March 20, 1928.

1,663,148

P. STONER

GRINDING MACHINE

Filed Nov. 18, 1920

5 Sheets-Sheet 1

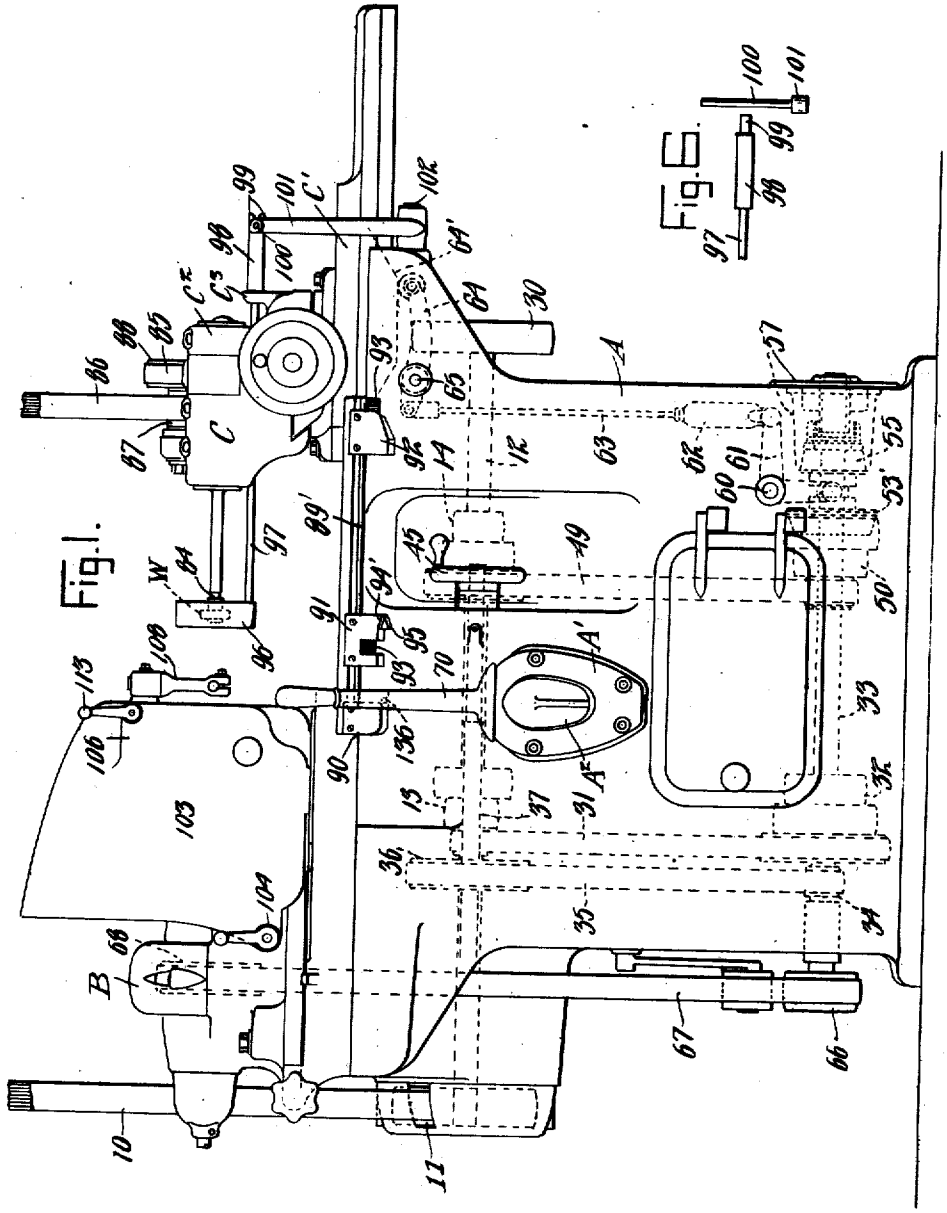

Fig. 1.

Fig. 6.

