

March 10, 1936.

E. D. VANCIL ET AL

2,033,406

MACHINE TOOL ORGANIZATION

Filed March 3, 1934

3 Sheets-Sheet 1

Fig. 1

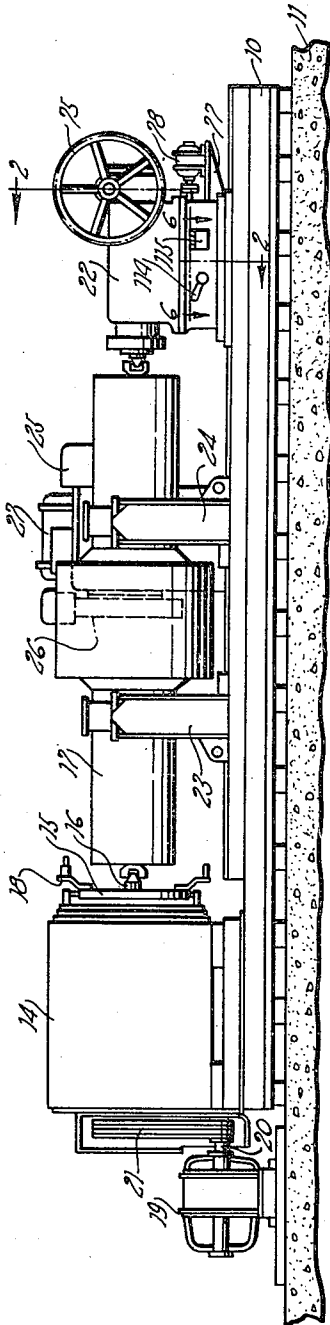
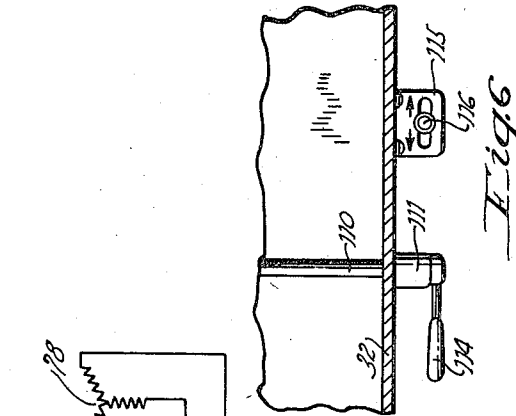


