Dec. 4, 1928.

1,694,340

H. G. WEINLAND

GRINDING MACHINE

Filed July 11, 1927

2 Sheets-Sheet 1

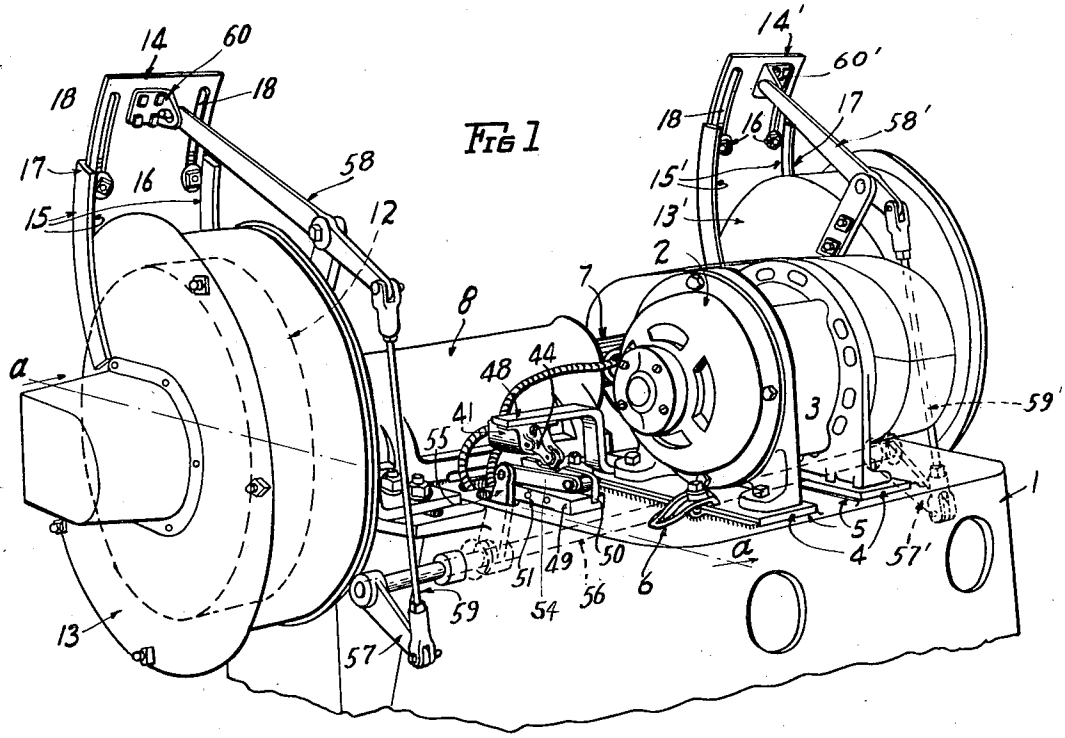


FIG 1

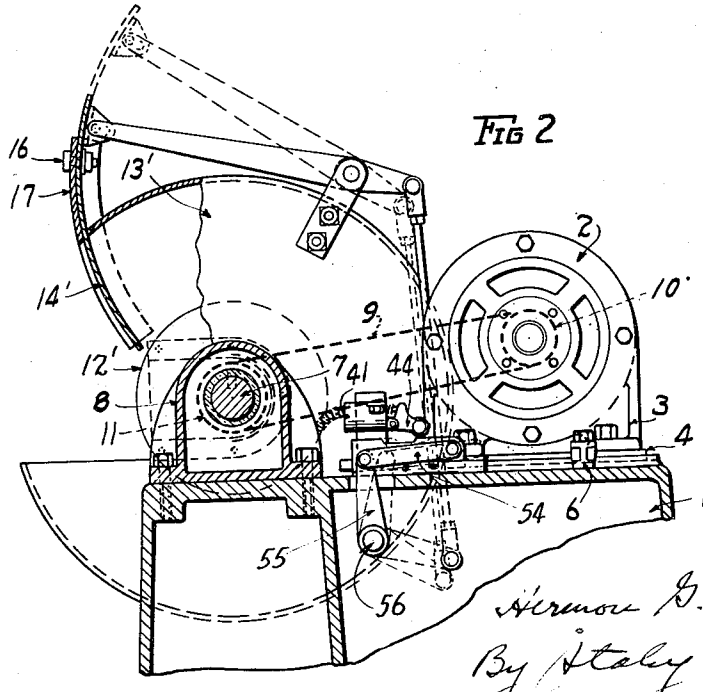


FIG 2

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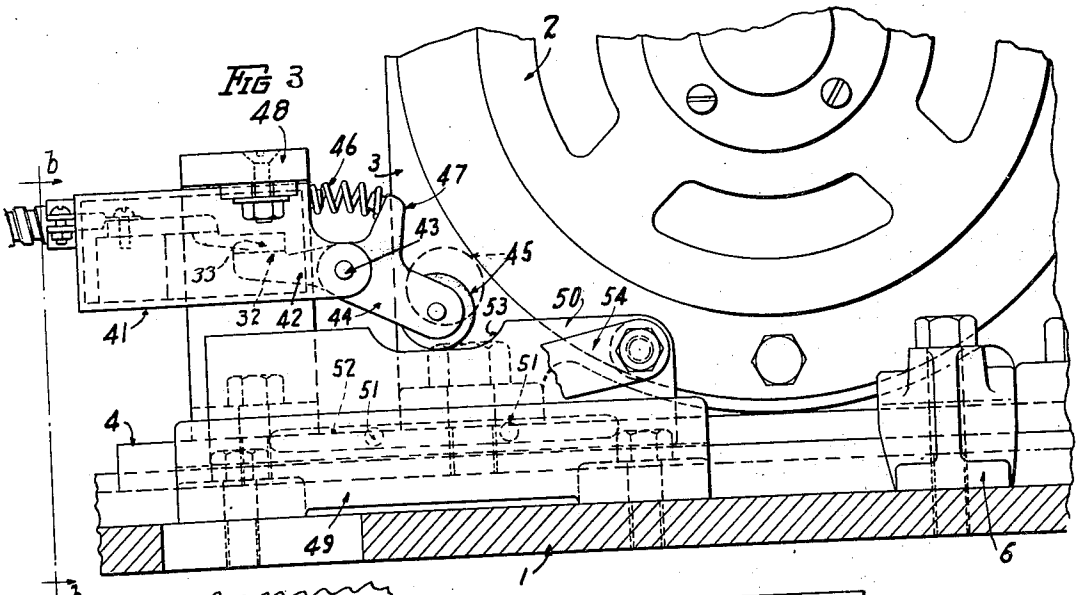