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Fig. 2

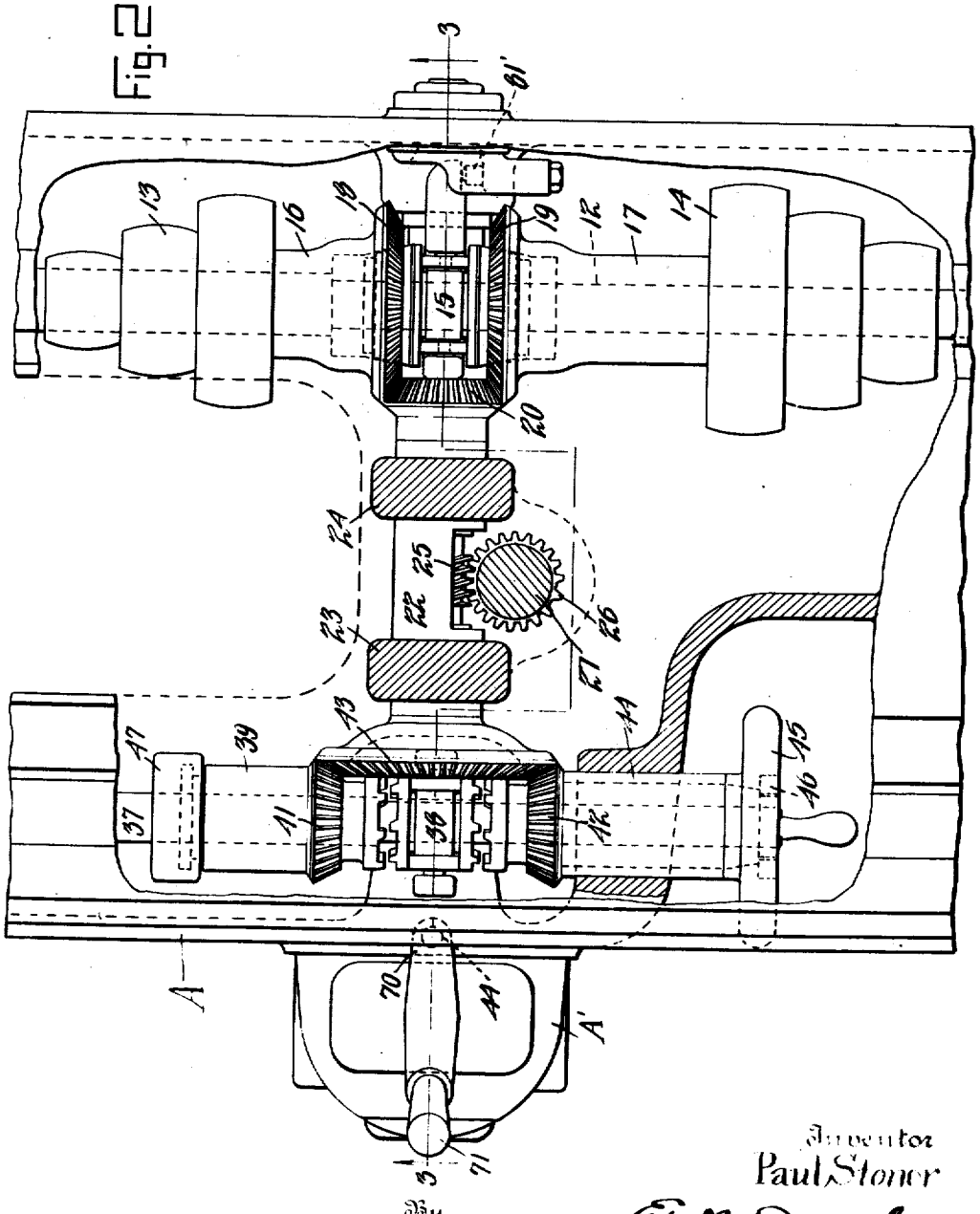

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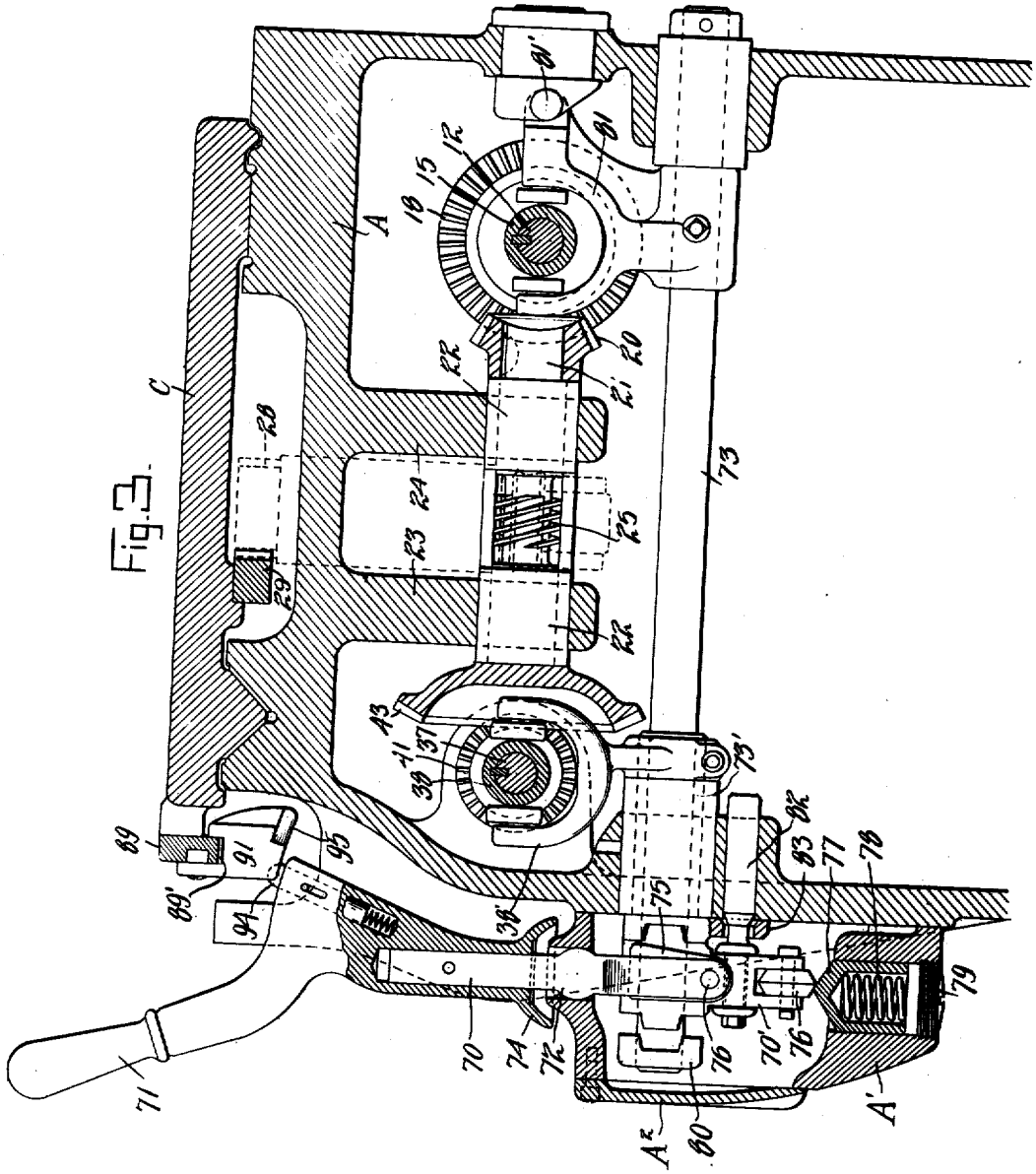
Fig. 3.