Fig. 6

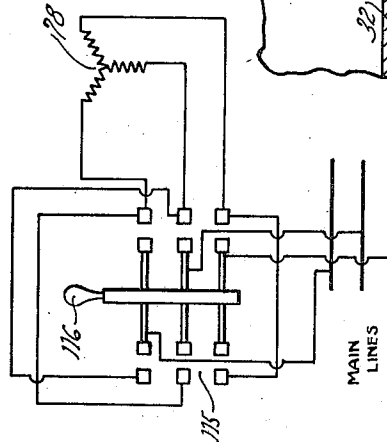


Fig. 7

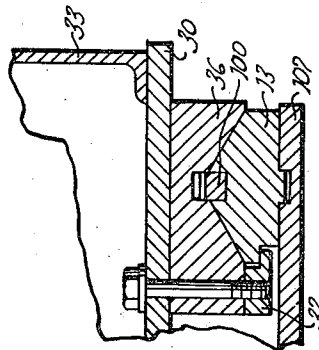


Fig. 8

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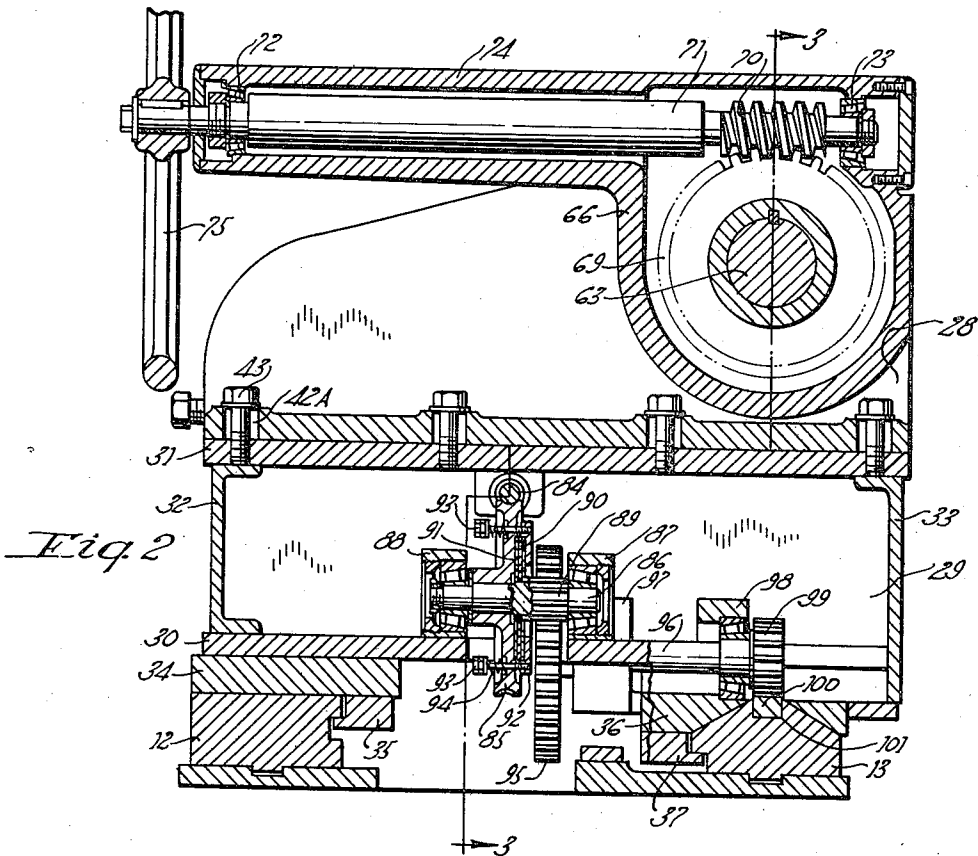
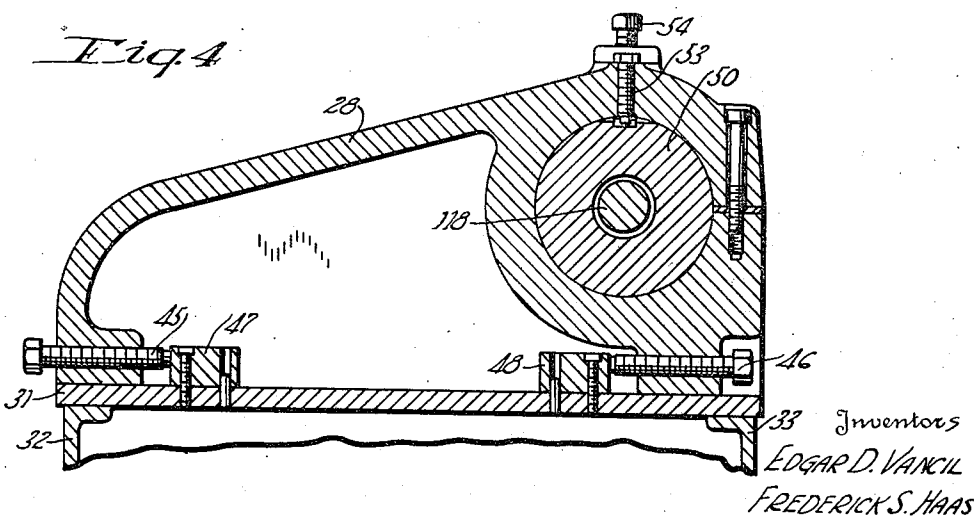
