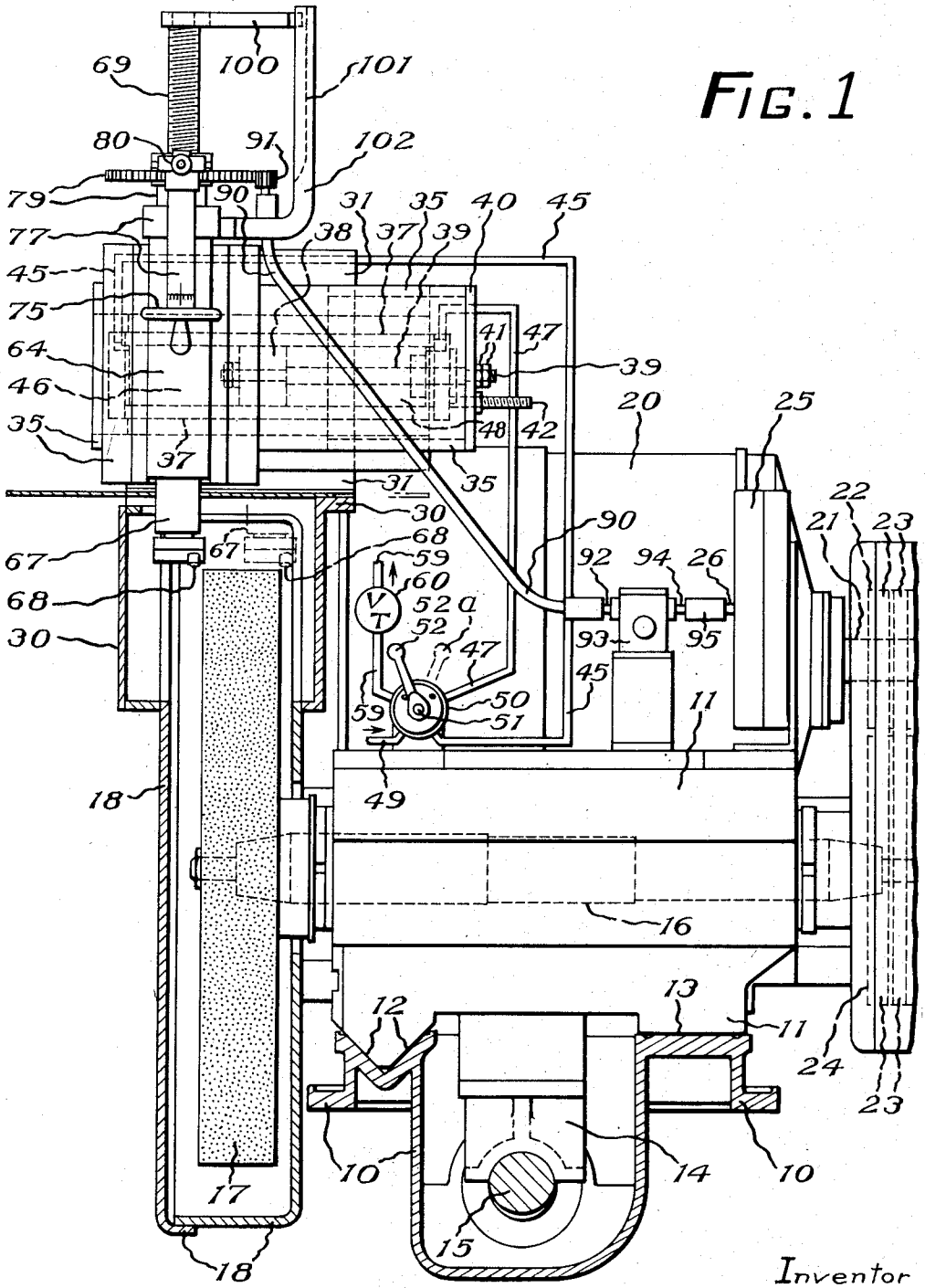
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GRINDING MACHINE