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2 Sheets-Sheet 2

FIG 3



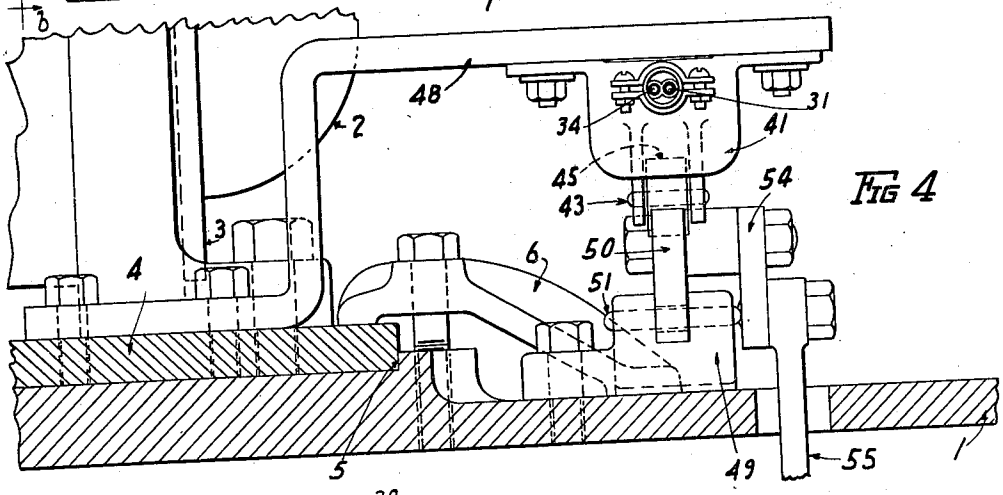


FIG 4

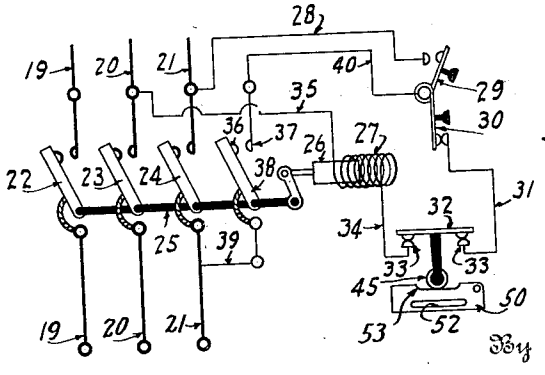


FIG 5

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UNITED STATES PATENT OFFICE.