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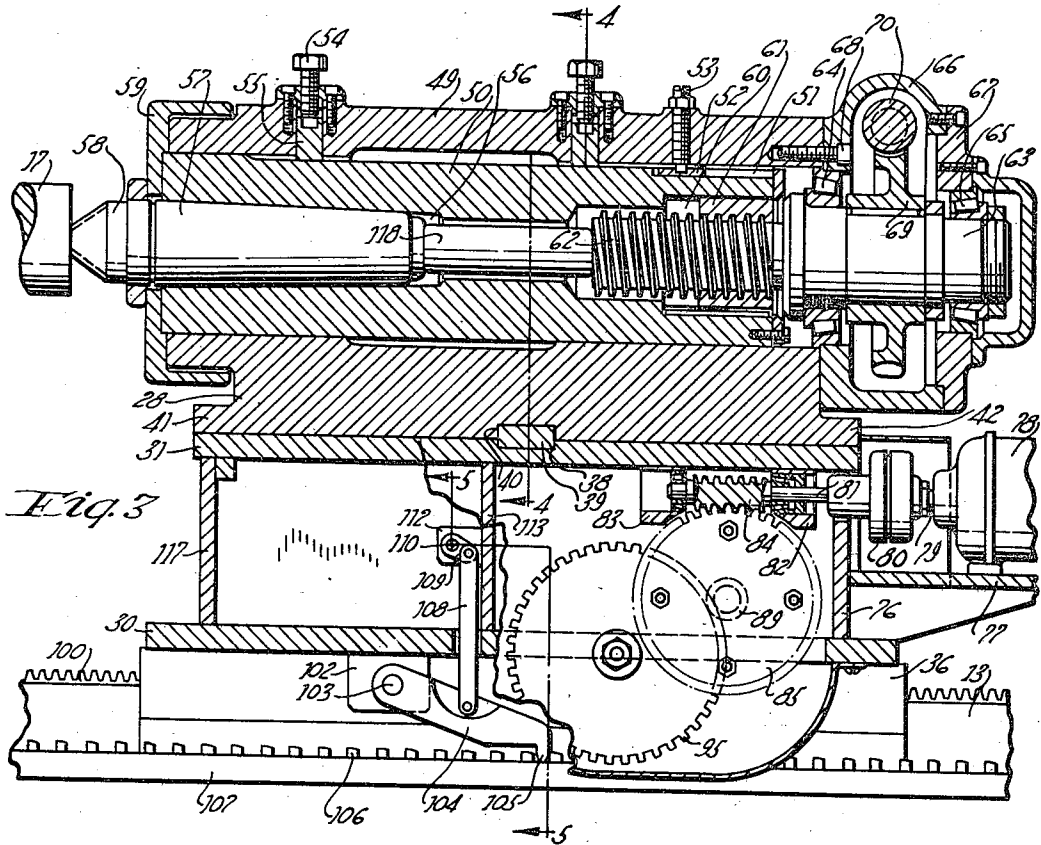
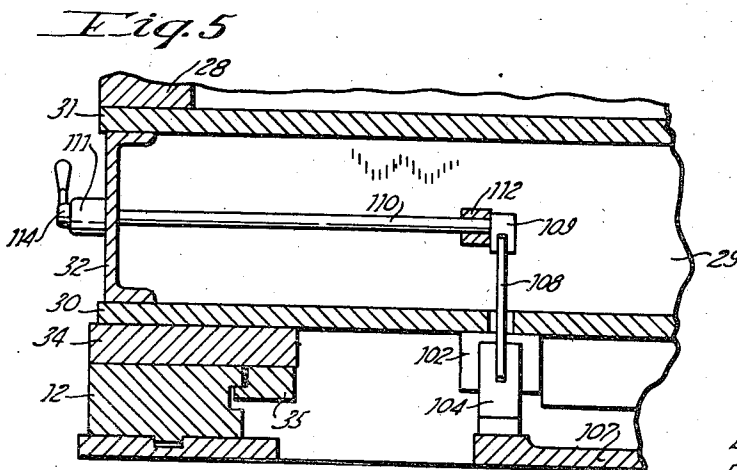
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3 Sheets-Sheet 3