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FIG. 1



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FIG. 2

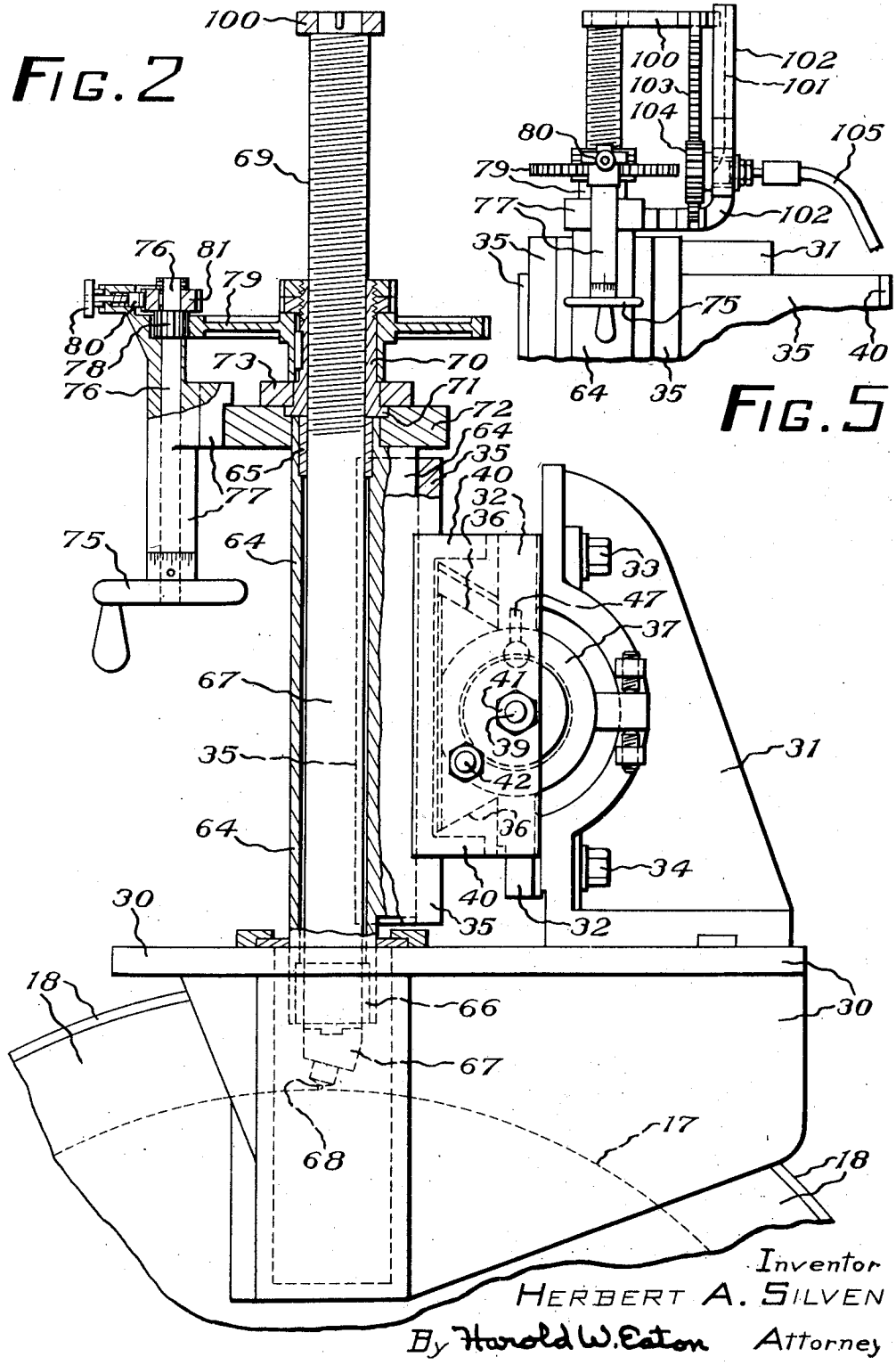


FIG. 5

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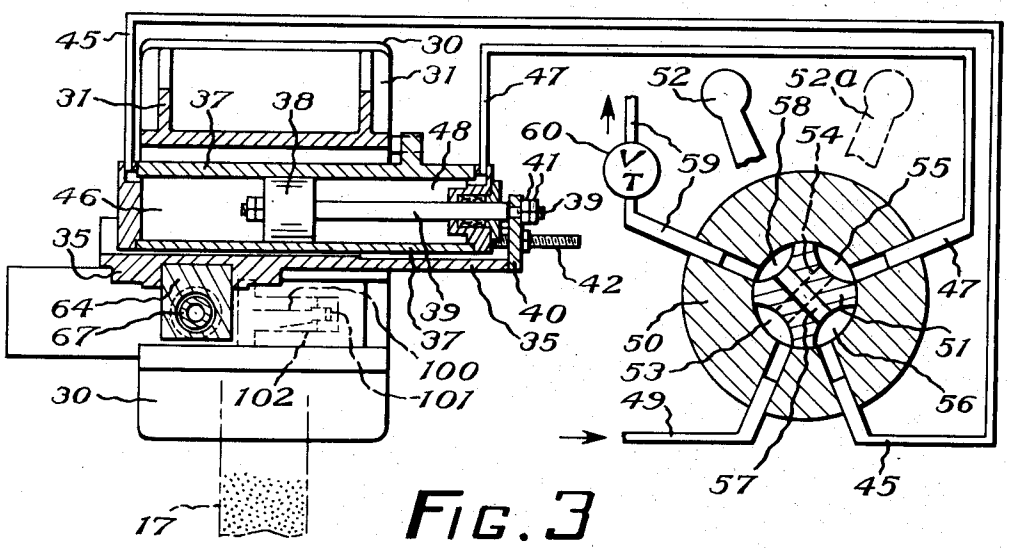


FIG. 3

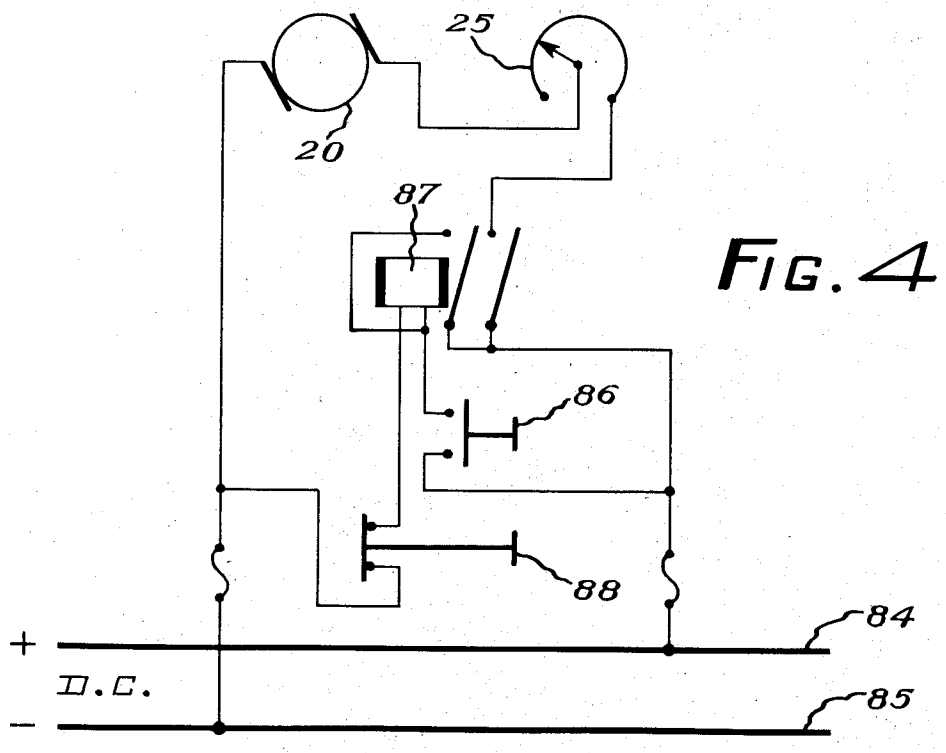


FIG. 4

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2,648,172

GRINDING MACHINE

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2 Claims. (Cl. 51—5)

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The invention relates to grinding machines, and more particularly to a speed control device automatically to maintain a uniform peripheral speed of the grinding wheel.