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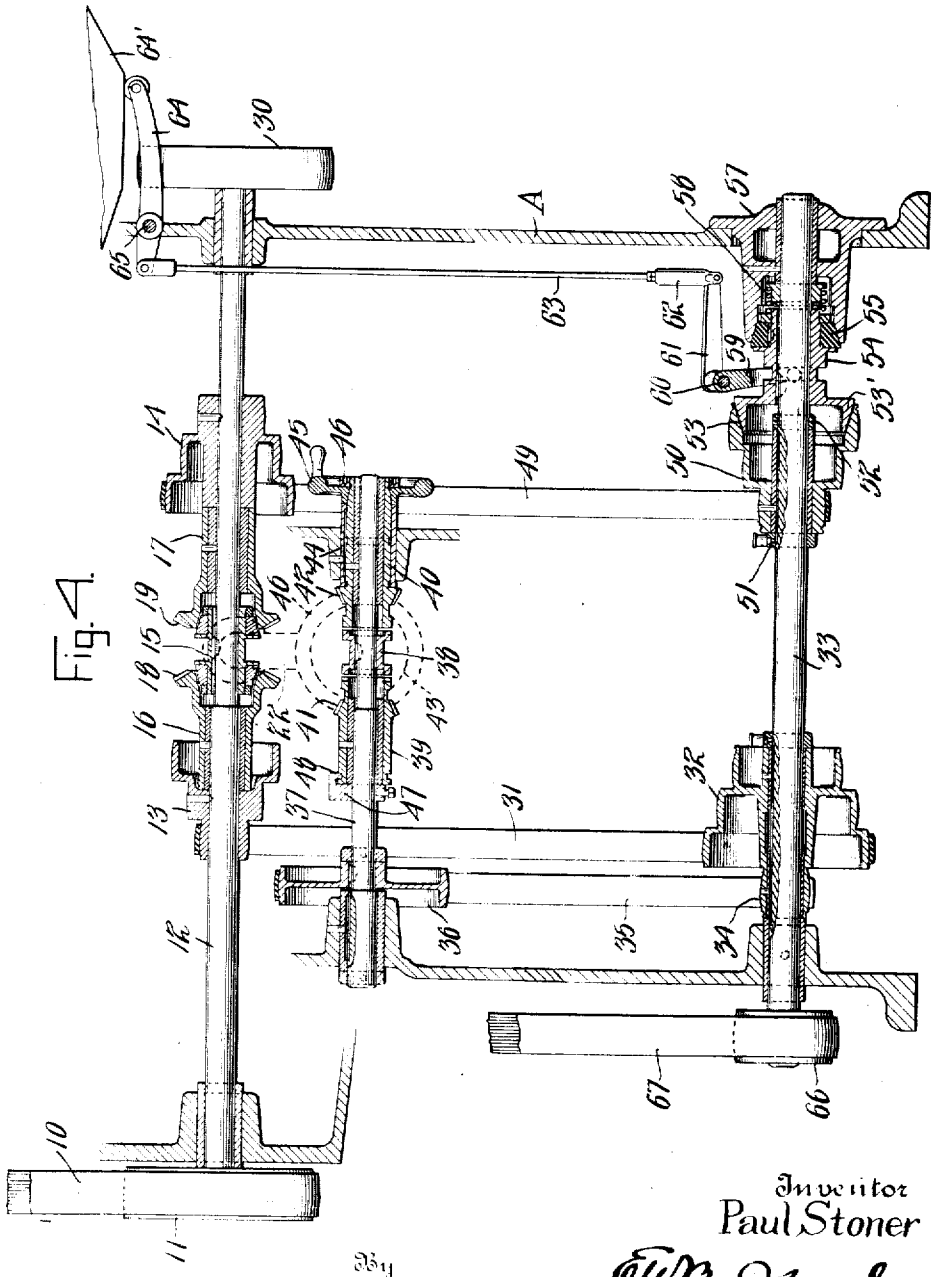

Fig. 4.

