

Oct. 23, 1934.

B. A. KEARNS
GRINDING MACHINERY

1,978,110

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3 Sheets-Sheet 1

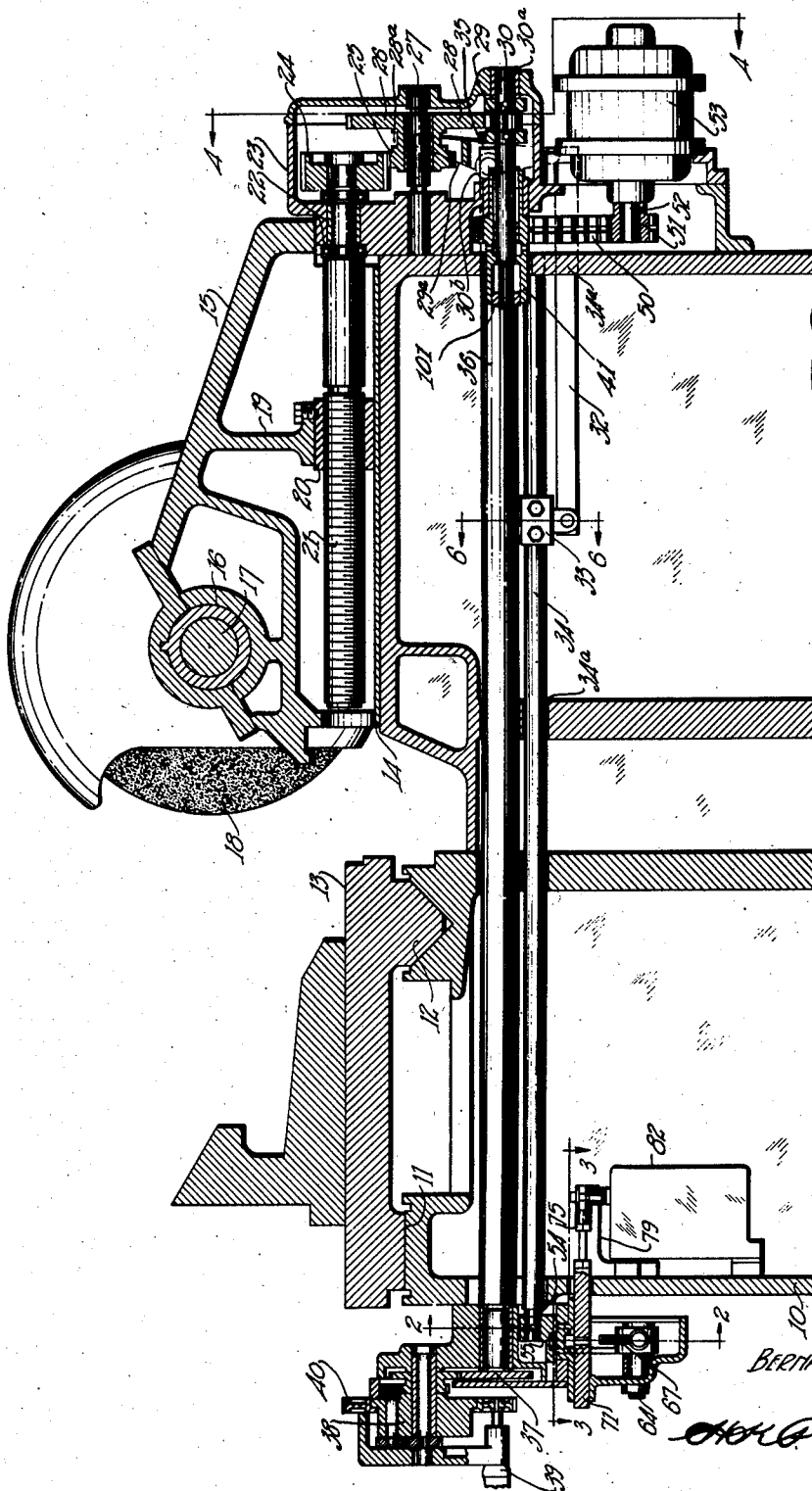


Fig. 1

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3 Sheets-Sheet 2

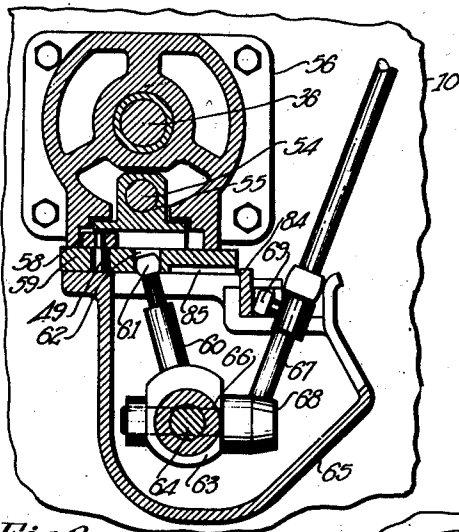


Fig. 2

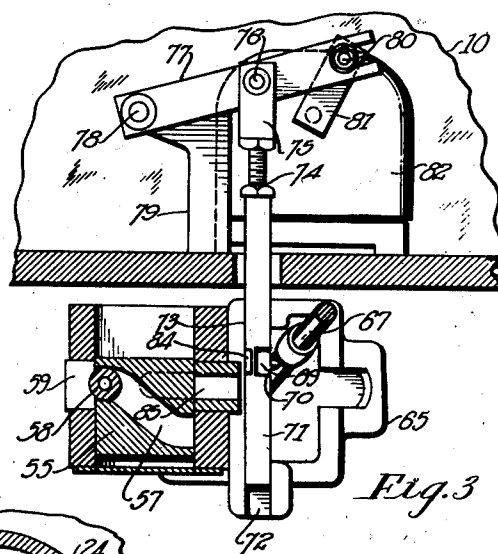


Fig. 3

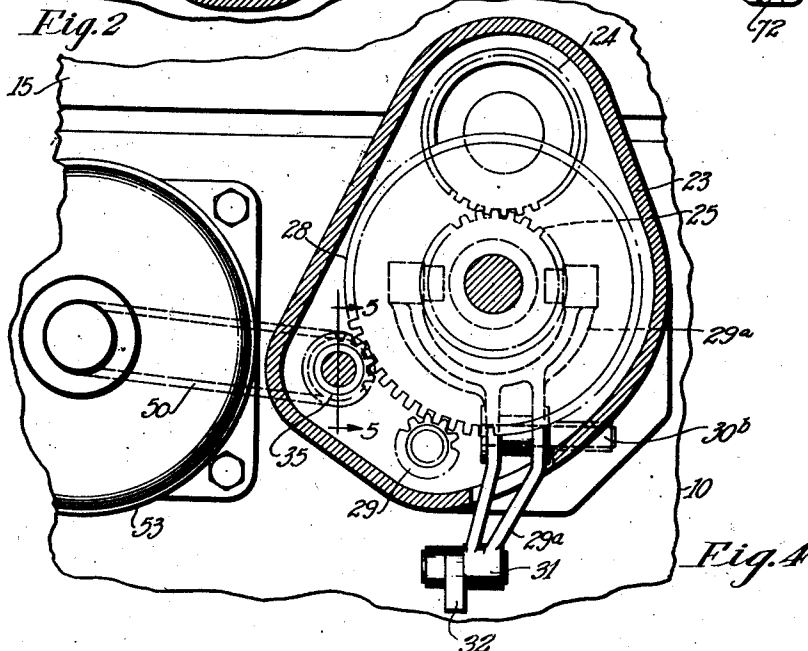


Fig. 4

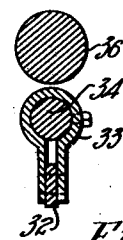


Fig. 6

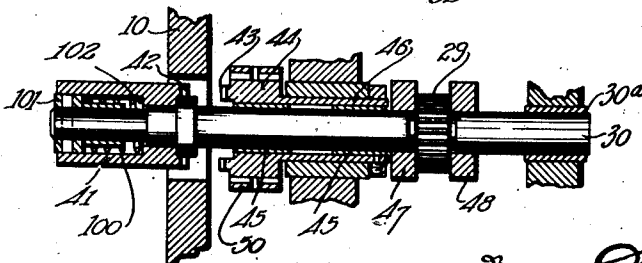


Fig. 5

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3 Sheets-Sheet 3

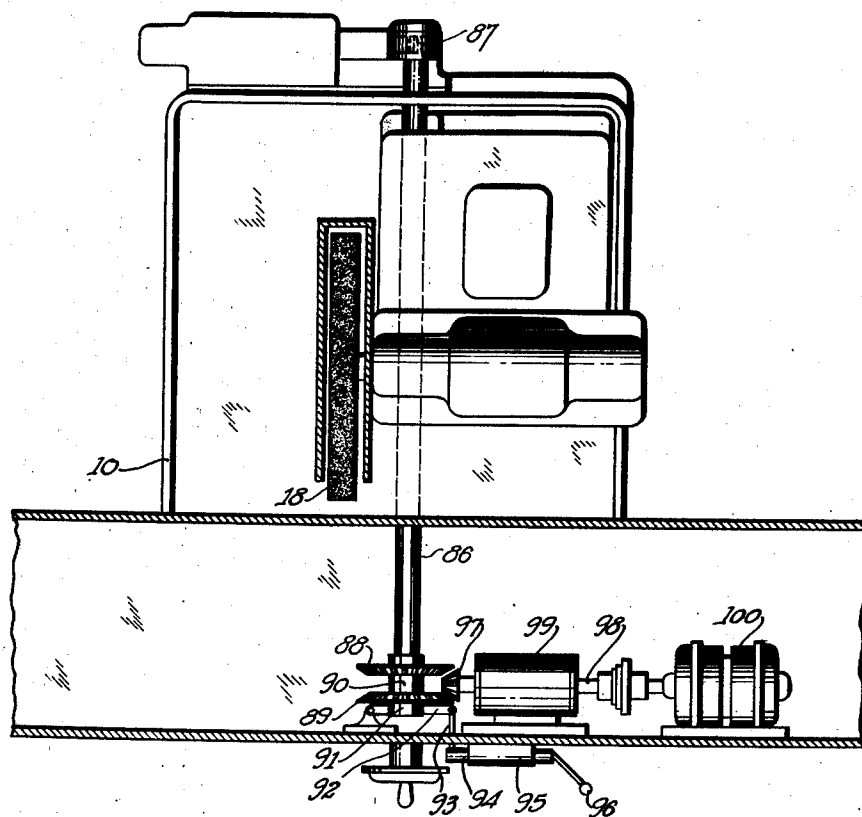


Fig. 7

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UNITED STATES PATENT OFFICE

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GRINDING MACHINERY

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Application February 13, 1930, Serial No. 428,169

14 Claims. (Cl. 51-165)

This invention relates to improvements in machine tools and especially to improvements in grinding machines of the center type.

One of the objects of the invention is the provision of improved means for effecting a rapid cross feed movement of a translatable part of a machine tool organization.

Another object of the invention is the provision of improved means for facilitating the cross feed movement of a grinding wheel carriage for example thereby reducing the time for shifting the said carriage to a minimum and increasing the production of the machine.

Other objects and advantages of the present construction 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 without departing from or exceeding the spirit of the invention.

Figure 1 is a transverse sectional view of a grinding machine embodying the improvements of this invention.

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

Figure 3 is a sectional view taken on line 3-3 of Figure 1.

Figure 4 is a sectional view taken on line 4-4 of Figure 1.

Figure 5 is an enlarged sectional view of certain parts shown in Figure 1 and as seen from line 5-5 of Figure 4.

Figure 6 is a sectional view taken on line 6-6 of Figure 1, and

Figure 7 is a semi-diagrammatic view of a modification embodying the invention.

