Jan. 30, 1934. A. P. STEINER 1,945,453

AUXILIARY POWER WHEEL FEED

Filed Oct. 4, 1928 2 Sheets-Sheet 1

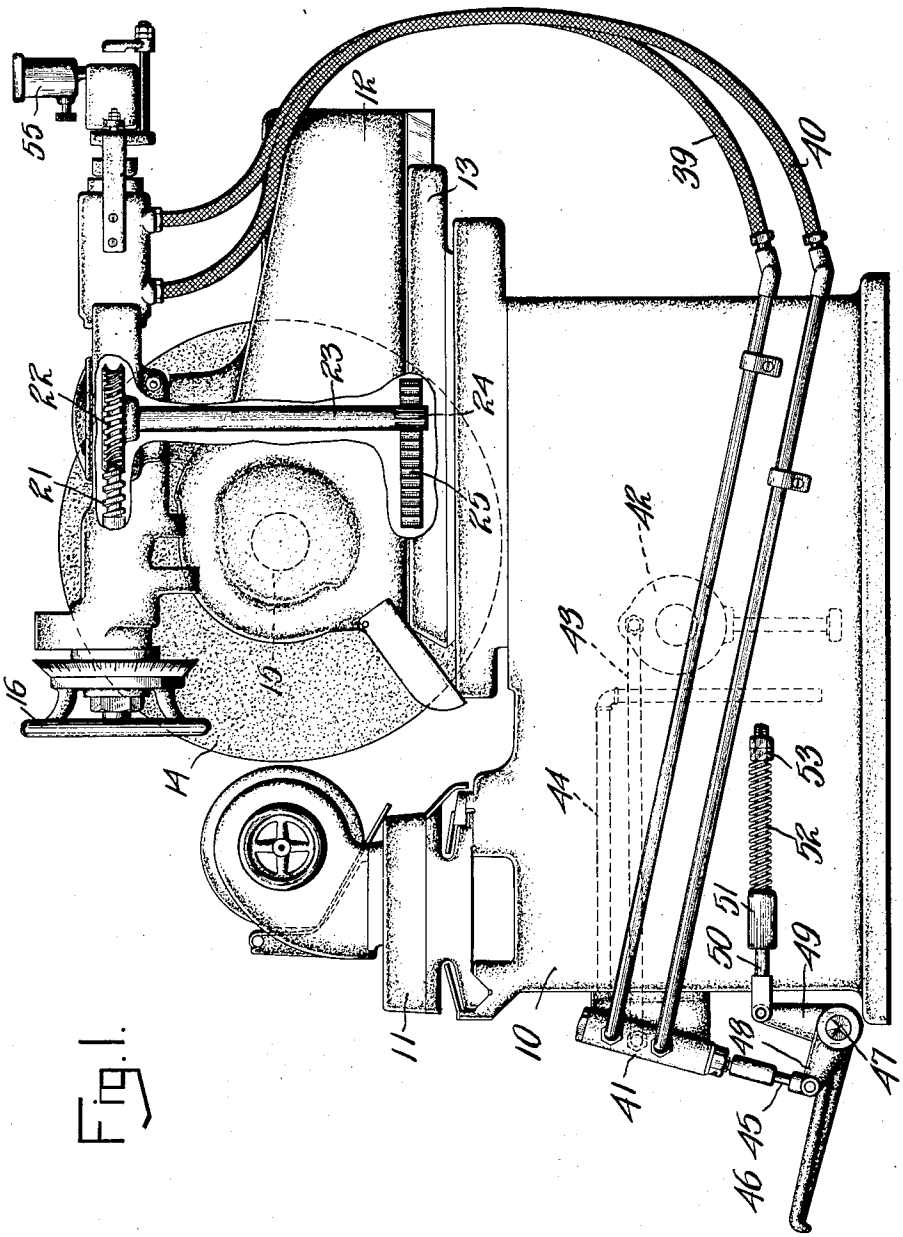


Fig. 1.