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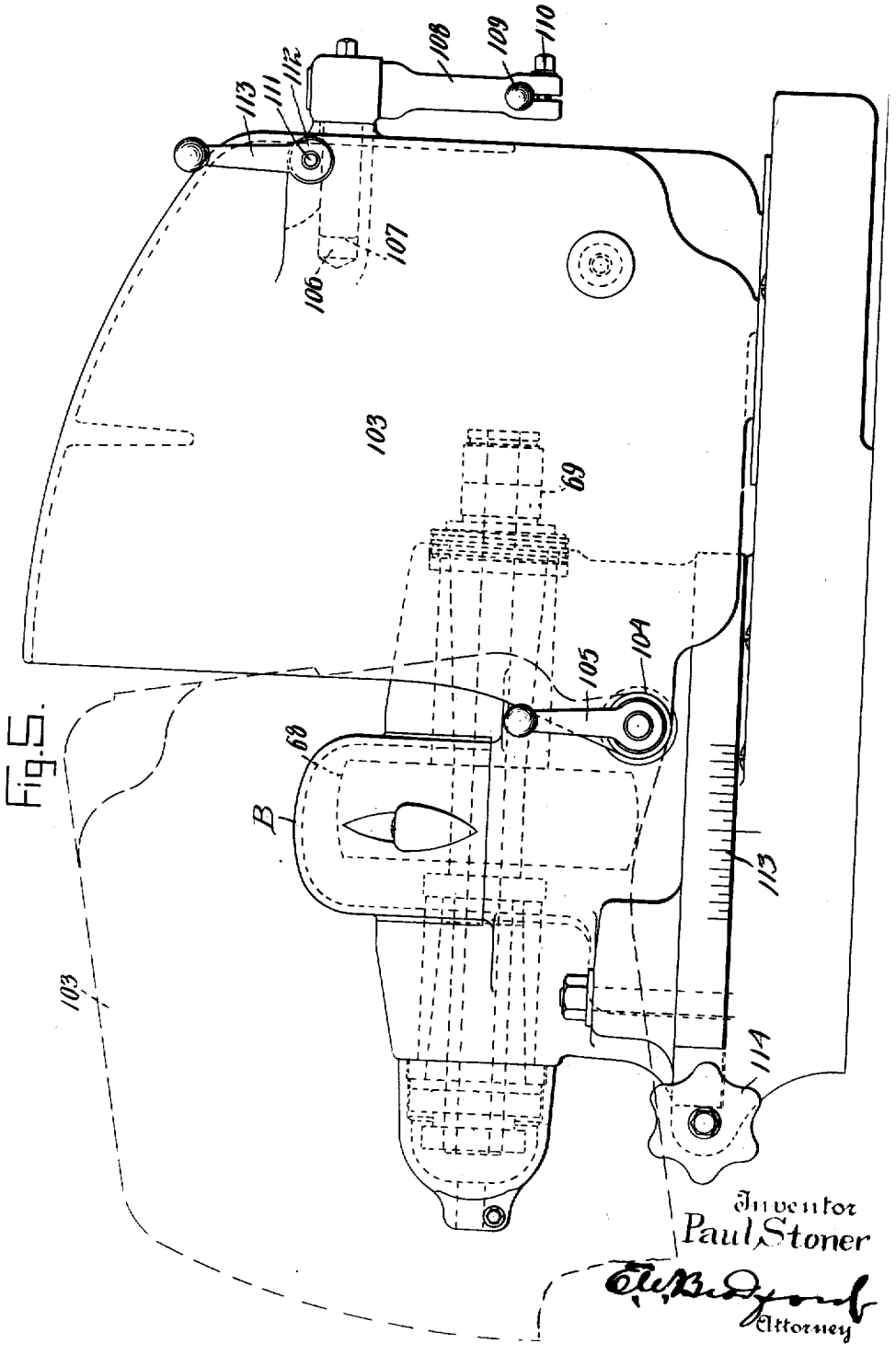

Fig. 5.

Patented Mar. 20, 1928.

1,663,148

UNITED STATES PATENT OFFICE.

PAUL STONER, OF WAYNESBORO, PENNSYLVANIA, ASSIGNOR TO LANDIS TOOL COMPANY, OF WAYNESBORO, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

GRINDING MACHINE.

Application filed November 18, 1920. Serial No. 424,898.

My said invention relates to grinding machines intended primarily for internal grinding as for smoothing the inside of the hub of a wheel or pulley having an internal bearing surface, and my main object is to provide a machine that is automatic in its operation, and that requires a minimum of attention after it has been put into operation.

Another object is to provide a construction in which the work stops when the grinding wheel is withdrawn from it.

Another object is to provide means for adjusting the length and position of the stroke.

Another object is to provide a work holder capable of being turned a few degrees so as to grind a tapered surface.

Still another object is to provide shields for both the work and the grinding wheel to protect the workman.

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

Figure 1 is a front elevation of the complete machine, with the carriage stationary and out of working position.

Figure 2, a horizontal section through the reversing gearing,

Figure 3, a vertical section on line 3—3, Figure 2, the parts being in working position.

Figure 4, a development of the main driving shafts and associated parts,

Figure 5, an elevation of the work holder, and

Figure 6, a detail of parts of a guard shown in Figure 1.