One object of the invention is to provide a simple and thoroughly practical speed control mechanism automatically to maintain a substantially uniform peripheral speed on the grinding wheel. Another object is to provide an automatically actuated rheostat control for varying the speed of the grinding wheel driving motor so as to maintain a substantially constant peripheral speed of the grinding wheel as it wears away. Another object is to provide an automatically actuated speed control mechanism which is actuated by and in timed relation with the truing tool feeding mechanism for increasing the rotative speed of the grinding wheel as it wears away so as to maintain a substantially constant peripheral speed thereof. Another object of the invention is to provide a driving connection between the truing tool feeding mechanism and the speed control for the driving motor automatically to increase the speed of the motor as the wheel wears away so as to maintain a substantially constant peripheral speed of the grinding wheel. Other objects will be in part obvious or in part pointed out hereinafter. In the accompanying drawings in which is shown one of the various possible embodiments of the mechanical features of the invention:

Figure 1 is a fragmentary front elevation, partly in section, of a wheel slide, wheel truing apparatus and a grinding wheel speed control mechanism; and

Figure 2 is a fragmentary sectional view, on an enlarged scale, through the truing apparatus feed mechanism;

Figure 3 is a hydraulic piping diagram of the actuating mechanism;

Figure 4 is an electric diagram of the controls for the wheel driving motor; and

Figure 5 is a fragmentary view of a modified form of the driving connection between the truing tool feeding mechanism and the speed control mechanism.

A grinding machine has been illustrated in the drawings comprising a base 10 which serves as a support for a rotatable work support (not shown). This work support may be identical with that shown in the prior U. S. Patent No. 2,522,485 to H. A. Silven and C. G. Flygare dated September 12, 1950, to which references may be had for details of disclosures not contained herein.

The base 10 also serves as a support for a

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transversely movable wheel slide 11 which is arranged to slide transversely on a V-way 12 and a flat-way 13 formed on the upper surface of the base 10.

A suitable feeding mechanism is provided for causing a transverse movement of the slide 11 relative to the base 10 comprising a half nut 14 depending from the under side of the wheel slide 11. The half nut 14 meshes with or engages a rotatable feed screw 15. The feed screw 15 may be actuated by any of the well known conventional feeding mechanisms.

Wheel slide 11 serves as a support for a rotatable wheel spindle 16 which is journaled in spaced bearings (not shown). The wheel spindle 16 supports a grinding wheel 17 on its left hand end (Fig. 1). The grinding wheel 17 is partially surrounded by a wheel guard 18 which is fastened to the wheel slide 11.

A suitable driving mechanism is provided for the spindle 16 comprising a variable speed electric motor 20 which is mounted on the upper surface of the wheel slide 11. The motor 20 is provided with a motor shaft 21 having a multiple V-groove pulley 22 mounted thereon which is connected by multiple V-belts 23 with a multiple V-groove pulley 24 which is mounted on the right hand end of the wheel spindle 16. A rheostat 25 having an actuating shaft 26 is provided for varying the speed of the motor 20.

The wheel guard 18 supports a housing 30 having a plane upper surface which in turn supports bracket 31 for supporting a grinding wheel truing apparatus. A slide base 32 is fixedly supported on the bracket 31 by means of clamping screws 33 and 34. The slide base 32 serves as a support for a longitudinally movable slide 35 which is arranged to slide longitudinally on a dove-tailed slideway 36 formed on the slide base 32.

A hydraulically operated mechanism is provided for traversing the slide 35 longitudinally comprising a cylinder 37 which contains a slidably mounted piston 38. The piston 38 is connected to the left hand end of a piston rod 39 (Fig. 3), the other end of which is fastened to an end cap 40 fixed on the end of a slide 35. A pair of nuts 41 serve to lock the piston rod 39 to the end cap 40. The end cap 40 carries a stop screw 42 which is arranged to engage the end of the cylinder 37 to facilitate limiting the movement of the slide 35 toward the left. When fluid under pressure is passed through a pipe 45 into a cylinder chamber 46, the piston 38 together with the slide 35 will move toward the right (Fig.