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2,033,406

MACHINE TOOL ORGANIZATION

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Application March 3, 1934, Serial No. 713,886

11 Claims. (Cl. 82—31)

This invention relates to improvements in machine tools such as grinding machines, lathes, and the like, and particularly to improvements in tailstocks as employed with such tools.

In general, the invention has reference to tailstocks or terminal work supporting mechanisms as utilized with very large machines of the type above referred to, particularly when such machines are adapted for operating on very large rolls. In this type of machine the parts are very massive and heavy, requiring large forces to effect their adjustment and positioning relative to the bed, or main support of the machine.

One of the principal objects of the present invention is, therefore, the provision of a tailstock for use with large machine tools which will adequately support large heavy work pieces such as the rolls utilized in steel and paper rolling mills.

Another object of the invention is the provision of a tailstock for use with machine tools as above specified which may be readily adjusted with the least amount of effort, despite its weight and massiveness, and locked in adjusted positions.

A further object of the invention is the provision of an improved tailstock and the like which may be positively and accurately locked to resist movement due to the camming action thereon due to the weight of the work supported thereby.

A still further object of the invention is the provision of improved power means for shifting the tailstock in either direction, together with improved control means therefor.

It is also an object of the present invention to provide a tailstock of fabricated construction of a new and novel design which is very efficient in operation and readily constructible.

Other objects and advantages of the present invention should be readily apparent by reference to the following specification, considered in conjunction with the accompanying drawings forming a part thereof and it is to be understood that any modifications may be made in the exact structural details there shown and described, within the scope of the appended claims, without departing from or exceeding the spirit of the invention.

In the drawings:

Figure 1 is a front elevation of a machine tool of the grinder, lathe or like type, embodying the improvements of the present invention.

Figure 2 is a transverse sectional view taken on line 2—2 of Figure 1.

Figure 3 is a longitudinal sectional view taken on line 3—3 of Figure 2.

Figure 4 is a sectional view on line 4—4 of Figure 3.

Figure 5 is a sectional view taken on line 5—5 of Figure 3.

Figure 6 is a fragmentary, horizontal sectional view taken on line 6—6 of Figure 1.

Figure 7 is a diagrammatic view of the electrical circuit involved in the invention.

Figure 8 is a sectional view through one of the ways of the bed and tailstock.

Throughout the several views of the drawings similar reference characters are employed to denote the same or similar parts.

As was noted above, this invention may be employed with grinding machines, lathes, and other similar types of machine tools, utilizing means at the termini of the work for supporting same which are generally termed head and tailstocks. The present invention is particularly directed to the improved tailstock and particularly to such a mechanism when utilized for supporting heavy work pieces such as the large rolls used in steel and paper mills. As is well known, the tailstock has projecting therefrom a tapered center entering a correspondingly tapered bore or center in the work. In view of the heavy weight of the work or roll and due to the angular faces of the center bore in the work and the surface of the supporting center a camming tendency results, attempting to shift the tailstock away from the work. By this invention the tailstock is adequately locked against any such movement and at the same time, due to the necessary massiveness and weight of the tailstock, means are provided for readily adjusting its position so as to take care of different lengths of work pieces.

The drawings illustrate the improved tailstock of this invention in connection with a roll grinding machine, and such a machine in general comprises a bed 10 mounted on a suitable supporting floor or the like 11. The bed 10 is provided for the major part of its length with guide ways 12 and 13, the former being of the flat type while the latter is of the intermediate V type. At the left hand end of the said guide ways 12 and 13, as seen in Figure 1, the bed 10 has secured thereto a headstock 14 in which is rotatably journaled a spindle for the face plate 15. Projecting from the face plate 15 is the headstock center 16 utilized for determining the axis of rotation of the work. The work 17 is rotated through suitable driving dogs 18 secured to the face plate 15, which in turn is driven through suitable trans-

mission enclosed within the headstock 14. Exterior of the headstock 14, and suitably mounted relative thereto, is a motor or prime mover 19 having a motor shaft 20 connected by a suitable flexible transmission 21 to the transmission within the headstock 14 for effecting the rotation of the face plate 15 and work 17.