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GRINDING MACHINE.

Application filed July 11, 1927. Serial No. 204,839.

This invention relates to grinding machines, it more particularly relating to means for changing the speed of the grinding wheel as the size of the wheel decreases through wear so as to maintain a peripheral speed of the wheel suitable for best results.

An object of this invention is to provide means for insuring the correct peripheral speed of the grinding wheel.

A further object is to provide means controlled by the size of the grinding wheel to prevent the operation of the wheel at peripheral speed less or greater than a predetermined speed.

A further object of this invention is to provide means controlled by the size of the grinding wheel to prevent the operation of the motor until alterations have been made in the driving connection for a change of speed to furnish a correct peripheral speed to the grinding wheel.

A further object of the invention is to provide improved means for changing the peripheral speed of the grinding wheel to compensate for wear without altering the speed of the motor which drives the wheel to thereby permit the employment of a motor having a constant speed.

A further object of the invention is to provide means for stopping the motor after a predetermined wear upon the grinding wheel by devices, the movement of which is determined by the wear upon the wheel, and for preventing the starting of the motor until proper alterations for change of speed have been made in the driving connections between the motor and the grinding wheel to provide for a proper increased peripheral speed of the grinding wheel.

A further object of my invention is to provide a manually movable gage member whose adjustment is determined by the wear upon the grinding wheel, in connection with a switch for controlling the motor circuit and operated by the movement of said gage, whereby when said gage is moved to a predetermined point with relation to the periphery of the grinding wheel the motor will be deenergized; a further object of this invention being to provide means whereby the gage operated switch is restored to closed position automatically by alterations in the position of the parts due to the substitution of proper change of speed devices, and is prevented from being closed until a proper change of speed has been made.

In the accompanying drawings:

Fig. 1 is a perspective view of a grinding machine embodying the improvement, looking from the rear.

Fig. 2 is a section on the line *a*—*a* of Fig. 1.

Fig. 3 is also a section on the line *a*—*a* of Fig. 1 and showing on an enlarged scale a portion of the devices illustrated in Fig. 2.

Fig. 4 is a section on the line *b*—*b* of Fig. 3.

Fig. 5 is a diagrammatic view of the circuits of the motor and of the switches for controlling the circuit.

Referring to the drawings, 1 represents a suitable supporting stand. An electric motor 2 is slidably mounted on the stand, the supporting frames 3 of the motor being bolted to slides 4 in ways 5 on the upper surface of the stand; suitable clamps 6 being employed to secure the motor and its slides in different positions of adjustment. A grinding wheel shaft 7 is mounted in suitable bearings 8 which are bolted to the stand 1 and this shaft is driven from the motor shaft by a silent chain 9 which passes about a sprocket 10 on the motor shaft and a sprocket 11 on the grinding wheel shaft. The sprocket 10 is removably connected with the motor shaft so that from time to time new sprockets of larger size may be substituted to provide for increased changes of speed of the shaft 7, the speed of the motor remaining constant. When such change is made in the sizes of the sprockets, the motor is suitably adjusted on the stand to compensate for the change in the size of the sprocket by unloosening the clamps 6 and sliding the motor and its slides 4 in the ways 5.

In the present machine, two grinding wheels are employed, one upon each end of the grinding shaft, one of these wheels being shown in dotted lines in Fig. 1, as indicated at 12, and the other wheel being shown at 12′ in Fig. 2. These wheels are mounted in suitable stationary cases 13 and 13′ which have openings on their forward sides to expose the grinding wheels, with the upper portions of the openings closed by adjustable doors 14 and 14′ mounted in ways 15 and 15′, together with means in the form of bolts 16 carried by an extension 17 of the casing and passing through slotted openings 18 in the doors for locking the doors in different posi-

tions of adjustment. These doors are of the usual form provided for the protection of the workmen and in the present machine are also employed as gages which cooperate with the grinding wheels and have suitable connections with an electric switch for controlling the motor. It is the usual practice to adjust the door toward the grinding wheel as the wheel wears so that therefore the movement of the door is in proportion to the wear upon the wheel.