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

A device embodying this invention may comprise a bed 10 having formed thereon ways 11 and 12 guiding for longitudinal translation thereof a work supporting table 13. Ways 14 may also be provided extending transversely of the bed 10 for supporting and guiding a grinding wheel carriage 15 having journaled as at 16 a spindle 17 supporting for suitable rotation grinding wheel 18. Any desired means may be employed for translating the work supporting table 13 as well as the grinding wheel carriage 15 which as shown herein utilizes the following mechanism. A web 19 depends interiorly of the carriage 15, and has fixedly secured therein a nut 20 threadedly receiving one end of feed screw 21.

Feed screw 21 is mounted in anti-friction bearings 22 carried by the housing 23 secured to the rear of the bed or support 10. Feed screw 21 is restrained from axial movement and has secured to its rearmost end a wide faced gear 24 in mesh with pinion 25 of compound gear 26. This gear 26 is slidably supported for rotation on a shaft 27 and has a large gear 28 meshing with pinion 29 on countershaft 30. Compound gear 26 is provided with an annular groove 28a receiving the end of shifter fork 29a pivoted at 30b to the housing 23. The other end 31 of shifter fork 29a is pivotally secured to link 32 secured at its inner end to slide block 33 fast on shifter shaft 34. The shaft 34 is adapted to be axially shifted through its bearings 34a in the walls of bed 10 by means to be later described and in so doing it shifts the compound gear 26 to the left as seen in Figure 1 to mesh the teeth of gear 28 with pinion 35 on the end of shaft 36 journaled in bearings carried by the bed 10. Shaft 36 has secured to its forward end a gear 37 forming a part of the normal standard feed mechanism indicated generally by the numeral 38 or a part of the hand feed mechanism and terminating in the hand lever 39. Included with the feed mechanism 38 is the ratchet member 40 cooperating with the automatic feed pawl of the feeding mechanism as will be understood by those conversant with this art.

From the foregoing description it will be understood that if compound gear 26 is shifted to engage gear 28 thereof, with the pinion 35, the grinding wheel carriage 15 may be actuated toward or from the work supporting table 13 through the standard feed mechanism 38 or manually by means of the hand lever 39. To rapidly actuate the grinding wheel and its carriage from and toward the work supporting table when it is desired for example, to remove finished work piece therefrom and place an unfinished work wheel to true the surface thereof the following mechanism may be employed. Countershaft 30 is slidably mounted in bearings 30a and has secured to its inner end clutch member 41 provided with clutch teeth 42 adapted to engage clutch teeth 43 formed on the end of sprocket 44 loosely journaled on bearings 45 surrounding the countershaft 30. The hub 46 of pinion 44 is journaled in a depending portion or bracket of the housing 23 and is restrained from axial movement while permitted unrestrained rotative movement. In order to shift clutch 41 to disengage the clutch teeth 42 and 43, the shaft 30 has

secured thereto and flanking the drive pinion 29 a pair of collars 47 and 48. These collars 47 and 48 engage opposite sides of the gear 28 so that as the compound gear 26 is shifted to engage the teeth of the gear 28 with the teeth of the pinion 35 or vice-versa the said gear 28 acts through the collars 47 and 48 to shift countershaft 30 to disengage or engage the clutch teeth 42 and 43.

To insure proper engagement of the clutch teeth 42 and 43 and proper positioning of the parts the clutch member 41 is substantially tubular in construction and has interiorly thereof a spring 100 surrounding the shaft 30 abutting on one end a collar 101 secured to the shaft and on the other end a shoulder 102 formed on the clutch member 41. By this construction should the clutch 42 and 43 not be in condition to properly engage one another but be positioned one on top of the other continued movement of the shaft 30 would compress the spring 100 and as soon as movement is imparted to the parts by means to be described later the spring will expand and properly engage the teeth 42 and 43. The driving sprocket 44 has trained thereover silent chain 50 likewise engaging driving pinion 51 secured to the shaft 52 of prime mover or motor 53. From the foregoing description it will be seen how the feed screw 21 is rotated for rapidly power actuating the grinding wheel carriage 15 toward and from the work supporting table.