In the drawings, reference character A indicates the fixed frame of a grinding machine, said frame being a closed casing having the usual doors, bearings, etc. and also having superposed thereon a work holder B and a reciprocating carriage C for a grinding wheel *w*.

A belt 10 connected with a source of power (not shown) drives a pulley 11 fast to main shaft 12. This shaft has fast thereon two stepped pulleys 13 and 14.

A sleeve 15 is splined to shaft 12 and has a cone clutch member at each end adapted to engage respectively with clutch members formed on sleeves 16 and 17 loose on shaft 12. Sleeves 16 and 17 have gear teeth 18 and 19 integral therewith respectively and both sets of teeth are in constant engagement with a gear 20 on a shaft 21. This shaft is mounted in a bearing 22 carried by lugs 23 and 24 on the frame of the machine. The bearing has a slot at one side through which a worm 25 engages with a worm wheel 26 on a vertical shaft 27 which drives wheel carriage C (Fig. 3) by means of a pinion 28 on the shaft in engagement with a rack 29 on the carriage. As the clutch sleeve 15 is shifted from side to side by means hereinafter described, the wheel carriage is moved back and forth on its track.

The fast pulleys 13 and 14 abut against the ends of sleeves 16 and 17 to hold them in place. A fast pulley 30 at the far end of the shaft drives a pump to provide for the circulation of water, this being no part of my present invention.

A belt 31 driven by pulley 13 passes over a stepped pulley 32 loose on a counter-shaft 33 and has integral therewith, or fixed thereto, a small pulley 34 which by means of belt 35 and pulley 36 drives shaft 37. This shaft has a clutch sleeve 38 splined thereto, said sleeve having oppositely projecting teeth. Sleeves 39 and 40 loose on shaft 37 carry teeth adapted to engage alternately with those of the sleeve 38 and they also carry gear teeth 41 and 42 respectively which are in constant engagement with a gear 43, on shaft 21. A bushing 44 pinned to a bearing on the fixed frame bears at one end against gear 42 and at the other against a hand wheel 45 held in place by a ring-nut 46 threaded on sleeve 40. This hand wheel is intended for operating the machine when the power is off. The other sleeve 39 is held in place by a collar 47 fixed to shaft 37 by a set-screw and having a flange 48 engaging a groove in the collar. It will be noted that the belt gearing provides for driving shaft 37 at a low speed, and this is again decreased by gears 41, 42, and 43 to slow down shaft 21. The carriage C may thus be driven either by hand or power at a low normal

speed, or it may be driven at a high speed to move it out of and away from the work, high speed being attained when shaft 21 is driven by gear 20 from gear 18 or 19.

Pulley 14 drives a stepped pulley 50 by means of a belt 49, this pulley being loosely held on shaft 33 between two collars 51 and 52. At one end the pulley has a tapered surface forming a clutch member 53 to engage with a clutch member 53′ on a sleeve 54. At the opposite end of the sleeve is a conical member 55 adapted to engage a braking surface 56 on a cylindrical member 57 located in an opening of the fixed frame and carrying a bearing for shaft 33. A spring 58 normally forces the clutch members into engagement.

The sleeve 54 has a shifter 59 on a shaft 60 actuated by a train of mechanism comprising a rock-arm 61, an elastic tension device 62, a link 63, and a lever 64 pivoted at 65 and having a roller at its free end for engagement by a cam 64′ on the wheel carriage. Sleeve 54 is splined to shaft 33 and when clutch members 53, 53′ are in engagement shaft 33 will be driven, thus driving pulley 66, belt 67, pulley 68 and work-holder 69 in the form of a rotary spindle, which might be embodied in various forms and might have movements other than simple rotation, within the limits of my invention, which carries pulley 68 substantially in line with the axis on which the support is rotarily adjustable so as to maintain proper alignment of belt 68 and its pulleys. Contrariwise, cone 55 acts as a brake for the work-holder and the train of gearing leading thereto.

A clutch shifter 70 (Figs. 1 and 3) having a handle portion 71 is pivoted at 72 for movement toward and from the machine and is also movable laterally thereof on shaft 73 as a pivot, the enlargement at 72 sliding in a slot of the machine frame. A hood 74 formed on the handle 71 covers the slot to prevent access of water and grit. Shaft 73 has a sleeve 73′ concentric therewith for moving a clutch-fork 38′ which controls reversing sleeve 38 and the lever 70 has a clutch sleeve 75 pivotally connected thereto at 76 in a fork at its lower end and slidable on shaft 73. A forked extension 70′ of sleeve 75 carries a roller 76 cooperating with a yieldable detent 77 set in a casing A′ on the machine frame to hold the lever 70 in front or rear position. The spring 78 of the detent is introduced through an opening normally closed by a screw-plug 79. The casing A′ also has a door A^2 for access to the lower end of lever 70 and adjacent parts.