Mounted on the bed guide ways 12 and 13 in opposition to the headstock 14 is the tailstock 22, while likewise disposed on the said bed guide ways between the head and tailstocks are the journal supports 23 and 24 which are utilized for additionally supporting the work, while being operated upon. Rearwardly of the bed 10 is a tool carriage 25 supporting a spindle for a grinding wheel 26 which effects a stock removal from the work. Associated with the carriage 25 is a prime mover 27 which rotates the grinding wheel 26. Any suitable or desirable means may be provided for effecting a relative feed of the tool or grinding wheel carriage 25 and the work to effect the proper stock removal from the work.

The headstock 22 comprises an upper housing 28 and a lower housing 29, the former of which is a casting and the latter a fabricated structure. The lower housing 29 comprises a lower plate 30 and an upper plate 31 substantially co-extensive, and to the longitudinal edges of which at opposite sides thereof are welded channel irons 32 and 33. To the forward ends of the top and bottom plates and the channel irons is welded a forward plate 117, while to the rear ends thereof is welded a similar plate 76 making a box like structure. Intermediate said front and rear plates 117 and 76 and extending transversely of the bed is a center plate 113 held in position by having its upper edge welded to the upper plate 31 and its lower edge welded to the lower plate 30. To the under surface of the lower plate 30 and beneath the channel iron 32 is secured the flat guide 34, carrying a gib 35, while beneath the channel iron 33 the plate 30 has secured to it the inverted V guide 36 likewise carrying a gib 37. The upper plate 31 is provided transversely thereof and intermediate its ends with a keyway 38 in which is secured a key 39 received also in a keyway 40 formed in the lower surface of the upper tailstock housing 28.

The upper housing 28 is disposed on the upper surface of the plate 31 and has formed at opposite ends flanges 41 and 42 through which is formed a plurality of elongated apertures or slots 42A. Passing downwardly through each of said apertures or slots 42A is a clamping bolt 43 having their lower ends threaded into the upper plate 31 for securing the housings to one another. The elongated apertures or slots 42 are provided to permit a relative lateral shifting or adjustment of the housing 28 relative to the bed ways for aligning the center carried thereby, as will later be described, with the center 16 of the headstock 14. In order to effect this lateral shifting the housing 28, see Figure 4, is provided at opposite sides thereof with adjusting screws 45 and 46 respectively contacting on their inner ends with blocks 47 and 48 secured to the upper surface of the plate 31. The lateral adjustment of the housing 28 with respect to the housing 29 is guided by the key 39 carried partly by each of the said housings.

Substantially lengthwise of the housing 28 it is provided with a circular boss or barrel 49 in which is disposed for sliding movement relative thereto a sleeve or spindle 50. The sleeve is provided

through a part of its length with a keyway 51 in which is disposed a shoe 52 held in position by a screw 53 extending through the top wall of the barrel 49. The shoe 52 and keyway 51 prevent any rotative movement of the sleeve 50, while permitting an axial adjustment thereof. Carried by the barrel 49 is one or more clamp screws or bolts 54 operating on their inner ends through clamp shoes 55 engaging the sleeve or spindle 50 for clamping the said sleeve or spindle in any position of adjustment.

The inner end of the sleeve or spindle 50 is provided with a tapered socket 56 in which is disposed the tapered shank 57 of the tailstock center 58. Additionally, the forward end of the sleeve or spindle 50 carries a cover or cap 59 which is utilized for preventing the inflow of foreign matter and coolant to the bearings between the spindle 50 and the supporting barrel 49.

In order to shift the sleeve or spindle 50 and therefore the center 58 axially of the housing 28 the said spindle is provided in its rear end with a counterbore 60 in which is secured a nut 61 in threaded engagement with the threaded end 62 of a screw 63. The screw 63 is rotatably journaled in anti-friction bearings 64 and 65 provided by a supplemental housing 66 and its cap 67. The housing 66 is secured to the tailstock barrel 59 by means of cap screws and the like 68. Keyed or otherwise secured to the screw 63 between the bearings 64 and 65 is a worm wheel 69 meshing with a worm 70 on the inner end of a shaft 71. The shaft 71 is rotatably mounted in anti-friction roller bearings 72 and 73 provided by the supplemental housing 66, and is enclosed within a substantially cylindrical extension 74 of said supplemental housing 66. The shaft 71 extends beyond one end of said enclosing sleeve 74 to receive a hand wheel 75 whereby said shaft is rotated. From the foregoing it will be noted that the axis of the shaft 71 extends at right angles to the axes of the screw 63 and spindle or sleeve 50. It will also be noted that by rotating the hand wheel 75 in one or the other direction the screw 63 will likewise be rotatably actuated for thereby effecting an axial movement of the spindle 50 since it cannot rotate with the screw.