The motor 53 is of the reversible type and to control its rotation and determine whether the manual, normal feed mechanism or power rapid traverse mechanism is connected with the carriage 15 the following mechanism is employed. The shift rod 34 has secured to its forward end 54 a shifter head 55 slidably actuated through housing 56 carried by the forward face of bed 10. The head 55 is provided with a cam groove 57 in which a roller 58 is adapted to be moved which roller 58 is carried by a stud 49 secured to and movable with cross head 59. An actuating member 60 having a ball end 61 received in a socket 62 formed in the cross head 59 is provided for actuating the said cross head 59 and effecting the shifting of shift rod 34.

Actuator 60 is carried by a pivot member 63 pivotally mounted on a stub shaft 64 journaled in the side walls of housing 65. A pin 66 extends forwardly of the pivot member 63 and pivotally supports a control handle or lever 67 having a stub 68 surrounding the said pivot pin 66. A lug or ear 69 extends from the handle 67 intermediate the ends thereof cooperating with a notch 70 formed in switch actuating bar 71. Switch bar 71 is guided in suitable guide ways 72 and 73 formed in the upper surface of housing 65 having an adjustable connection at 74 with finger 75 pivoted at 76 to link 77. Link 77 is in turn pivoted at 78 to a bracket 79 extending interiorly of the bed 10 and has a sliding connection at 80 with switch arm 81 of drum switch 82. This drum switch 82 is electrically connected with the motor 53 for reversely rotating same to effect reverse movement of the grinding wheel carriage as above described.

In order to prevent the power drive being connected when either the manual means or normal feed means is employed the switch bar 71 is provided with an upstanding lug 84 cooperating with a slot 85 formed in the underside of cross head 59 to interlock therewith.

The operation of the control mechanism controlled by shift lever 67 is as follows:

Assuming that a work piece has been completed

and it is desired to remove same from the work supporting table and replace a new work piece thereon handle or lever 67 is actuated in a counterclockwise direction about the pivot stub shaft to the position shown for example in Figures 2 and 3. This movement will similarly actuate arm 60 to shift the cross head 59 to the rear to the position shown in Figure 2. In so doing roller 58 carried by the cross head 59 will through the cam groove 57 shift the head 55 on the end of shift rod 34 forwardly carrying with it the said rod 34, slide block 33 and link 32 actuating the shifter fork 29a about its pivot to rearwardly shift compound gear 26 and through the interengagement thereof with collar 47 correspondingly shift shaft 30 to engage the clutch teeth 42 and 43 thereby connecting the cross feed screw 21 with the motor 53. Handle or lever 67 now has the lug 69 thereof within the notch 70 in switch bar 71 whereupon it is shifted either to the right or left as seen in Figure 3 to correspondingly rotate the switch arm 81 and effect a rotation of motor 53 either in a clockwise or counterclockwise direction. As here shown, the shifting of the lever or handle 67 to the right or toward the bed 10 actuates the motor in a direction to retract the grinding wheel carriage from the table 13. After the work piece has been properly positioned on the work supporting table the handle or lever 67 is actuated in the reverse direction or away from the bed 10 as seen in Figure 3 to effect a rotation of the motor 53 for actuating the grinding wheel carriage toward the work supporting table. As soon as the grinding wheel has approached the work the proper amount handle 67 is actuated to its neutral position thereby stopping further actuation of the motor and consequently the grinding wheel carriage. Handle 67 is again actuated about the stub shaft pivot 64 in a reverse direction or in a clockwise direction to shift cross head 59 to the right as seen in Figure 2 and actuate slide bar 34 to the rear to disconnect the gear 28 from pinion 29 of the power transmission and connect same with pinion 35 of the normal feeding mechanism 38 or hand lever 39. At this time the groove 85 rides over the upstanding lug 84 on the switch bar 71 locking the switch bar in this position so that the switch 82 cannot be operated.