In the present machine there is employed a three-phase motor, the main line wires of which are indicated at 19, 20 and 21 in Fig. 5. 22, 23 and 24 are the movable contacts of the main switch which are all secured to a shaft 25 of insulating material, which has a connection with the core 26 of a solenoid, the coil of which is indicated at 27. This solenoid is in a shunt circuit which bridges the line wires 20 and 21 consisting of wire 28, a normally-open switch member 29, a normally-closed switch member 30, wire 31, gage operated switch consisting of a movable contact 32 and stationary contacts 33, wire 34, solenoid coil 27 and wire 35. To start the motor the shunt circuit is closed by the normally-open switch member 29 which energizes the coil of the solenoid and closes the main line wires through the movable switch members 22, 23 and 24. This also closes the contacts 36 and 37, the contact 36 being on a switch member 38 which is fastened to the shaft 25 and has a connection with the main line wire 21 through the wire 39. The contact 37 is connected with the wire 40 which leads to the normally-closed switch member 30. The operator but momentarily closes the shunt circuit through the normally-open switch member 29, the circuit through the solenoid coil being maintained by the contacts 36 and 37 to hold the main switch members in closed position. So long as the switch member 30 remains closed and the contacts 32 and 33 remain unbroken, it will be seen that the solenoid will remain energized and the main circuit through the motor maintained. The switch member 30 is an operator's switch and is employed to stop the motor when desired, but the switch members 32 and 33 are controlled by the doors 14 and 14′, which will be termed gages, so that when either one of said gages is adjusted to a certain point with relation to the periphery of its grinding wheel the switch members 32 and 33 will be opened to break the circuit through the motor by deenergizing the solenoid, permitting the main switch members 22, 23 and 24, as well as the switch member 38, to be moved to breaking position by gravity or otherwise. This is accomplished as follows:

The stationary contacts 33 are mounted in a box 41, while the movable contact 32 is on one arm 42 of a lever which is pivoted as at 43 on the box. The arm 42 projects into the box while the other arm 44 of the lever projects outwardly and carries a roller 45. A coil spring 46 interposed between the box and a finger 47 on the lever arm 44 normally holds the contacts 32 and 33 together. The box 41 is supported upon one end of a bracket 48, the other end of which is connected to one of the slides 4 upon which the motor is mounted. Slidably mounted in a slot in a block 49 bolted to the supporting stand 1 is a switch operating member 50, this member 50 being held in the slot by a pair of pins 51 carried by the block 49 and extending through an elongated opening 52 in the member 50. The upper surface of the member 50 has an elongated recess 53 with inclined end walls within which the roll 45 of the lever arm 44 normally lies. The switch operating member 50 has pivotally connected therewith one end of a link 54, the opposite end of which is pivotally connected to a crank arm 55 on a rocker shaft 56. One end of this rocker shaft 56 has a crank arm 57 which is pivotally connected with one end of a pivoted lever 58 by a link 59, the other end of the lever 58 being pivotally connected with an ear 60 on the upper rear side of the gage 14. The other end of the rock shaft is similarly connected with the gate 14′ by a crank arm 57′, link 59′, lever 58′ and ear 60′.

The operation is as follows: As the grinding wheels wear the gages 14 and 14′ are adjusted toward the peripheries of the wheels. The adjustment of these gages, through the connections described, rocks the shaft 56, which through the link 54 and crank arm 55 slides the operating member 50 forwardly. When the operating member 50 has moved far enough the roll 45 rides upon the high part of the member 50 and opens the contacts 32 and 33. This deenergizes the solenoid 27 and permits the main switch members to open to stop the motor. A new sprocket wheel of larger size is then substituted and the motor and slides 4 readjusted by sliding the same forwardly to compensate for the increased size of the sprocket wheel. This forward movement of the motor moves the bracket 48 and switch box 41 a corresponding distance so as to again restore the roller 45 to its position in the recess 53 which permits the contacts 32 and 33 to close. The normally-open switch 29 is then closed and the motor started in the manner described.

As both gages 14 and 14′ are connected with the operating devices for the switch member 32, the larger of the two grinding wheels will determine the change of speed adjustment thereby permitting a safe peripheral speed to be maintained with the larger wheel.

