R. R. ROBERTS.

APPARATUS FOR DRESSING GRINDSTONES.

APPLICATION FILED MAR. 28, 1918.

1,373,833. **Patented Apr. 5, 1921.**

3 SHEETS—SHEET 1.

FIG. 1.

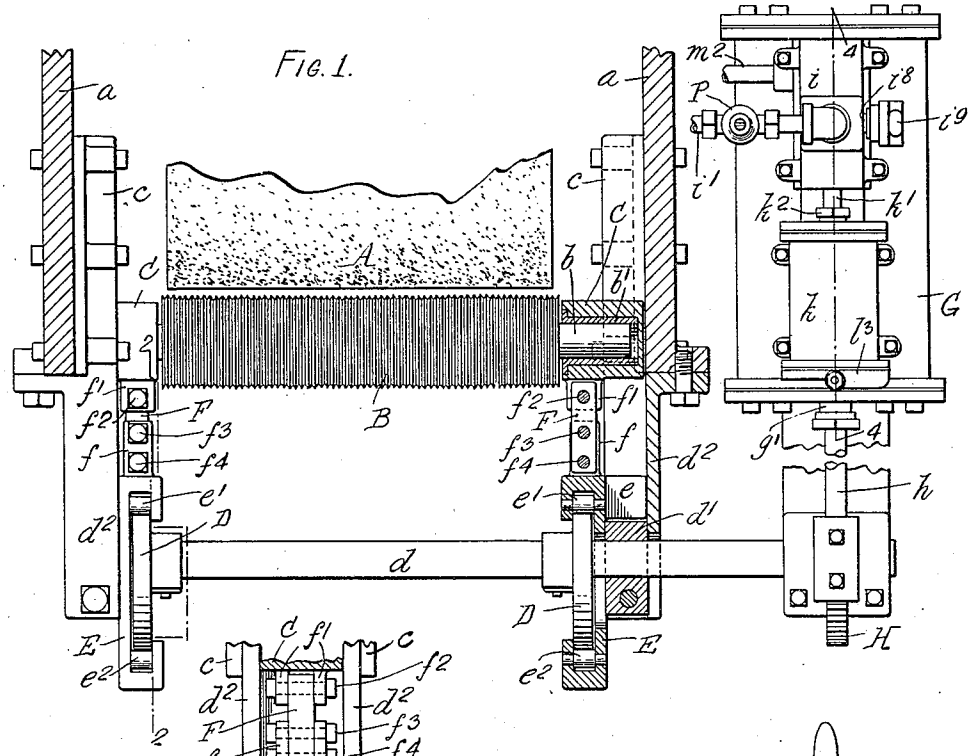


FIG. 2.

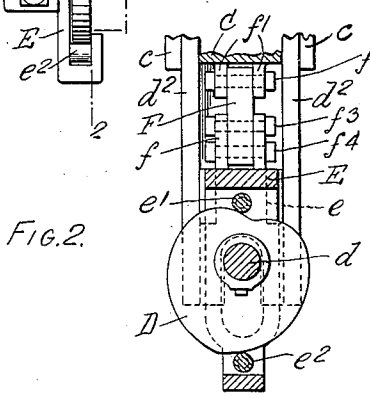


FIG. 3.

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3 SHEETS—SHEET 2.

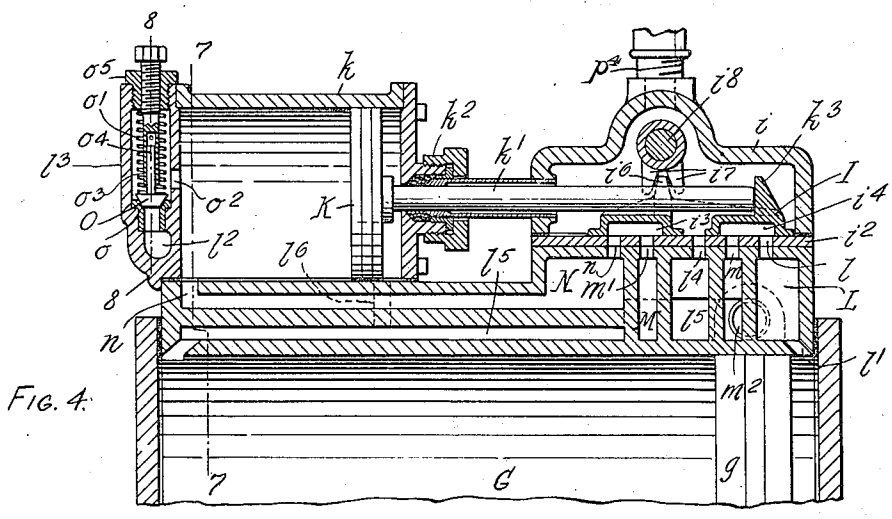


FIG. 4.