3). During this movement of the piston 38, fluid within a cylinder chamber 48 may exhaust through a pipe 47.

A suitable control mechanism is provided for the cylinder 37 comprising a rotary type reversing valve 50 having a valve rotor 51 which may be manually actuated by a control lever 52. When fluid under pressure is passed through a pipe 49 from a suitable source of supply, it passes into a valve chamber 53, through a traverse passage 54 formed in the valve rotor 51 into a valve chamber 55 and through the pipe 47 into the cylinder chamber 48 to cause the piston 38 to move toward the left. This movement of the piston 38 and the slide 35 toward the left continues until the stop screw 42 engages the right hand end of the cylinder 37. During movement of the piston 38 toward the left, fluid within the cylinder chamber 46 may exhaust through the pipe 45 into a valve chamber 56, through a traverse passage 57 in the valve rotor 51, into a valve chamber 58 and out through an exhaust pipe 59 and through a throttle valve 60. By manipulation of the throttle valve 60, the speed of movement of the piston 38, and the wheel slide 35 may be readily varied and controlled as desired.

When it is desired to reverse the direction of the movement of the slide 35, the control lever 52 will be moved in a clockwise direction into the broken line position 52a (Fig. 3) which movement shifts the valve rotor 51 so that fluid under pressure from the pipe 49 passes into the valve chamber 56, through the pipe 45 into the cylinder chamber 46 to cause the piston 38 and the slide 35 to move longitudinally toward the right. During this movement fluid within the cylinder chamber 48 may exhaust through the pipe 47, into the valve chamber 55, through the transverse passage 54 and out through the pipe 59 and the throttle valve 60.

The longitudinally movable slide 35 serves as a support for a vertically arranged housing 64. The housing 64 is provided with a pair of spaced bearings 65 and 66 which support a vertically arranged truing tool carrier 67 having a truing tool 68 mounted at its lower end.

A suitable feeding mechanism is provided for feeding the carrier 67 vertically in either direction relative to the slide 35. This mechanism preferably comprises a nut and screw feeding mechanism in which a screw threaded portion 69 is provided on the upper end of the carrier 67. A rotatable nut 70 meshing with or engaging the threaded portion 69 is provided with an integral flange 71 which is rotatably supported on the carrier 64 by a pair of plates 72 and 73.

A manually operable feed wheel 75 is mounted on the lower end of a vertically arranged rotatable shaft 76 which is rotatably supported in a housing 77. The housing 77 is fixedly mounted relative to the housing 64. The upper end of the shaft 76 is provided with a pinion 78 which meshes with a gear 79 keyed on the periphery of the nut 70. It will be readily apparent from the foregoing disclosure that a rotary motion of the hand wheel 75 will be imparted through the mechanism above described to rotate the nut 70 and thereby impart a vertical movement to the truing tool carrier 67. The direction of rotation of the hand wheel 75 serves to determine the direction of movement of the carrier 67. In order to facilitate locking the carrier 67 in an adjusted position, a spring pressed detent 80 is arranged to engage the teeth of a gear 81 which is keyed on the upper end of the shaft 76. When it is desired to adjust the position of the truing tool 68, the detent 80 is moved in a direction toward the left (Fig. 2) to disengage the detent from the gear 81 after which the feed wheel 75 may be rotated to cause the desired vertical movement of the truing tool carrier 67 and the truing tool 68.

As shown in Figure 4, power lines 84 and 85 are provided for supplying electric power to the motor 20. A start switch 86 is provided which when closed serves to energize a relay switch 87 which when energized serves to pass current through the rheostat 25 to rotate the motor 20. A stop switch 88 is provided whereby the motor 20 may be stopped at any time during the grinding operation as desired.