In the event that the operator should substitute a sprocket-wheel of a size greater than the size required to give a proper peripheral speed to the grinding wheel, the adjustment of the motor made necessary by such a

sprocket-wheel would cause the roll 45 of the movable switch member to ride up the forward inclined wall of the recess 53 and thus maintain the contacts 32 and 33 open to thereby prevent the operation of the grinding wheel. The operator would then be compelled to insert another sprocket-wheel of proper size, the position of the roll 45 in the recess serving as a guide to the operator for the selection of the proper size sprocket.

While I have shown a three-phase motor with automatic control, yet the improvements are equally applicable to other forms of motors with other suitable forms of control.

Having thus described my invention, I claim:

1. In a grinding machine, a grinding wheel, a constant speed motor for driving said wheel, and means controlled by the size of said wheel to prevent operation of the wheel at peripheral speeds other than predetermined speeds.

2. In a grinding machine, a grinding wheel, a constant speed electric motor for driving said wheel, and means controlled by the size of said wheel to deenergize said motor to prevent operation of the wheel at peripheral speeds other than predetermined speeds.

3. In a grinding machine, a grinding wheel, a motor for driving said wheel, including changeable speed driving connections, and means controlled by the size of said wheel to prevent operation of said wheel at other than predetermined ratios in said driving connections.

4. In a grinding machine, a grinding wheel, a motor for driving said wheel, including changeable speed driving connections, and means controlled by the size of said wheel to control said motor to prevent operation of said wheel at other than predetermined driving ratios in said driving connection.

5. In a grinding machine, a grinding wheel, a constant speed electric motor for driving said wheel including a control switch, said means controlled by the size of said wheel for operating said switch to prevent energizing of said motor at other than predetermined peripheral speeds of said wheel.

6. In a grinding machine, a grinding wheel, an adjustable gage member movable relatively to said wheel, a movable motor, changeable speed driving connections between said motor and wheel, and means for controlling the operation of said wheel through the combined movements of said gage member and motor.

7. In a grinding machine, a grinding wheel, a motor, including a control switch, devices controlled by the size of the wheel for operating said switch, changeable speed driving connections between said motor and wheel including a movable element arranged to reposition said switch relatively to said devices, together with means associated with said devices to maintain said switch open until said switch is so positioned with relation thereto as to insure a predetermined alteration in said changeable speed driving connections.

8. In a grinding machine, a grinding wheel, an adjustable member whose adjustment is determined by the size of said wheel, a constant speed electric motor, changeable speed drive devices between said motor and wheel, and means actuated by said adjustable member for stopping said motor upon a predetermined adjustment thereof.

9. In a grinding machine, a grinding wheel, an adjustable member whose adjustment is determined by the size of said wheel, a constant speed electric motor, changeable speed drive devices between said motor and wheel, means including a movable switch member actuated by said adjustable member for stopping said motor upon a predetermined adjustment of said adjustable member, and means controlled by a change of speed adjustment of the parts for placing the movable switch member in closed position.

10. In a grinding machine, a grinding wheel, a constant speed electric motor, change of speed driving connections between said motor and wheel, and means controlled by the size of the wheel for periodically stopping the motor until a change of speed has been effected.

11. In a grinding machine, a grinding wheel, a constant speed electric motor, change of speed driving connections between said motor and wheel, means controlled by the size of the wheel for periodically stopping the motor until a change of speed has been effected, and means for readjusting the stopping means by the movement of the parts required in making the change of speed.

12. In a grinding machine, a grinding wheel, a constant speed electric motor, change of speed driving connections between said motor and wheel, means controlled by the size of the wheel for periodically stopping the motor until a change of speed has been effected, and means operable by a change of speed adjustment for repositioning relative parts of the stopping means to permit the starting of said motor.

13. In a grinding machine, a grinding wheel, a gage member adjustable toward the periphery of said wheel, an electric motor for driving said wheel, a switch for controlling said motor, and connections between said gage member and said switch for opening said switch and stopping said motor upon a predetermined adjustment of said gage member.

14. In a grinding machine, a grinding wheel, a gage member adjustable toward the periphery of said wheel, an electric motor, driving connections between said motor and wheel, a switch for said motor, connections

between said gage member and said switch to open switch and stop said motor upon a predetermined adjustment of said gage member, means for altering said driving connections to change the speed of said wheel, and means whereby said switch is closed to permit the starting of said motor when said alterations have been effected.