The center 58 through its tapered shank 57 has a rather tight fit in the tapered socket 56 of the spindle and the same must therefore be forcedly ejected from the spindle. This ejection of the center is effected through a pin 118 lying between the inner end of the center and the opposed end of the screw 63. From this it will be seen that upon complete retraction of the spindle or sleeve 50 the center 58 will be dislodged for regrinding or replacement.

As is usual, the tailstock as a whole, including both the upper and lower housings 28 and 29, is adapted to be shifted axially of the supporting bed 10. To effect this movement of the tailstock the rear plate 76 of the housing 29 has welded to it a bracket 77 supporting a reversible prime mover or motor 78. The motor 78 has its shaft 79 connected through a suitable coupling 80 with a worm shaft 81. The worm shaft 81 is rotatably journaled in suitable anti-friction bearings supported by bearing blocks 82 and 83 welded to the under surface of the plate 31 and the said worm shaft 81 has formed integral therewith or keyed thereto a worm 84 meshing with a worm wheel 85. The worm wheel 85 is loosely mounted on a shaft 86 rotatably journaled in bearings supported by blocks 87 and 88 welded to the lower plate 30.

The shaft 86 has integral therewith or secured thereto an elongated pinion 89 with the teeth of which at one end thereof meshes the internal gear teeth of plate 99 which in turn is flanked on either side by friction discs 91. The plate 99 and friction discs 91 are yieldably clamped between a cover plate 92 and the adjacent side of the worm wheel 85 by means of bolts 93 extending through apertures in the worm wheel 85 and threaded into the cover plate 92. The yieldable pressure is obtained by a spring 94 surrounding each of the bolts 93 and abutting on one end with the heads of said bolts and the side of the worm wheel 85. This construction provides a friction clutch which will give under excess force or pressure.

The elongated pinion 89 meshes with a gear 95 keyed or otherwise secured to a shaft 96 rotatably journaled in bearings supported by blocks 97 and 98 welded or otherwise secured to the plate 30. At the outer end the shaft 96 has integral therewith or secured thereto a rack pinion 99 meshing with the teeth of a rack bar 100 set into a recess 101 formed in the guide 13 substantially at the apex of the angle formed by said guide.

From the foregoing it will be seen that rotation of the motor 78 in one or the other direction will, through the transmission just described, rotate the rack pinion 99 and effect a translation of the tailstock as a unit relative to the bed 10.

The tail stock, as above suggested, is adapted to be locked in different positions of adjustment and for this purpose the lower plate 30 has welded or otherwise secured to its under surface a lug 102 having pivotally connected thereto at 103 one end of a latch 104. The free end of the latch 104 is formed into a nose 105 adapted to enter the space between adjacent rack teeth 106. As shown in the drawings, the rack teeth 106 are lugs welded to the plate 107, see Figure 2, which is a part of the bed 10. It will be appreciated that to attempt to translate the tailstock, while the latch 104 is in locking position, the motor 78 would be burnt out or ruined. It was to obviate this possibility that the friction clutch associated with the worm 85 was provided, since if the tailstock could not be moved the friction clutch would slip.

In order to release the latch 104 prior to the operation of the motor 78 the latch 104 has pivotally connected therewith one end of a link 108. The other end of this link is pivotally connected to a lever 109 in turn keyed or otherwise secured to a shaft 110. The shaft 110 is rotatably journaled in a pair of lugs 111 and 112 respectively secured to the outer surface of the channel 32 and the transverse brace plate 113. The shaft 110 extends beyond the lug 111 to which extension is fastened an operating handle 114. From the foregoing, it will be seen that by actuation of the shaft 110 in a counterclockwise direction by means of the handle 114, the latch nose 105 will be lifted free of the rack teeth 106 whereupon the tailstock may be translated.