The modification shown in Figure 7 includes a shaft 86 having on the end thereof a pinion 87 similar to pinion 29 on shaft 30 adapted to be meshed with the gear 28. This shaft 86 has on its forward end a pair of bevel gears 88 and 89 formed integral with a sleeve 90 slidably keyed thereto. A hub 91 extending from the gear 89 is provided with a shift mechanism including arm 92 pivotally connected with link 93 having one end secured to rock shaft 94 journaled in bearing 95 and having a lever 96 on the end thereof. The lever 96 is employed for shifting the sleeve 90 to cause engagement of the teeth of either of gears 88 or 89 with drive pinion 97 to effect a reverse rotation of drive shaft 86. Pinion 97 is carried by a shaft 98 journaled in bearing 99 carried by the inner surface of the bed 10 and coupled with unidirectional motor 100. From this it will be seen that shaft 96 may be rotated in either a clockwise or counterclockwise direction from the motor 100 depending on the position of handle 96. The construction here employed is such that if lever 96 were actuated away from the bed 10 the grinding wheel carriage would move toward the work supporting table and if reversely actuated the carriage would be retracted from the table or, in

other words, lever 96 similar to lever 67 indicates the direction of movement of the carriage 15 and may be known as a direction indicating lever.

What is claimed is:

- 5 1. In a grinding machine of the class described the combination of a bed, a work supporting table mounted thereon for translation longitudinally thereof, a grinding wheel carriage mounted on the bed for movement transversely thereof to-
10 ward and from the work table, manual means for effecting the movement of the carriage at a feeding rate, reversible power actuated means for effecting a movement of the carriage at a rapid rate, and a single means for connecting either
15 the manual means or the power means with the carriage and for effecting the energization of the latter means whereby the carriage may be actuated in either direction by either the manual or the power means.
- 20 2. In a machine tool organization the combination of a bed or support, a work supporting table movable longitudinally thereof, a tool supporting table movable transversely of the support toward and from the work support, manual
25 means for effecting the shifting of the tool support at a feeding rate, power actuated means for effecting the shifting of the tool support at a rapid rate and means for connecting either the manual means or the power means with the tool
30 support, and interlocking means to prevent actuation of the tool support by either the power means or the manual means when the other is being employed.
3. In a grinding machine the combination
35 of a bed or support, a tool carriage carried thereby and movable relatively thereto, means for actuating the tool carriage at a slow feeding rate, means for actuating the tool carriage at a rapid rate including a motor, a trans-
40 mission line operatively connecting the motor with the tool carriage, a switch for the motor and means associated with the switch to determine the direction of rotation of the motor and the direction of movement of the tool carriage.
- 45 4. In a grinding machine of the class described the combination of a bed, a grinding wheel carriage carried thereby for movement relative thereto, a screw for moving the carriage in reverse directions relative to the bed, a gear fixed
50 on the screw, a shiftable transmission gear in mesh with the screw gear, means for rotating the transmission gear at a slow rate, a reversible independent source of power for rotating the transmission gear at a rapid rate, means for connect-
55 ing the transmission gear with either the slow rate rotation means or the independent source of power, and simultaneously disconnecting it from the other, and for determining and indicating the direction of actuation of the independent source of power and consequently the
60 direction of actuation of the carriage.
5. In a grinding machine the combination of a bed or support, a tool carriage carried thereby, a screw for moving the carriage in reverse direc-
65 tions relative to the bed, a shiftable idler gear in mesh with the screw gear to rotate same, means for rotating the idler gear at a slow rate, a reversible independent source of power for rotating the idler gear at a rapid rate, means connecting
70 the idler gear with either the slow rate rotation means or the independent source of power, and for determining the direction of actuation of the independent source of power said means including a single manually actuatable member.
- 75 6. In a grinding machine the combination of

a bed or support, a tool carriage carried thereby and movable relative thereto, means for actuating the tool carriage at a slow feeding rate, means for actuating the tool carriage at a rapid rate
80 including a reversible motor, and means for connecting either the slow feeding rate means or the rapid rate means with the tool carriage and for determining the direction of rotation of the motor including a shifter rod, a switch and a
85 manually shiftable lever for actuating the shifter rod and switch.