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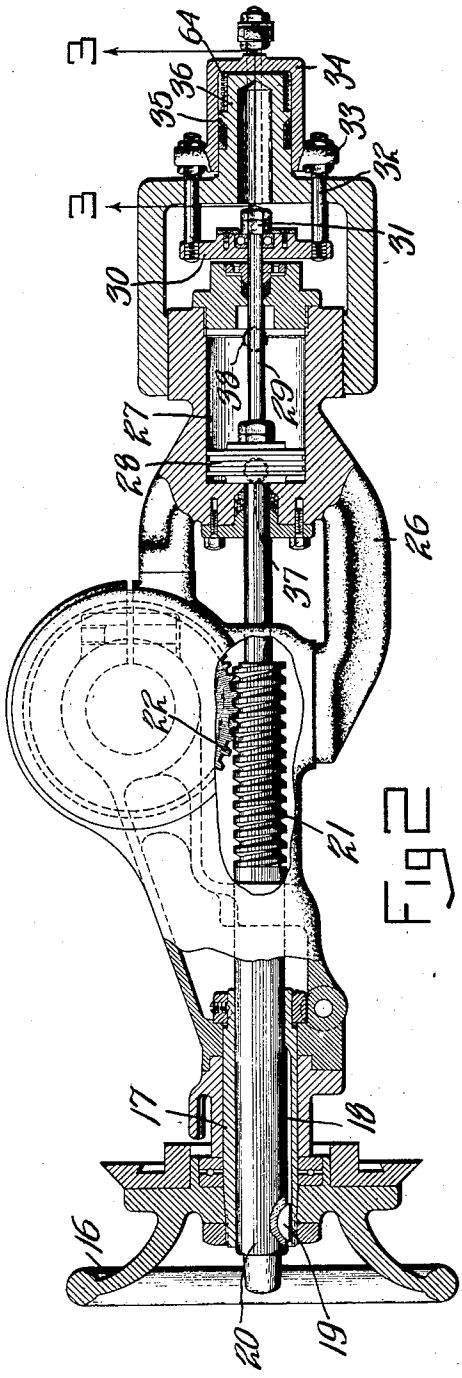


Fig 2

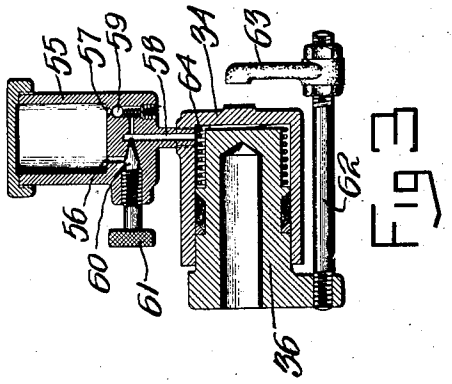


Fig 3

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AUXILIARY POWER WHEEL FEED

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18 Claims. (Cl. 51—95)

This invention relates to power wheel feed mechanism for grinding machines. An object of the invention is to provide power operative means integral or associated with manual means for feeding the grinding wheel into the work.

A further object is to provide feeding means which will impart a short rapid movement to the wheel base for a part of the feeding in of the wheel and a gradual feeding for the remainder of the distance.

Still another object is to provide convenient controlling means for operating the power feeding means.

Further objects and advantages will appear as the description proceeds.

Referring to the accompanying drawings, which are made a part hereof and on which similar reference characters indicate similar parts,

Figure 1 is an end elevation of a grinding machine showing the method of mounting the power wheel feed and the controlling means for the same,

Figure 2, a plan view of the wheel feed mechanism partly in section, and

Figure 3, a sectional side elevation of the feed regulator assembly.