As was noted above, the prime mover or motor 78 is of the reversible type and is connected to a switch mechanism contained in switch box 115 mounted on the outer face of the tailstock housing channel 32. As seen in Figure 6 the switch housing 115 has projecting therefrom a lever 116 adapted to actuate the reversing switch. The housing 115 is provided with an elongated aperture through which the actuating lever or handle 116 projects and whereby the said handle may be shifted in reverse direction to close the switch. This construction is such that if the handle 116 is actuated toward the left the motor will be ro-

tated in such a direction to cause the tailstock to be moved toward the work, while the reverse movement of the handle 116 will translate the tailstock away from the work.

By further reference to Figure 6 it will be seen that the latch operating lever 114 and the switch operating lever 116 are closely adjacent one another, whereby the operator may with one hand release the latch and with the other effect the translation of the tailstock, and upon release thereof will stop the translation of the tailstock and immediately lock same in position.

The rolls which are ground on the present machine are very heavy and must be ground accurately about the axis. This heavy weight of the roll will, if the tailstock is not locked against movement, shift the tailstock away from it. In operation, therefore, the tailstock is shifted toward the work to the approximate position whereupon the latch 104 is dropped into position between the rack teeth 106 and then the tailstock backed away from the work until the nose 105 engages solidly with the tooth 106 behind it, whereupon the tailstock translating motor current is shut off. The current most probably will not be shut off the instant the latch engages its tooth, wherefor the motor will tend to shift a locked tailstock which might result in a burnt out motor or a blown fuse in the electrical circuit. It was to overcome this possibility that the slip friction clutch was placed in the transmission line so that the motor may rotate, even though the tailstock were locked. The final position of the tailstock center is, of course, obtained by the hand wheel 75 and parts operated thereby.

What is claimed is:

1. In a tailstock construction the combination of a lower housing mounted on a supporting bed for translation relative thereto, an upper housing mounted on the lower housing for transverse movement relative thereto and translation therewith, means carried by the upper housing for effecting its transverse adjustment, and reversible power actuated means carried by the lower housing for effecting its translation.

2. In a tailstock construction the combination of a lower housing mounted on a supporting bed for translation relative thereto, an upper housing mounted on the lower housing for transverse movement relative thereto and translation therewith, means carried by the upper housing for effecting its transverse adjustment, reversible power actuated means carried by the lower housing for effecting its translation, said translating means including a prime mover, a rack in pinion connection between the lower housing and its supporting bed, and a transmission train between the prime mover and rack and pinion.

3. In a tailstock construction the combination of a lower housing mounted on a supporting bed for translation relative thereto, an upper housing mounted on the lower housing for transverse movement relative thereto and translation therewith, means carried by the upper housing for effecting its transverse adjustment, reversible power actuated means carried by the lower housing for effecting its translation, and latch means for locking the housing in its different positions of adjustment.

4. In a tailstock construction the combination of a lower housing mounted on a supporting bed for translation relative thereto, an upper housing mounted on the lower housing for transverse movement relative thereto and translation therewith, means carried by the upper housing for ef-

fecting its transverse adjustment, reversible power actuated means carried by the lower housing for effecting its translation, said translating means including a prime mover, a rack in pinion connection between the lower housing and its supporting bed, a transmission train between the prime mover and rack and pinion, and releasable latch means for locking the lower housing and parts carried thereby in its several positions of adjustment.

5. In a tailstock construction the combination of a lower housing mounted on a supporting bed for translation relative thereto, an upper housing mounted on the lower housing for transverse movement relative thereto and translation therewith, means carried by the upper housing for effecting its transverse adjustment, reversible power actuated means carried by the lower housing for effecting its translation, said translating means including a prime mover, a rack in pinion connection between the lower housing and its supporting bed, a transmission train between the prime mover and rack and pinion, releasable latch means for locking the lower housing and parts carried thereby in its several positions of adjustment, and a slip clutch in the transmission to prevent damage to the prime mover if attempted to be operated while the tailstock is locked against movement.