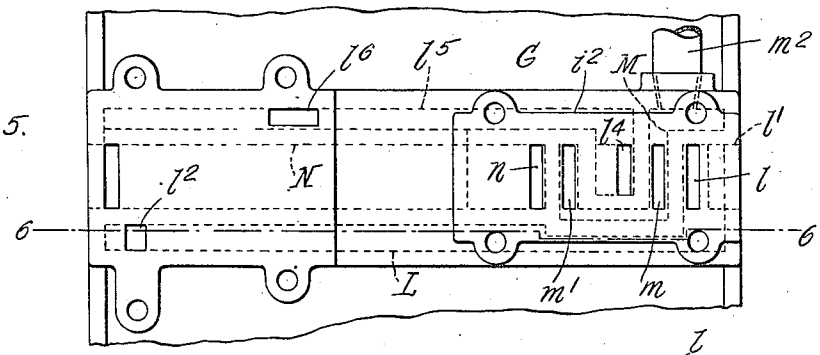


FIG. 5.

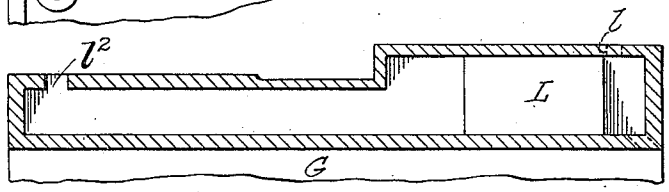


FIG. 6.

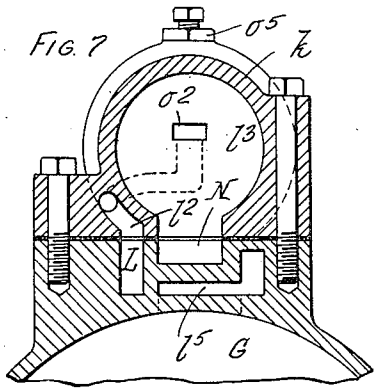


FIG. 7

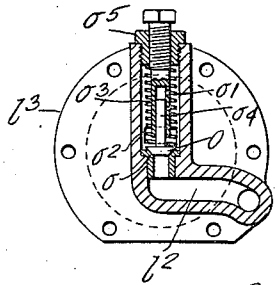


FIG. 8.

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APPARATUS FOR DRESSING GRINDSTONES.

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1,373,833. Patented Apr. 5, 1921.

3 SHEETS—SHEET 3.

FIG. 9.

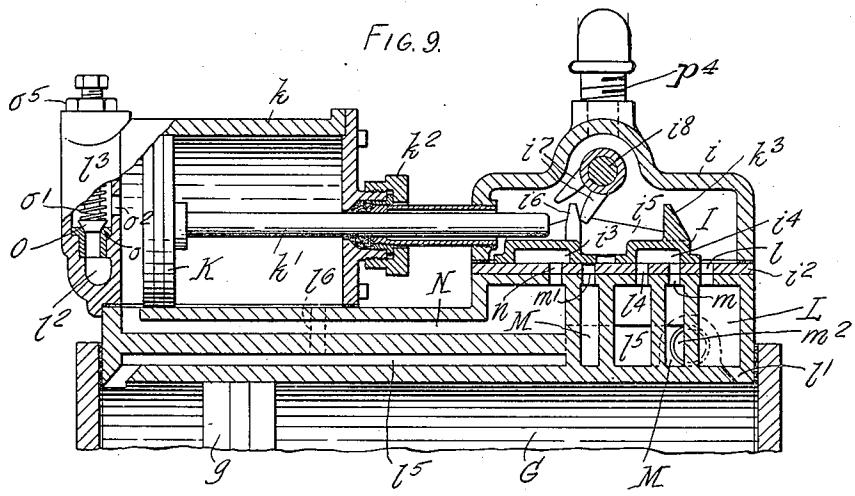


FIG. 10.