In the drawings, Fig. 1, reference character 10 indicates the bed of a grinding machine having a work carriage 11 and a grinding wheel base 12. The grinding wheel base is adapted to slide in guide-ways on a sub-slide 13. The grinding wheel base 12 carries a grinding wheel 14 mounted upon a shaft 15. The grinding wheel base 12 is movable toward and from the work carriage by means of a hand wheel 16 secured upon a sleeve 17. The sleeve 17 is provided with an elongated keyway 18. A key 19 in a shaft 20 secures the sleeve 17 against rotation upon the shaft 20, but permits axial movement of the said shaft 20 relative to the sleeve. The shaft 20 has integral therewith a worm 21 which meshes with a worm wheel 22 upon a shaft 23. The lower end of the shaft has a pinion 24 made integral therewith or secured thereupon, which pinion meshes with a rack 25 on the sub-slide 13. Rotation of the hand wheel 16, through the means just described, will move the grinding wheel base carrying the grinding wheel toward or from the work carriage as desired. The feeding means just described is substantially that used in many well known grinding machines. The structure about to be described provides power means for moving the grinding wheel base toward and from the work. The casting which carries the hand wheel 16 has secured thereto a bracket 26 in which is provided a cylinder 27. The end of the shaft 20 extends into this cylinder and carries a piston 28. An extension 29 of the rod 20 has secured thereon a yoke 30. The yoke is adjustably secured upon the rod by means of nuts 31.

The yoke 30 carries bolts or studs 32 which extend through bores in the end of the bracket and are secured in lugs 33 on a cup-like member 34 which is provided with a cylindrical interior 35. A projection 36 on the bracket fits in and acts as a piston in the interior of the cup 34. The cylinder 27 is provided with inlet ports 37 and 38 to which are connected fluid conduits 39 and 40 respectively. Mounted on the front of the grinding machine is a bracket carrying a control valve 41. This valve is a well known reversing valve of the piston type. A pump 42 in the bed of the grinding machine delivers pressure fluid through a pipe 43 to the said valve and an exhaust pipe 44 returns the fluid from the valve to the reservoir in the base of the machine. Pipes 39 and 40 are connected to the said valve 41. The control valve 41 is provided with a piston 45, which is operated by a foot pedal 46. The foot pedal is secured upon a shaft 47. A rock arm 48 on the shaft 47 is connected to the plunger 45 and a rock arm 49 is secured to a plunger 50. This latter plunger passes through a supporting bracket 51 which is secured upon the base of the machine. A compression spring 52 is secured upon the plunger 50 by means of nuts 53. As shown in Fig. 1, the valve plunger is normally held in its upward position by means of the spring 52, but is movable to its lower position by the pedal 46. A reservoir 55 is mounted upon the cylinder 34. The interior of this reservoir is in communication with the interior of the cylinder 34 by means of ports 56, 57 and 58. A spring pressed valve 59 closes the port 57, and a needle valve 60 controls the port 56. The valve 59 permits fluid to flow freely from the reservoir to the interior of the cylinder 34 but checks its return to the reservoir. The needle valve 60 is adjustable by means of a threaded screw 61. A pin or bolt 62 secured upon the bracket 26 has an arm 63 which is adapted to strike the end of the cylinder 34 and limit its outward movement. The arm 63 is adjustable on pin 62 to vary the position at which the regulator is picked up by the rapid feed and the distance it travels after pick-up. The interior of the plunger 36 is hollowed out to provide a space into which the end of a bolt carrying the nuts 31 may enter. A spring 64 is positioned around the plunger 36 between the end of the cylinder 34 and the plunger 36.