With lever 70 in the position shown in Fig. 3 the teeth of sleeve 75 engage sleeve 73′ to operate reversing sleeve 38 as in the normal working of the machine with the wheel carriage reciprocating slowly. If the handle portion 71 of lever 70 is now forced toward the machine sleeve 75 will be unclutched from sleeve 73′ and engaged with a clutch member 80 on shaft 73. Lateral movement of lever 70 will now rock shaft 73, clutch fork 81 and reversing sleeve 15. As lever 70 moves sleeve 75 out of engagement with sleeve 73′, the extension 70′ drags a bar 82 with it. This bar slides in a guide on the machine frame and is fixed at one end to extension 70′ to move therewith and also extends through an opening of a downward extension 83 on sleeve 73′. This opening is preferably tapered to correspond to a tapered portion of the bar and the sleeve is moved to a central position and locked therein, thus locking the reversing sleeve 38 in central inactive position. Clutch-fork 81 is similarly moved toward central position from one side by a yieldable abutment 81′ on the frame, the shaft 73 and its clutch member 80 being moved to neutral position by dog 90 to stop the carriage and further movement being opposed by abutment 81′.

The carriage C which is here shown as bearing the grinding wheel *w*, but which may carry the work operated on, or an abrading device of different character, or other object, if desired, consists mainly of two parts, viz, a base C′ slidable lengthwise of the machine frame A, and a support C^2 here shown as carrying the wheel and its driving devices, said support being adjustable transversely of the base. The wheel *w* and its spindle 84 are driven at high speed in a direction opposite to that in which the work rotates, by a pulley on the spindle driven by a belt 85. A belt 86 connected to a source of power (not shown) drives pulley 87 which is on the same shaft with pulley 88 that drives belt 85. A dogging device for lever 70 moves back and forth in time with the carriage being preferably rigidly fastened thereto, and comprises a rod 89 having rack teeth 89′ on its under side and carrying a fixed abutment or dog 90 at one end. Dogs 91 and 92 are adjustable on the rod, each one having a worm 93 on a journal pivoted at one end to the dog and spring pressed toward the rack. By swinging the worm away from the rack a rough and quick adjustment may be made and thereafter an accurate adjustment by turning the worm. As the carriage reciprocates the inner sides of dogs 91 and 92 strike against a spring-supported engaging lug 94 on lever 70 and move it to and fro to reverse whichever clutch-reversing sleeve may be operative at the time. The dog 91 has a downward incline 95 to force the lug 94 back against the pressure of its spring as hereinafter described and is also cut away at the other side to form an inclined face 94′.

A guard or shield 96 is provided to keep the operator from touching wheel *w* and to

protect him from flying cuttings, water and the like. This guard is supported on a rod 97 slidable with respect to the carriage C.

Rod 97 has a sleeve 98 slidable thereon at one end and the sleeve has spring fingers 99 for engagement with opposite sides of a stationary rod 100. Rod 100 is supported on a bracket 101 fixed on the frame at 102. An abutment C^3 is adapted to engage the opposite end of sleeve 98.

A second guard 103 is provided for the workholder 69 and this guard is pivoted at 104 for movement as by a handle 105 into the dash line position and back to the full line position where it completely covers the work. At its forward edge it has a boss having a bore 106 to hold a stub shaft 107. This stub shaft has a depending bracket 108 to receive a rod 109 clamped in place by screw 110 which supports a device, e. g., for truing the wheel. The stub shaft 107 is clamped in position in the bore which is split for this purpose, by a screw 111 having a nut 112 and a handle 113 for operating the nut.

The base of the work-support is calibrated as at 113 and provided with a hand wheel 114 for operating means such as worm-gearing for turning the support a few degrees so that the machine may operate on tapering work and particularly on work that is internally tapered.

Operation.

The machine as a whole is started and stopped by means (not shown) operative to cut off power from belts 10 and 86, and which are not a part of my invention. As shown in the drawings, the belt 86 is driving the pulleys 87 and 88, spindle 84 and grinding wheel *w* which is surrounded by shield 96. Belt 10 is driving shaft 12 and also shaft 37 through the train of parts 11, 12, 13, 31, 32, 34, 35, and 36. Sleeve 54 is held in position to disengage the clutch and operate the brake by the engagement of cam 64′ with lever 64, and reversing sleeves 15 and 38 are in idle position, the lever 70 being in a position at the limit of its movement (opposite of Figure 3) whereby bar 82 centers and locks the clutch shifter 74 and lever 70 is in its central position to which it has been moved by dog 90, its further movement being resiliently opposed by yielding abutment 81′.

An object having been placed on the workholder e. g., a wheel with a tapering bearing to be internally ground, abutments 91 and 92 having been adjusted according to the length of the work, and the work-holder having been properly adjusted on its pivot by operation of hand wheel 114, the shield 103 is placed in full-line position, and the operator moves lever 70 to the right (Fig. 1) to engage sleeve 15 with gear 19 and run the carriage up to the work at high speed. When abutment 95 engages the lever the operator moves it to its forward position (Fig. 3) and the incline 94′ engages lug 94 to force it down until the abutment has passed when the lug snaps back to position after which the abutments 91 and 92 strike the lug alternately at the end of each grinding traverse to reverse the carriage during the low speed or feed drive.

As the cam 64′ passes off from lever 64, the clutch 53, 53′ is thrown in and the work begins to revolve. Also the guard 96 is left in the position shown, being held by spring fingers 99 to rod 100, but abutment C^3 moves away from sleeve 98 with the carriage.