6. In a mechanism of the class described the combination of a supporting bed being provided with a pair of guide ways, a tailstock mounted on said bed guide ways for movement relative thereto, a rack associated with one of the guide ways, a rack pinion meshed with the rack and rotatably supported by the tailstock, and means associated with the tailstock for rotating the rack pinion and thereby translating the tailstock relative to the bed guide ways, said rack pinion rotating means including a reversible electric motor, and a reversing switch secured to the tailstock and connected with the motor to effect its reverse operation and therefore the reverse translation of the tailstock.

7. In a mechanism of the class described the combination of a supporting bed being provided with a pair of guide ways, a tailstock mounted on said bed guide ways for movement relative thereto, a rack associated with one of the guide ways, a rack pinion meshed with the rack and rotatably supported by the tailstock, and means associated with the tailstock for rotating the rack pinion and thereby translating the tailstock relative to the bed guide ways, said rack pinion rotating means including a reversible electric motor, a second rack associated with the bed, and a latch carried by the tailstock cooperating with the second rack for locking the tailstock in the several positions as effected by the reversible electric motor.

8. In a mechanism of the class described the combination of a supporting bed being provided with a pair of guide ways, a tailstock mounted on said bed guide ways for movement relative thereto, a rack associated with one of the guide ways, a rack pinion meshed with the rack and rotatably supported by the tailstock, means associated with the tailstock for rotating the rack pinion and thereby translating the tailstock relative to the bed guide ways, said rack pinion rotating means including a reversible electric motor, a second rack associated with the bed, and a latch carried by the tailstock cooperating with the second rack for locking the tailstock in the several positions as effected by the reversible

electric motor, a reversing switch associated with the tailstock for reversing the direction of operation of the motor, and manually operable means for rendering the latch inoperative prior to the operation of the reversing switch.

9. In a mechanism of the class described the combination of a supporting bed being provided with a pair of guide ways, a tailstock mounted on said bed guide ways for movement relative thereto, a rack associated with one of the guide ways, a rack pinion meshed with the rack and rotatably supported by the tailstock, means associated with the tailstock for rotating the rack pinion and thereby translating the tailstock relative to the bed guide ways, said rack pinion rotating means including a reversible electric motor, a second rack associated with the bed, and a latch carried by the tailstock cooperating with the second rack for locking the tailstock in the several positions as effected by the reversible electric motor, a reversing switch associated with the tailstock for reversing the direction of operation of the motor, manually operable means for rendering the latch inoperative prior to the operation of the reversing switch, and a slip clutch between the motor and rack pinion to prevent damage to the motor if attempted to be operated while the tailstock is locked against movement.

10. In a tailstock the combination of a housing having a bore therethrough, a sleeve-spindle mounted in said bore, means connecting the spindle and housing whereby the sleeve may be axially shifted relative to the housing but held against rotative movement, the sleeve having formed at one end thereof a tapered socket and secured to the other end thereof an internally threaded nut, a center frictionally held in the tapered socket, a screw rotatably supported by the housing and having a threaded engagement with the sleeve nut, means for rotating the screw, the screw and center being in axial alignment with one another, and a loose member between the screw and center whereby rotation of the screw to fully retract the sleeve causes the intermediate member to abut the center and break the frictional engagement of a center and sleeve spindle for thereby ejecting a center from its socket.

11. In a tailstock the combination of a housing having a bore therethrough, a sleeve-spindle mounted in said bore, means connecting the spindle and housing whereby the sleeve may be axially shifted relative to the housing but held against rotative movement, the sleeve having formed at one end thereof a tapered socket and secured to the other end thereof an internally threaded nut, a center frictionally held in the tapered socket, a screw rotatably supported by the housing and having a threaded engagement with the sleeve nut, means for rotating the screw, the screw and center being in axial alignment with one another, and a loose member between the screw and center whereby rotation of the screw to fully retract the sleeve causes the intermediate member to abut the center and break the frictional engagement of a center and sleeve spindle for thereby ejecting a center from its socket, said screw rotating means comprising a shaft rotatably supported by the housing with its axis disposed at right angles to the axis of the sleeve spindle and direction of adjustment thereof, and a worm and worm wheel connection between the shaft and screw.

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