The operation of the power control is as follows:

The normal position of the grinding wheel is forward against the work. In order to move it to the rear the foot pedal 46 is depressed, which moves the piston valve to admit pressure fluid through the pipe 39 to the port 37 to the left of the piston. This drives the piston to the right as shown in Fig. 2. When driven to the right, the

worm 21 acts as a rack on the worm wheel 22 to rotate the shaft 23 to move the wheel base 12 to the rear. When moving in this direction the key 19 slides in the key-way 18 in the sleeve 17. As the shaft 20 moves to the right the spring 64 moves the cup-like cylinder 34 to the right along with the shaft 20. Fluid in the reservoir 55 may freely flow through the port 57 past the ball check valve into the cylinder 34. When the foot pedal 46 is released, the spring 52 returns the plunger 45 to its upward position to reverse the flow of fluid through the valve and to deliver pressure fluid through the pipe 40 and the port 38 to the right of the piston 28. This tends to urge the shaft 20 to the left and the worm 21 acting on worm-wheel 22 tends to rotate the shaft 23 to move the grinding wheel base toward the work. This shaft 20 may be quickly moved a part of the distance, due to a free play between the rod 29 and the yoke 30. When the nut 31 has come into engagement with the face of the yoke the cylinder 34 is then moved toward the left along with the shaft 20. The fluid in the cylinder 34 however tends to prevent movement of the cylinder to the left. The restricted port 56 allows fluid under pressure to be slowly forced up through the ports 58 and 56 into the reservoir 55. The speed with which the wheel base may move toward the left is determined by the size of the opening of the needle valve 60. By means of the screw 61 the restriction may be controlled to provide any predetermined speed with which the feeding is carried on. The arm 63 limits the outward movement of the cylinder 34.

The manual wheel feed operated by wheel 16 also provides means for adjusting the grinding wheel to provide for wearing away of the grinding wheel.

It will be obvious to those skilled in the art that various changes may be made in my device without departing from the spirit of the invention, and I, therefore, do not limit myself to what is shown in the drawings and described in the specification, but only as set forth in the appended claims.

Having thus fully described my said invention, what I claim as new and desire to secure by Letters Patent is:

1. In a grinding machine having a work support and a grinding wheel base, means for moving the grinding wheel base toward and from the work support comprising a rack mounted on the bed of the grinding machine, a pinion meshing with said rack, a shaft supporting said pinion, a worm wheel on said shaft, a hand wheel, a sleeve mounted in said hand wheel, a key-way in said sleeve, a shaft having a key secured therein and adapted to have axial movement through the said key-way, a worm upon said shaft adapted to mesh with said worm wheel, a cylinder, a piston on the said shaft movably mounted in said cylinder, ports in the said cylinder in communication with a source of fluid under pressure, an auxiliary cylinder movable with the said shaft, a fluid reservoir having its interior in communication with the interior of the said last named cylinder, a valve in said reservoir adapted to permit liquid to flow freely from the said reservoir to the said auxiliary cylinder and a restricted port between the said cylinder and the interior of the said reservoir whereby fluid may freely flow from the reservoir to the interior of the said cylinder but will have its flow restricted from the said cylinder to the said reservoir, substantially as set forth.

2. A grinding machine having a work support and a wheel base movable toward and from the work support, a bracket mounted upon the wheel base, said bracket having a manually operable means for moving the wheel base toward and from the work support and having pressure fluid means connected to and operable independently of the said manually operable means for moving the wheel base toward and from the work support, self contained auxiliary pressure fluid means for determining the speed of movement of the wheel base toward the work support when the said wheel base has reached a predetermined position relative to the work support and a manually operable valve positioned at the front of the grinding machine in control of movement of the wheel base toward and from the work support, said valve being biased to cause the wheel base normally to rest in its most remote position from the work support, substantially as set forth.

3. In a grinding machine having a base, a work support, a grinding wheel support, means for moving the grinding wheel support toward and from the work support comprising a fixed bracket upon the grinding wheel support, a cylinder in said bracket, a piston in said cylinder, operative connection between said piston and the machine base for causing relative movement between the said base and the wheel support, pressure fluid connections to said cylinder, and a separate self-contained hydraulic regulator for limiting movement of said piston, said regulator being directly connected in axial alignment with said piston, substantially as set forth.