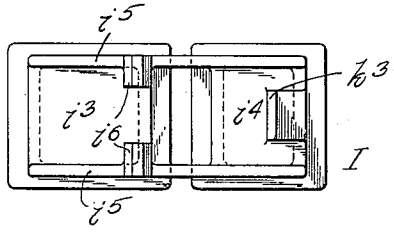
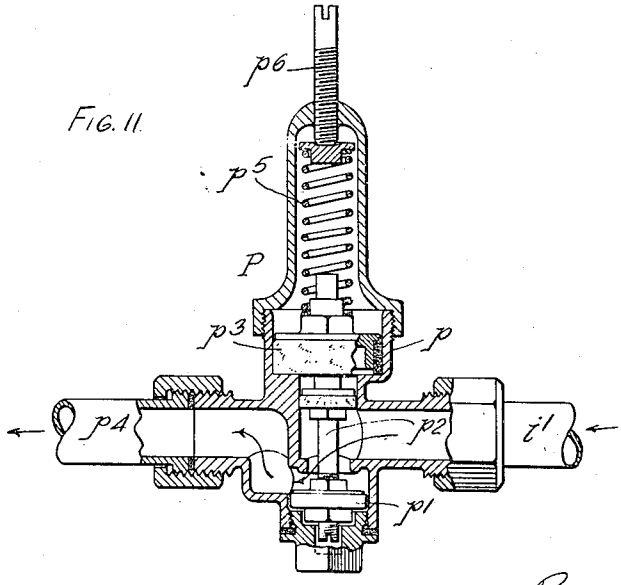


FIG. 11.



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APPARATUS FOR DRESSING GRINDSTONES.

1,373,833. Specification of Letters Patent. Patented Apr. 5, 1921.

Application filed March 28, 1918. Serial No. 225,164.

To all whom it may concern:

Be it known that I, RALPH R. ROBERTS, a citizen of the United States, residing at Lockport, in the county of Niagara and State of New York, have invented a new and useful Improvement in Apparatus for Dressing Grindstones, of which the following is a specification.

This invention relates to apparatus for dressing grind stones, such for example, as are used in the manufacture of wood pulp.

Stones for grinding pulp wood have heretofore been dressed by hand by pressing a bur or dressing tool against the face of the grind stone and forming grooves or depressions thereon. The quality of the ground pulp depends very largely upon the nature of the grooves or impressions in the grind stone, and in order to produce a uniform quality of pulp it is necessary that the face of the grind stone should be uniformly dressed at all times, which is almost impossible when the dressing is done by hand. Furthermore, it frequently happens that in dressing a stone considerably more of the surface thereof is removed by the bur than is necessary, so that the stone is rapidly worn out.

The objects of the invention are to produce an apparatus of this kind by means of which a stone will always be uniformly dressed so as to produce a uniform grade of pulp; also to produce an apparatus of this kind which may be adjusted for dressing a stone in a desired manner and by means of which a stone is dressed without requiring the exercise of skill or judgment on the part of the operator; also to provide an apparatus of this kind which can be readily adjusted in accordance with the hardness of the stone to be dressed to produce the desired surface on the stone; also to provide an apparatus of this kind which is adapted to be secured in operative relation to the stone to be dressed and accurately positioned with regard to the same so that the teeth or projections of the bur or dressing tool will always engage in the same grooves or depressions in the stone; also to provide an apparatus of this kind which may be regulated to control the pressure with which the bur is pressed against the stone; also to provide an apparatus of this kind with means for regulating the length of time that the bur is pressed against the stone; also to provide an apparatus of this kind in which the entire operation of dressing the stone is performed automatically after the apparatus has been started; also to provide an apparatus of this kind which will keep the periphery of the stone truly circumferential with regard to the axis of rotation, so that the stone will run true at all times; also to improve the construction of apparatus of this kind in other respects hereinafter specified.

In the accompanying drawings:

Figure 1 is a top plan view, partly in section of an apparatus embodying the invention for dressing grind stones.

Fig. 2 is a fragmentary sectional elevation thereof on line 2—2, Fig. 1.

Fig. 3 is a side elevation of the actuating and controlling mechanism of the apparatus.

Fig. 4 is a fragmentary longitudinal sectional elevation of a part of the controlling mechanism on line 4—4, Fig. 1.

Fig. 5 is a fragmentary top plan view thereof, showing the actuating piston with the controlling valve and timing piston removed therefrom.