A suitable connection is provided between the feeding mechanism above described and the rheostat so that when the truing tool is fed toward the periphery of the grinding wheel 17 for a truing operation, also a corresponding motion is imparted to the rheostat control shaft 26 so as to adjust the rheostat as the grinding wheel wears away due to normal wheel wear and also to the truing feed so as to maintain a substantially constant peripheral speed on the periphery of the grinding wheel at all times. As the wheel reduces in size, the motor speed is increased by means of the rheostat to increase the rotative speed of the wheel 17 so that the surface speed thereof remains substantially constant. As illustrated in Figure 1, a flexible shaft 90 is provided for connecting the wheel feeding mechanism of the truing apparatus with the shaft 26 of the rheostat 25. The upper end of the flexible shaft 90 is provided with a pinion 91 which meshes with the gear 79 on the truing tool feeding mechanism. The lower end of the flexible shaft 90 is connected to a drive shaft 92 on a conventional gear reduction unit 93. The drive shaft 94 of the unit 93 is connected by a coupling 95 with the rheostat control shaft 26. It will be readily apparent from the foregoing disclosure that actuation of the feed wheel 75 will be imparted through the gear 79 and the gear 91 to impart a rotary motion to the rheostat control shaft 26 so as automatically to adjust the speed of the motor 20.

A modification has been illustrated in Figure 5 in which the vertical movement of the truing tool carrier 67 is utilized to impart a compensating adjustment to the rheostat 25. As illustrated in Figure 5, the upper end of the carrier screw 69 is provided with an outwardly extending arm 100, the outer end of which rides in a vertical groove 101 formed in a bracket 102. The arm 100 serves to hold the screw 69 and the carrier 67 against rotary motion. A rack bar 103 is fastened at its upper end to the arm 100. The rack bar 103 meshes with a gear 104 mounted on the upper end of a flexible drive shaft 105, the lower end of the flexible shaft 105 is connected with the control shaft 26 of the rheostat 25. It will be readily apparent from the foregoing disclosure that when the carrier 67 and the screw 69 are moved vertically, a corresponding movement will be imparted to the rack bar 103 which in turn imparts a rotary motion through the gear 104, the flexible shaft 105 to the control shaft 26 of the rheostat 25.

It will thus be seen that there has been provided by this invention apparatus in which the various objects hereinabove set forth together with many thoroughly practical advantages are successively achieved. As many possible embodiments may be made of the above invention

and as many changes might be made in the embodiment above set forth, it is to be understood that all matter hereinbefore set forth, or shown in the accompanying drawings, is to be interpreted as illustrative and not in a limiting sense.

I claim:

1. In a grinding machine having a transversely movable wheel slide, a rotatable wheel spindle thereon, a grinding wheel on said spindle, means including an electric motor on said slide to rotate said spindle, a rheostat on said slide operatively connected to control the speed of said motor, a gear reducer unit on said slide operatively connected to actuate said rheostat, a truing apparatus on said slide including a longitudinally movable slide movable parallel with the axis of said wheel spindle, a transversely movable carrier on said latter slide, a truing tool carrier thereon, a manually operable nut and screw feed mechanism interposed between the truing apparatus slide and the carrier for feeding the truing tool toward and from the grinding wheel, and operative connections including a flexible shaft, one end of which is operatively connected to said feeding mechanism and the other end of which is operatively connected to said gear reducer unit whereby actuation of the feeding mechanism automatically actuates said rheostat to adjust the speed of said motor so as to maintain a constant peripheral speed of the grinding wheel as it wears away.

2. In a grinding machine having a transversely movable wheel slide, a rotatable wheel spindle thereon, a grinding wheel on said spindle, means including an electric motor on said slide operatively connected to rotate said spindle, a rheostat on said slide to control the speed of the said motor, a gear reducer unit on said slide operatively connected to actuate said rheostat, a truing apparatus on said slide supporting a longitudinally movable slide movable parallel with the axis of said wheel spindle, a transversely movable carrier on said truing apparatus slide, a truing tool on said carrier, a manually operable feed mechanism interposed between the truing apparatus slide and the carrier for feeding the truing tool toward and from the grinding wheel, a flexible shaft, a gear connecting one end of said shaft to said feeding mechanism, and a coupling connected to the other end of said shaft to said gear reducer unit whereby actuation of the feeding mechanism automatically actuates said rheostat to vary the speed of said motor so as to maintain a uniform peripheral speed of the grinding wheel as it wears away.

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