4. In a grinding machine having a base, a work support, a grinding wheel support, means for moving the grinding wheel support toward and from the work support comprising a fixed bracket upon the grinding wheel support, a cylinder in said bracket, a piston in said cylinder, operative connection between said piston and the machine base for causing relative movement between the said base and the wheel support, pressure fluid connections to said cylinder, and a separate self-contained hydraulic regulator for limiting movement of said piston, said regulator being directly connected in axial alignment with said piston, fluid for operating said regulator being independent of the fluid for operating the piston which moves the said wheel base, substantially as set forth.

5. In a grinding machine, a wheel support, a work support, hydraulic mechanism for moving the wheel support comprising a bracket having a cylinder therein, a piston operable in said cylinder, said piston being operably connected to the wheel support for moving it toward and from the work support at a relatively high speed, a hydraulic feed regulator separate from said feed mechanism but adapted to cooperate therewith and to limit the speed of operation of said feed mechanism, said regulator comprising a stationary piston and a movable cylinder, the movable cylinder being connected to and in axial alignment with the said wheel feed piston, substantially as set forth.

6. In a grinding machine having a work support and a grinding wheel support, means for moving the grinding wheel support toward and from the work support at high speed comprising a bracket having a cylinder therein and a reciprocating piston in the cylinder, means rotatably mounted on said wheel support and engageable with a stationary element of the ma-

chine for moving the wheel support, the piston being operably connected to said rotatable means, so that the reciprocating motion of said piston will impart rotary motion to said wheel support moving means whereby movement of the piston will move the wheel support and a regulator having means for limiting the speed of movement of the wheel base at a predetermined period in its movement toward the work, said regulator comprising a piston rigidly secured to the said bracket, a cylinder surrounding said piston, said cylinder being connected to the said piston to move therewith and a body of liquid having fluid connections to the said cylinder, said body of liquid being independent of the fluid which operates to move the said wheel support relative to the work support, substantially as set forth.

7. In a grinding machine, a wheel support, a work support, hydraulic mechanism for feeding one of said supports toward the other comprising a piston and cylinder mounted on the wheel support, a source of pressure fluid for said mechanism, a self contained hydraulic feed regulator having a supply of fluid independent of said source, and connections between said hydraulic mechanism and said feed regulator whereby the latter controls the rate of movement of the former, substantially as set forth.

8. In a grinding machine having a base, a work support and a grinding wheel support, means for moving the grinding wheel support toward and from the work support comprising a cylinder mounted on the wheel support, a piston in said cylinder, operative connection between said piston and the machine base for causing relative movement between said base and the wheel support, pressure fluid connections to said cylinder, and a separate self-contained hydraulic regulator for limiting movement of said piston, said regulator being directly connected in axial alignment with said piston, substantially as set forth.

9. In a grinding machine having a base, a work support, and a wheel support, means mounted on the wheel support for moving said support comprising a cylinder, a piston in said cylinder, a reduced speed drive connection between said piston and the said wheel support whereby movement of the piston will impart a relatively lesser movement to the wheel support, pressure fluid connections to the said cylinder, a separate self-contained hydraulic regulator for limiting movement of said piston, and means for limiting the movement of the regulator and for adjusting the feed movement, substantially as set forth.

10. In a grinding machine, a wheel support, a work support, a hydraulic motor for feeding one of said supports toward and from the other comprising a piston and a cylinder, a source of pressure fluid for said motor, a self-contained hydraulic feed regulator having a supply of fluid independent of said source, said motor and said feed regulator being mounted upon and movable with said wheel support, and connections between said hydraulic motor and said feed regulator whereby the feed regulator controls the rate of movement of the wheel support during a portion of its movement, substantially as set forth.

11. In a grinding machine having a base and a work support, a grinding wheel support movable toward and from the work support, means for effecting such movement comprising a cylinder mounted on the wheel support, a piston in said cylinder, a piston rod on said piston, said piston rod having a worm thereon engageable with a worm gear, a vertical shaft mounted in said wheel support, said shaft having said worm gear mounted thereon, a rack on said base, a pinion on said shaft engageable with said rack, pressure fluid connections to said cylinder for operating the piston to move the wheel support, and a separate self-contained hydraulic regulator for limiting movement of said piston, substantially as set forth.