Fig. 6 is a fragmentary sectional elevation thereof on line 6—6, Fig. 5.

Fig. 7 is a fragmentary transverse sectional elevation of the timing piston on line 7—7, Fig. 4.

Fig. 8 is a fragmentary transverse sectional elevation of the controlling or regulating means of the apparatus on line 8—8, Fig. 4.

Fig. 9 is a fragmentary longitudinal sectional elevation similar to Fig. 4 and showing parts of the device in different positions.

Fig. 10 is a top plan view of the slide valve detached from the apparatus.

Fig. 11 is a central sectional elevation of a pressure regulating device which may be used in connection with the apparatus.

The grind stone dressing apparatus shown in the accompanying drawings may be used in connection with any desired pulp grinding machine. In the accompanying drawings, A represents a part of the periphery

of the grind stone to be dressed which is suitably journaled in bearings (not shown) secured on sides *a* of the grinding machine.

The dressing of the periphery of the grind stone is effected in the construction shown by means of a bur or dressing tool B which extends across the entire width of the stone so that the entire surface of the stone which is used in grinding the wood pulp may be dressed at one time. The bur B is mounted on a shaft *b*, the ends of which are suitably journaled in bearings *b'* which are slidably mounted on the frame or housing of the pulp grinding machine so that the bur is movable toward and from the pulp grinding stone in parallel relation to the axis of the stone. This may be accomplished by any suitable means. In the construction shown, the bearings *b'* of the bur are arranged in cross heads or slidable parts C which are arranged to move toward and from the axis of the grind stone on guides *c* which are suitably secured on the frame of the grinding machine. The bur B may be provided with any suitable surface for dressing the grind stone, the bur in the construction shown being provided with annular projections or teeth extending around the bur circumferentially, which teeth, in the dressing of the grind stone, form on the surface thereof annular circumferential depressions or grooves, and since the bur is accurately guided in its movement toward and from the grind stone by means of the cross head C and the guides *c*, the projections or teeth on the bur will always enter the same grooves or depressions on the grind stone, thereby preventing the rapid wearing out of the grind stone and facilitating the dressing thereof.

The moving of the bur toward and from the surface of the grind stone may be accomplished by any suitable means which will insure the maintaining of the axis of the bur at all times parallel to the axis of the grind stone. In the construction shown for this purpose, cams D are provided which are mounted on a cam shaft *d* suitably journaled in bearings *d'* secured on extensions d^2 of the guides *c*. The cams are suitably connected to actuate the cross heads C and are for this purpose preferably arranged to engage with yokes E having portions *e* slidably arranged between the guides *c*. The yokes are preferably provided with antifriction rollers e' e^2 on which the cams bear. The yokes are connected in any desired manner with the cross heads to actuate the same, the connection preferably being adjustable so that when the grind stone becomes worn down the cross heads and the bur can be moved closer to the axis of the grind stone without changing the position of the cam shaft *d* relatively to the axis of the grind stone. The connections shown in the drawings include connecting bars or rods F which are secured between lugs or projections *f f'* arranged respectively on the yokes E and on the cross heads C. The bars or rods F are secured to the projections by means of bolts, pins or the like f^2 f^3 and f^4, the pins f^2 connecting the bars F with the lugs *f'* and the pins f^3 and f^4 connecting the bars or rods F with the lugs or projections *f*. If it is desired to move the bar from the position shown in Fig. 1 to a position closer to the axis of the grind stone, the pins f^3 and f^4 can be removed and the rod or bar F can be moved outwardly with regard to the lugs *f*, so that the hole for the pin f^4 registers with the hole for the pin f^3 and can be secured in this position by one of the pins. Any other adjustable connection between the yokes and cross-heads may be employed.

Means are provided for pressing the bur B into engagement with the grind stone A, these means being preferably so constructed that they can be placed into action by the mere actuation of a lever or other device, and are preferably provided with means for controlling the pressure with which the bur is forced against the face of the grind stone and the time during which the bur is in engagement with the grind stone. Any suitable means may be provided for this purpose, those employed in the construction shown including a piston *g* arranged in a cylinder G, the piston being moved back and forth in the cylinder by a suitable motive fluid, such as water, steam or the like. The cylinder may be of any suitable construction and may be mounted in any desired relation to the bur. The piston *g* is provided with a piston rod *g'* which is suitably connected for actuating the bur. In the construction shown the piston rod actuates the bur through the medium of the cam shaft *d* and cams D, although these parts may be omitted if desired. In order to actuate the cam shaft, the piston rod is preferably connected with a rack bar *h* in any desired manner which is adapted to engage a gear H suitably journaled on a frame or base *h'* on which the cylinder G is mounted. This gear is secured to the cam shaft *d* so that the reciprocation of the piston *g* rotates the gear H and the cam shaft *d* and causes the cams D to move the bur toward and from the grind stone. Any other connection between the piston and the bur for actuating the latter may be employed.