7. In a grinding machine the combination of a bed or support, a tool carriage carried thereby and movable relative thereto, means for actuating the tool carriage at a slow feeding rate
90 means for actuating the tool carriage at a rapid rate including a motor and control means common to the carriage shifting means operable through one plane for connecting either the slow feeding rate means or the rapid rate means with the tool
95 carriage and operable through an angularly related plane to effect rotation of the motor.

8. In a grinding machine the combination of a bed or support, a tool carriage carried thereby and movable relative thereto, means for actuating the tool carriage at a slow feeding rate,
100 means for actuating the tool carriage at a rapid rate including a reversible motor, and means connecting either the slow feeding rate means or the rapid rate means with the tool carriage including
105 a shifter fork, a shifter rod, a head on the rod having a cam groove therein, a cross slide cooperating with the cam, and a lever for actuating the cross slide to effect a shifting of the head and rod through the cam groove.
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9. In a grinding machine of the class described the combination of a bed, a tool carriage carried thereby, and movable relative thereto, means for actuating the tool carriage at a slow feeding rate,
115 means for actuating the tool carriage at a rapid rate including a reversible motor, a switch for the motor and a lever for the motor switch operable in opposite directions to effect a rotation of the motor in said opposite directions and said lever
120 indicating in which direction the tool carriage will be operated.

10. In a grinding machine the combination of a bed or support, a tool carriage carried thereby and movable relative thereto, means for actuating the tool carriage at a slow feeding rate, means for actuating the tool carriage at a rapid rate including a reversible motor and a switch for the motor,
125 and means for connecting either the slow feeding rate means or the rapid rate means with the tool carriage and for determining the direction of rotation of the motor including a shifter fork, a shifter rod, a head on the rod having a cam groove therein, a cross slide cooperating with the cam and a lever operable through one plane for actuating the cross slide to effect a shifting of the head
130 and rod through the cam groove and operable in opposite directions through an angularly related plane for closing the switch to effect a rotation of the motor in opposite directions and actuate the tool carriage correspondingly.
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11. In a grinding machine the combination of a bed, a tool carriage carried thereby and shiftable relative thereto, means for shifting the carriage including a rotatable screw, a gear on the screw,
145 a pinion in constant operative engagement with the gear, a second gear associated with the pinion, a pair of pinions adapted to be independently meshed with the gear for driving the gear thereby, means for rotating one of the pinions at a normal feeding rate, and additional means for rotat-
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ing the other pinion at a rapid traverse rate.

12. In a grinding machine the combination of a bed, a tool carriage carried thereby and shiftable relative thereto, means for effecting said shifting including a rotatable screw, means driven at a slow feeding rate, means driven at a rapid traverse rate, transmission means shiftable between the feeding rate means and rapid traverse rate means for correspondingly actuating the tool carriage, and interlocking means between the feeding rate means and the rapid traverse rate means whereby the energization of one of said means precludes the operation of the other.

13. In a grinding machine the combination of a bed, a tool carriage carried thereby and shiftable relative thereto, means for effecting said shifting including a rotatable screw, means driven at a slow feeding rate, means driven at a rapid traverse rate, transmission means shiftable between the feeding rate means and rapid traverse rate means for correspondingly actuating the tool carriage,

and interlocking means between the feeding rate means and the rapid traverse rate means whereby the energization of one of said means precludes the operation of the other, said means including a single lever operable in one plane for energizing one of said means and in an angularly related plane for engaging the remaining means.

14. In a grinding machine the combination of a bed, a grinding wheel carriage carried thereby and shiftable relative thereto, means for shifting said carriage including a rotatable adjusting screw, means for rotating the screw at normal feeding rates, means for rotating said screw at rapid traverse rates, and control means therefor including a manually actuable lever operable in angularly related planes and in opposite directions for engaging and energizing respectively the slow rate actuating means and the rapid traverse rate actuating means.

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