12. In a grinding machine having a base and a work support, a grinding wheel support movable toward and from the work support, means for effecting such movement comprising a cylinder mounted on the wheel support, a piston in said cylinder, a piston rod on said piston, said piston rod having a worm thereon engageable with a worm gear, a vertical shaft mounted in said wheel support, said shaft having said worm gear mounted thereon, a rack on said base, a pinion on said shaft engageable with said rack, pressure fluid connections to said cylinder for operating the piston to move the wheel support, and a separate self-contained hydraulic regulator for limiting movement of said piston, said regulator being connected in axial alignment with said piston, substantially as set forth.

13. In a grinding machine having a base and a work support, a grinding wheel support, means for moving the grinding wheel support toward and from the work support comprising a cylinder, a piston reciprocable longitudinally of said cylinder, a piston rod connected to said piston, a worm on said piston rod, a shaft mounted in said wheel support said shaft having a relatively large worm gear engageable by the said worm, a rack on the said machine base, a relatively small pinion on the said shaft engageable with the said rack whereby movement of the said piston effects a relatively smaller movement of the said wheel support, pressure fluid connections to the said cylinder and a separate self-contained hydraulic regulator for limiting the movement of said piston, said regulator being connected directly with and limiting the movement of said piston, substantially as set forth.

14. In a grinding machine having a base, a work support and a grinding wheel support movable toward and from the work support, means for moving the grinding wheel support toward and from the work support comprising a cylinder mounted on the wheel support, a piston in said cylinder, operative connection between said piston and the machine base for moving the wheel support relative to the work support, said operative connection comprising a rack on the wheel base, a shaft rotatably mounted in the said wheel support having a pinion engageable with the said rack, a gear on the shaft, a piston rod connected to said piston, said rod having a worm thereon engageable with the said gear whereby movement of the piston will rotate said shaft to move said wheel support, pressure fluid connections to said cylinder and a separate self-contained hydraulic regulator for limiting movement of said piston, substantially as set forth.

15. In a grinding machine having a base, a work support and a grinding wheel support movable toward and from the work support, means for moving the grinding wheel support toward and from the work support comprising a cylinder mounted on the wheel support, a piston in said cylinder, operative connection between said pis-

ton and the machine base for moving the wheel support relative to the work support, said operative connection comprising a rack on the wheel base, a shaft rotatably mounted in the said wheel support having a pinion engageable with the said rack, a gear on the shaft, a piston rod connected to said piston, said rod having a worm thereon engageable with the said gear whereby movement of the piston will rotate said shaft to move said wheel support, pressure fluid connections to said cylinder and a separate self-contained hydraulic regulator for limiting movement of said piston, said regulator being directly connected in axial alignment with said piston, substantially as set forth.

16. In a grinding machine a wheel support, a work support, hydraulic mechanism comprising a piston and a cylinder adapted to feed one of said supports toward the other, a hydraulic feed regulator, connections between said regulator and said feed mechanism, said connections being independent of any portion of the wheel support, substantially as set forth.

17. In a grinding machine, a wheel support, a work support, fluid means to move said wheel support toward and from said work support, means to effect said movement at high speed, means to reduce the high speed to grinding speed as the wheel approaches the work, comprising a hydraulic feed regulator, and means connecting said fluid means and said feed regulator directly, said means being independent of the wheel support.

18. In a grinding machine, a wheel support, a work support, a hydraulic motor for feeding one of said supports to the other comprising a cylinder mounted in the wheel support and having a piston operable therein and connected to means for moving the wheel support, a source of fluid under pressure for operating said motor, a feed regulator having a supply of fluid for operating it independently of operation of said wheel feeding motor and means for connecting said regulator directly to said wheel feed motor and independently of the wheel support, the wheel feed regulator controlling the speed of the wheel feed motor.

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