The movement of the piston *g* in the cylinder G may be controlled by any suitable means. In the construction shown for this purpose a slide valve I is provided which is suitably mounted in a valve housing *i* secured on the cylinder G and which controls the flow of motive fluid to and from the cylinder. The motive fluid is supplied to the housing I by means of an in-

let pipe i'. The slide valve housing has a base i^2 which is provided with a plurality of ports or openings controlled by the valve I. The valve I may be of any suitable construction, that shown being provided with two recessed valve portions or parts connected by flanges i^5 and having recesses or passages i^3 i^4 through which the motive fluid may pass from one port to another. The valve is provided with spurs or projecting portions i^6 which are adapted to engage with bifurcated parts i^7 straddling the projections i^6. The bifurcated portions i^7 are preferably secured on or otherwise connected with a shaft i^8 journaled on and extending into the valve housing and to which a handle i^9 is secured by means of which the valve may be shifted.

The handle i^9 is used for shifting the valve into a position in which the motive fluid moves the piston g into a position as shown in Fig. 9, to place the bur against the grind stone. The valve is preferably shifted into the other position shown in Fig. 4 for causing the bur to be removed from the grind stone by automatic means, which in the construction shown, include a valve actuating piston K mounted in a cylinder k secured on the cylinder G in operative relation to the valve housing i. The piston K has a piston rod k' extending through a stuffing box k^2 in the head of the cylinder k and extending into the valve housing i. The end of the piston rod k' is adapted to engage with a projection k^3 formed on the valve I for moving the valve into the position shown in Fig. 4 for causing the bur to be withdrawn from the grind stone. The return movement of the piston K is also preferably controlled by means of the valve I.

The connection between the several ports or openings in the base of the valve housing and the cylinders G and K are preferably arranged as follows: The base i^2 of the slide valve housing is provided with a port l which connects with a passage L having an opening l' through which the motive fluid can pass into the cylinder for moving the piston in the direction to cause the bur to be pressed into engagement with the grind stone. The passage L extends lengthwise of the wall of the cylinder G and connects with a passage l^2 in the head l^3 of the cylinder k from which the motive fluid may pass into the cylinder k to force the piston into a position to actuate the valve I. The base of the valve housing is also provided with a port l^4 through which motive fluid may enter into a passage l^5 which conducts the motive fluid to the other end of the cylinder G for moving the piston G in a direction to cause the bur to be moved out of engagement with the grind stone. This branch is provided with a branch l^6 leading to the other side of the cylinder k to move the piston K out of engagement with the valve I. m and m' represent exhaust ports which are connected to an exhaust passage M terminating in an exhaust or discharge tube m^2 through which the fluid is discharged from the apparatus. n represents a port connecting with the passage N through which the liquid is discharged from the cylinder k when the piston K moves into position out of engagement with the valve I. When the valve I is so positioned that the motive fluid passes through the port l to the passage L, the fluid will pass into the cylinder through the opening l' and will move the piston g in a direction to cause the bur to be pressed against the grind stone. When the bur is moved into engagement with the grind stone, the pressure in the cylinder acting against the piston g will be increased until it reaches a pressure equal to that of the motive fluid. This pressure also acts upon a valve O which is arranged at the end of the passage l^2 connecting with the passage L. The valve O is held against its seat o by means of a spring o' which is of such strength as to hold the valve O against its seat until sufficient pressure has accumulated in the passage L and the cylinder G to press the bur against the grind stone with the desired pressure. The valve O will then be opened to permit motive fluid to pass the valve and enter through the passage o^2 into the cylinder k to move the piston K outwardly in the cylinder k so that the piston rod k' will engage the projection k^3 on the valve I to shift the valve from the position shown in Fig. 9 to the position shown in Fig. 4. Means are preferably provided for controlling the time required for the piston K to close the valve and in this manner to control the time during which the bur is pressed into engagement with the grind stone. In the construction shown for this purpose, a guide sleeve o^3 is provided in which the stem o^4 of the valve O is slidably mounted. This sleeve is adjustable toward and from the valve so as to limit the movement of the valve relatively to the valve seat and thus control the rate of flow of motive fluid past the valve O. The guide sleeve o^3 is arranged in a threaded bushing o^5 which may be adjusted, if desired, to regulate the pressure of the spring o' on the valve. Any other means for controlling the time during which the bur is in engagement with the grind stone may be employed.