The guard 96 remains stationary until the spindle housing strikes against it, and then moves therewith, remaining in contact with the housing until the carriage moves so far toward inactive position that the fingers 99 contact with rod 100, and this in turn holds the guard stationary while the wheel approaches the guard 96. When abutment C^3 strikes sleeve 98, the spring fingers 99 are forced into gripping relation with rod 100 while the wheel comes to position under the guard.

Dogs 91 and 92 are spaced so that as dog 91 passes lever 70 the wheel engages the work and when the inner faces of dogs 92 and 91 in turn engage lug 94 they reverse lever 70 as the wheel reaches the ends of the work, thus moving sleeve 38 to engage sleeves 39 and 40 in alternation.

When the reciprocation of the carriage and the rotation of the work are to be stopped the operator swings lever 70 toward the machine, so clutching sleeve 75 to shaft 73 and throwing the carriage on high speed for a quick traverse away from working position.

The sleeve 38 being put in neutral position by bar 82 as lever 70 moves over, shaft 73 is at the same time moved so as to throw clutch-sleeve 15 to one side or the other, the teeth on sleeve 75 being so formed that they will engage those of the clutch member on shaft 73 and by a cam action move the shaft to cause engagement of one or the other friction clutch member by sleeve 15. The lever should always be operated for changing from low to high as the carriage moves to the right, but if it is moving to the left no harm will be done, as it will merely traverse rapidly to the left and then reverse and traverse rapidly to the right and away from the work.

As the carriage travels to the right, the incline 95 will depress lug 94 and the travel will continue until the side of dog 90 strikes lug 94 when the lever 70 will be moved to its central position. At the same time cam 64′ operates lever 64 to actuate the clutch 53 and brake 55 to stop the work, and clutch-shifter 81 comes to rest against stop 81′.

As the carriage C moves to inoperative position, guard 96 is carried along by the friction of the carriage on rod 97 until fingers 99 strike rod 100 when the guard stands still until C^3 strikes sleeve 98 forcing the fingers past rod 100 on opposite sides thereof and into holding engagement therewith, when the cycle of movement is completed.

Various modified forms of my machine and its parts falling within the scope of my invention will occur to those skilled in the art, as well as adaptations of certain features for use in machines for other purposes. Therefore I do not limit myself to any particular embodiment or use of my machine or its component parts except as indicated by 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 an abrading machine, a carriage, gearing to reciprocate the same, a control lever for said gearing, a yieldable plug extending upward from said lever, dogs on the carriage adapted to engage the plug and swing the lever from side to side, said lever being also swingable toward and from the carriage, and said dog having a beveled face adapted to ride over the plug in one position of the lever without moving the lever, substantially as set forth.

2. In a grinding machine, a reciprocatory carriage having an abrading device movable therewith, a rotary work-holder, means for giving the carriage an excessive movement in one direction, and means on the carriage operating on such excessive movement to stop the work-holder, substantially as set forth.

3. In a grinding machine, a reciprocatory carriage having an abrading device movable therewith, a rotary work-holder, a reversing lever for the carriage, means on the carriage to move said lever to neutral position to stop the carriage, means for driving the work-holder comprising a clutch, and a cam on the carriage for throwing out the clutch as the carriage comes to a stop, substantially as set forth.

4. In a grinding machine, a carriage, and reversing gearing for driving the carriage to and fro including a driven shaft, gears on said shaft, a pair of driving shafts, a pair of gears on each driving shaft engaging different gears on the driven shaft, means for clutching either one of each pair of gears to its shaft and selective means to render one pair of such gears inoperative, substantially as set forth.

5. In a grinding machine, a work-holder and means for driving the same comprising a power shaft, a fast pulley thereon, a counter-shaft connected to the workholder, a loose pulley on the countershaft, a belt connecting said loose pulley to said fast pulley and a clutch member splined to said counter-shaft and adapted to engage and be driven by said loose pulley, substantially as set forth.

6. In a grinding machine, a rotary work-holder, a reciprocatory carriage for an abrading device and means for driving the work-holder and the carriage comprising a driving shaft having reversible gearing thereon connected to the carriage, a driven shaft also having reversible gearing connected to the carriage, a counter shaft connected to the workholder to drive the same, and means thereon for transmitting power from the driving to the driven shaft, substantially as set forth.

7. In a grinding machine, a carriage and means for driving the same, a lever for changing the speed and direction of motion of the carriage, dogging means on the carriage adapted to move the lever for reversing the movement of the carriage comprising a dog adapted to pass the lever in one direction in its low-speed position, and in the opposite direction in its high-speed position, substantially as set forth.

8. In combination, a reciprocatory device, a lever to control the speed and direction of said device, means for reversing the lever and for placing it in neutral position to stop the reciprocatory device, such means comprising a dog having the forward and rearward parts of one face oppositely beveled to permit the lever to pass it in opposite directions in its front and rear positions, substantially as set forth.

9. In a grinding machine, a reciprocatory carriage, a lever movable in one plane to change the direction of the carriage and in another to alter its speed, dogging means to move it into reversing positions and also into neutral position to stop the carriage, said dogging means comprising a dog adapted to pass the lever in opposite directions in different positions of the lever, substantially as set forth.

10. In a grinding machine, a reciprocatory carriage, a lever movable parallel thereto and also transversely thereof, a yieldable abutment on said lever, and a dog movable with the carriage and having a beveled face to depress said abutment, during a movement in one direction and another beveled face to depress the abutment during a movement in the contrary direction, substantially at set forth.