15. In a grinding machine, a grinding wheel, a gage member adjustable toward the periphery of said wheel, an electric motor, driving connections between said motor and wheel, a switch having a movable switch member for controlling said motor, an actuating device for said movable switch member connected with said gage member arranged to operate said switch member to open said switch after a predetermined movement thereof, means for effecting a change of speed in said driving connections, and means when said change of speed is effected for altering the position of said movable switch member with relation to said operating device to permit the closing of said switch.

16. In a grinding machine, a grinding wheel, a gage member adjustable toward the periphery of said wheel, an electric motor, driving connections between said motor and wheel, a switch for controlling said motor including a pivoted switch member, an actuating device for said pivoted switch member connected with said gage member having an elongated depression to receive one end of said movable switch member and arranged to actuate said movable switch member after a predetermined movement to open said switch, means for effecting a change of speed in said driving connections, and means operable by the change of speed alterations for repositioning said movable switch member in said elongated depression of said actuating member.

17. In a grinding machine, a grinding wheel, a gage member adjustable toward the periphery of said wheel a movably mounted electric motor, driving connections between said motor and wheel comprising sprocket wheels and a chain, a switch for controlling said motor movable therewith and having a movable switch member, a movable actuating device for said movable switch member having a connection with said gage member to actuate said switch member after a predetermined movement of said gage member, a change of speed in said driving connections being effected by a change in size of the sprocket wheel connected with said motor and by an adjustment of the position of said motor to compensate therefor, such movement of the motor effecting a repositioning of said movable switch member with relation to said actuating member.

18. In a grinding machine, a driven shaft, a grinding wheel on said shaft, a constant speed electric motor, sprocket wheels on said driven shaft and motor shaft together with a chain connecting the same, said motor being movable toward said driven shaft to compensate for a change in the size of at least one of said sprocket wheels, a switch movable with said motor having a movable switch member, a gage member adjustable toward the periphery of said grinding wheel, a movable actuating device for said movable switch member having a connection with said gage member, arranged to actuate said switch member after a predetermined movement of said gage member, the movement of the parts to compensate for changes of speed effecting a repositioning of said movable switch member relatively to said actuating member.

19. In a grinding machine, a grinding wheel, a gage member adjustable toward the periphery of said wheel, a slidably-mounted actuating member having an inclined surface operably connected with said gage member, a slidably mounted electric motor, a switch having a pivotally mounted contact member movable with said motor, a roll mounted in one end of said pivoted contact member riding on said actuating member, and a spring to normally hold said contact member in closed position.

20. In a grinding machine, a grinding wheel, an electric motor, change of speed driving connections between said motor and wheel, a main line switch, an electrical operating device for said switch located in a shunt circuit, a second switch in said shunt circuit, and means controlled by the size of the wheel for periodically opening said second switch until a change of speed has been effected.

21. In a grinding machine, a grinding wheel, an electric motor, change of speed driving connections between said motor and wheel, a main line switch, an electrical operating device for said switch located in a shunt circuit, a second switch in said shunt circuit, means controlled by the size of the wheel for periodically opening said second switch until a change of speed has been effected, and means controlled by a change of speed adjustment of the parts for placing said second switch in closed position.

22. In a grinding machine, a grinding wheel, an electric motor, changeable speed drive devices between said motor and wheel, a main switch for controlling the circuits of said motor, a solenoid arranged in a shunt circuit operably-connected with said main switch, a normally-open, manually-operated switch in said shunt circuit to cause said solenoid to close said main switch, an adjustable gage member whose adjustment is determined by the size of said grinding wheel, a third normally-closed switch in said shunt circuit having a movable member, and connections between said movable switch member and said gage member such that said third switch is opened by a predetermined movement of said gage member.

23. In a grinding machine, a grinding wheel, an electric motor, changeable speed drive devices between said motor and wheel, a main switch for controlling the circuits of said motor, a solenoid arranged in a shunt circuit operably-connected with said main switch, a normally-opened, manually-operated switch in said shunt circuit to energize said solenoid to close said main switch, an adjustable gage member whose adjustment is determined by the size of said grinding wheel, a third normally-closed switch in said shunt circuit having a movable member, connections between said movable switch member and said gage member such that said third switch is opened by a predetermined movement of said gage member, and means whereby a movement of the parts in effecting a change of speed adjustment also moves said third switch to reposition the same relatively to said connections.

In testimony whereof, I have hereunto set my hand this 7th day of July 1927.

HERMON G. WEINLAND.