightly divergent.

For the purposes of the hand-controlled clutch-rod-actuating apparatus the sliding collar 152 may be considered as fixedly connected to said clutch-rod, since by the action of said hand-controlled apparatus the movement of said collar 152 is always coincident with that of the clutch-rod itself, the parts herein shown intermediate to said collar and clutch-rod being for a distinct purpose and not constituting a part of said hand-controlled apparatus.

It will be understood that the collar 147 is a principal element of the hand-actuated devices for sliding the collar 152 on the feed-shaft, and that the sleeve 145 is a subordinate element, which, together with certain minor features operating in connection therewith, is in the nature of an additional improvement upon the principal and more essential features of the invention. The collar 142, for instance, is made adjustable, as set forth, on the feed-shaft for the purpose of readily tightening the torsion-spring 149; but said spring may be constructed of suitable size and tension, so as to require no adjustment, in which case said collar may be dispensed with. So, also, the collar 147 and the sleeve 145 may be constructed integral, the preferred construction of said parts, herein shown and described, being adopted for the purpose of facilitating construction and to permit the use of different materials for the different portions thereof.

Having thus described my invention, I claim—

1. In a feed mechanism, the combination, with the feed-shaft and the driving-clutch therefor, of the clutch-rod, a slidable collar carried on the shaft and connected to said rod, a hand-actuated revoluble collar on said shaft, and one or more rods set obliquely between said collars, substantially as described.

2. In a feed mechanism, the combination, with the feed-shaft furnished with a driving-clutch, and a slidable collar connected to actuate said clutch, of the revoluble collar, means for turning said collar on the shaft by hand, means limiting the rotary movement of said revoluble collar relatively to the shaft, and thrust-rods intermediate to said collars and set obliquely to the shaft, all substantially as described.

3. In a feed mechanism of the class specified, the combination, with the feed-shaft carrying the clutch and having a slidable collar connected to actuate the clutch, of the revoluble collar, the thrust-rods intermediate the revoluble collar and said slidable collar, means, substantially as described, for turning the revoluble collar by hand, and means limiting the turning movement of said revoluble collar on the shaft, the spring, and the spring-adjusting collar, substantially as described.

4. In a feed mechanism, the combination, with the feed-shaft, and with a clutch connected for actuating said shaft, of the slidable collar 152, hand-controlled means, substantially as described, for sliding said collar by hand, and clutch-actuating apparatus, substantially as described, intermediate the clutch-rod and said slidable collar, whereby the clutch may be actuated by either said clutch-actuating apparatus through the same clutch-rod, substantially as described.

5. In a feed mechanism, the combination, with the feed-shaft and its clutch and clutch-rod, of the slidable collar 152, connected to the clutch-rod, the revoluble collar 147, having the keyway 151, the key 150 for limiting the revoluble movement of the collar 147, one or more thrust-rods, substantially as described, intermediate to said revoluble and slidable collars, the torsion-spring, means, substantially as described, for adjusting the tension of said spring, and means, substantially as described, for actuating the revoluble collar by hand, substantially as described.

6. In a feed mechanism, the combination, with the feed-shaft and a clutch connected for actuating said shaft, of a slidable collar connected, substantially as described, for actuating the clutch, and two clutch-actuating mechanisms, arranged one on each side of said slidable collar, substantially as shown, one said mechanism being hand-controlled and when not in use serving as an abutment for taking the thrust of the other clutch-actuating apparatus, substantially as set forth.

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