11. In a grinding machine, a reciprocating carriage for an abrading device, said carriage adapted to be withdrawn from the work, a guard for the abrading device adapted for movement with and with relation to the carriage, and means to bring the guard into operative relation as the carriage is withdrawn from the work, and to remove the guard from the abrading device as the

latter approaches working position, substantially as set forth.

12. In a grinding machine, a reciprocating carriage for an abrading device, said carriage being adapted to be withdrawn from the work, a guard movable with the carriage, and means to hold the guard stationary during a part of the withdrawing movement, substantially as set forth.

13. In a grinding machine, a carriage for an abrading device adapted to be moved into and out of working position and a guard for the abrading device having a lost motion connection with the carriage, substantially as set forth.

14. In combination, a movable carriage, a rotary shaft thereon, a device rotating with the shaft, a guard for said rotary device, and means for producing relative movement between the carriage and the guard whereby the guard is operative only in certain positions of the device, substantially as set forth.

15. In a grinding machine, a work-holder, a base therefor, means for adjusting the base about its center, a pulley mounted on the work-holder substantially at the center of rotation of said base, and a guard on the base between the work and the operator, substantially as set forth.

16. In a grinding machine, an abrading device, a guard for the device when in active position, said device movable to idle position outside of said guard, and truing means for the abrading device carried by said guard and located adjacent to such idle position, substantially as set forth.

17. In a grinding machine, a work-holder, a rotarily adjustable base therefor, an abrading device, a guard carried by said base and shielding said abrading device when in active position, said device movable to idle position beyond said guard, a truing device carried by said guard adjacent an idle position of the abrading device, and adjustable on the guard to compensate for the adjustment of the base, substantially as set forth.

18. In a grinding machine, a work-holder and an abrading device having a relative rotary adjustment to position them for grinding surfaces at varying angles, and a truing device adjacent said abrading device, said truing device being adjustably mounted to compensate for said rotary adjustment, substantially as set forth.

19. In a grinding machine, a workholder, a pivotally adjustable base therefor, a wheel truing device carried by said workholder and adjustable about an axis at an angle to that of the base, substantially as set forth.

20. In a grinding machine, a workholder, a pivotally adjustable base therefor, a wheel truing device carried by said workholder and adjustable about an axis lying in a plane perpendicular to that of the base, substantially as set forth.

21. In a grinding machine, a workholder adjustable about a vertical axis, a guard for the work mounted on said workholder and swinging on a horizontal axis into and out of operative position, and a wheel truing device carried by said guard and adjustable about a third axis at right angles to each of said other axes, substantially as set forth.

22. In a grinding machine, a workholder, a rotarily adjustable base therefor, an abrading device, a truing device for the abrading device pivoted on said base, and clamping means to fix the truing device in adjusted position, substantially as set forth.

23. In a grinding machine, an abrading device movable from idle to active position and vice versa, a guard for said device in active position, and an independent guard therefor in idle position, substantially as set forth.

24. In a grinding machine, an abrading device movable from idle to active position and vice versa, a guard for said device in active position, an independent guard therefor in idle position spaced from the first, and a truing device located between said guards and adapted to act on the abrading device in an idle position thereof, substantially as set forth.

25. In a grinding machine, a workholder, a grinding wheel adapted to move into and out of operative relation to the work, a guard for the wheel in operative position and an independent guard therefor in idle position, the latter guard having a lost motion connection to said grinding wheel, substantially as set forth.

26. In a grinding machine, a workholder and means for driving the same comprising a power shaft, a fast pulley thereon, a countershaft connected to the workholder, a loose pulley on the countershaft, a belt connecting said loose pulley to said fast pulley, a clutch member splined to said shaft and adapted to engage and be driven by said loose pulley, a shifter for said clutch, a reciprocating carriage for an abrading device, and means on the carriage to operate said shipper to disengage said clutch, substantially as set forth.

27. In a grinding machine, a workholding device, an abrading device, a carriage for one of said devices adapted to be moved into and out of operative relation, and a guard automatically movable to shield said device as the carriage moves out of such operative relation, substantially as set forth.

28. In an abrading machine, a carriage and means to reciprocate the same comprising means to move the carriage at working speed in working position, automatic

means to move it at higher speed away from working position and means to stop it in working position, substantially as set forth.

29. In an abrading machine, a carriage, means to move the carriage to-and-fro including reversible gearing, a reversing lever therefor oscillating in a plane, change-speed gearing for the carriage, and connections from the change-speed gearing to said lever for changing the speed of the carriage by movement of the lever in a plane angularly related to the first, substantially as set forth.

In witness whereof, I have hereunto set my hand at Washington, District of Columbia this thirteenth day of November, A. D. nineteen hundred and twenty.

PAUL STONER.

CERTIFICATE OF CORRECTION.

Patent No. 1,663,148. March 20, 1928.

PAUL STONER.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 6, lines 2 and 3, claim 28, strike out the words "means to stop it in working position" and insert instead "manual controlling means for such automatic means"; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 7th day of February, A. D. 1933.

(Seal)

M. J. Moore,
Acting Commissioner of Patents.

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