P represents a pressure regulator which may be of any suitable or desired construction and which regulates the pressure of the motive fluid within the valve housing i. By controlling the pressure of the motive fluid in the valve housing i, the pressure with which the bur is pressed against the grind stone may be regulated as desired, so that

grind stones of different degrees of hardness may be dressed in a uniform manner. A pressure regulator which may be used for this purpose is shown in Fig. 11, which is arranged to receive fluid from the inlet pipe i' and comprises a housing p containing a valve disk p' adapted to interrupt the flow of fluid in the slide valve housing when the fluid in the slide valve housing attains the pressure for which the regulator is set. The valve disk p' is connected by means of a valve stem p^2 to a piston or diaphragm p^3 on the lower face of which the pressure of fluid in a fluid supply pipe i' acts. The lower part of the pressure regulator housing p is connected with the slide valve housing i by a pipe or passage p^4. The pressure of the fluid acting on the piston p^3 is counteracted by a spring p^5, the pressure of which on the piston may be adjusted by means of a set screw p^6. In the operation of this device, the pressure in the pipe p^4 leading to the slide valve housing acts on the lower face of the valve disk p' and when this pressure is less than the pressure for which the set screw p^6 is adjusted, the spring p^5 will unseat the valve disk p' and permit fluid to pass from the pipe i' to the pipe p^4. When the pressure in the pipe p^4 rises to the point for which the pressure regulator is adjusted, the valve disk will again be closed. Any other desired pressure regulating means may be employed, and if desired, the regulating means may be dispensed with.

In the operation of the device for dressing a grind stone, the operator starts the operation of the apparatus by moving the lever i^9 in a direction to the right in Fig. 3, which causes the valve to be moved into the position shown in Fig. 9, thus opening the valve port l and permitting the motive fluid from the valve housing i to enter into the passage L and into the cylinder G. The motive fluid forces the piston g in a direction to cause the rack bar h to rotate the gear H and the cams D to press the bur against the grind stone. When the bur comes into contact with the grind stone, the pressure in the cylinder G and in the passage L will increase, causing the valve O to be opened and permitting motive fluid to enter the cylinder k and move the piston K to the right from the position shown in Fig. 9 until the same moves the valve to the right and reaches a position shown in Fig. 4. The valve in this position connects the port l with the exhaust port m through the recess i^4 in the valve I and permits the motive fluid to discharge from the passage L to the exhaust. The recess i^3 in the valve I connects the port n with the exhaust port m', thus permitting the motive fluid to discharge from the passage N and from the cylinder k so as to permit the piston K to return to the initial position shown in Fig. 9. The port l^4 is also opened in this position of the valve I so that the motive fluid enters the passages l^5 and l^6 to return the piston K to its initial position.

The drawings show one embodiment of the invention but it is not intended to limit the invention to apparatus shown in the drawings. If desired, the cams D could be omitted and the pressure from the piston g could be transmitted directly to the bur without the medium of the cams. The cams, however, are desirable in that the cam faces thereof are so shaped as to positively hold the bur in any position until the cams are actuated by the piston G. This is important in keeping the periphery of the grind stone truly concentric with the axis of the grind stone shaft, since any eccentric portion of the surface of the grind stone can not force the bur backwardly against the action of the cams, so that any eccentric portions of the grind stone will be cut by the bur to form a truly concentric face on the grind stone.

When the valve O and the pressure regulator device P are adjusted to suit the grind stone, the apparatus will always dress the grind stone uniformly, so that the depth of the grooves in the grind stone after dressing will always be the same. The skill or judgment of the operator in dressing the stone is entirely dispensed with, it being only necessary in order to effect a dressing of the grind stone to actuate the lever i^9 to start the operation of the apparatus.

I claim as my invention:

1. In an apparatus for dressing grindstones, the combination of a rotary dressing tool arranged in operative relation to a stone, means for pressing said tool against the circumferential face of the stone to form impressions on said face of said stone and for controlling the pressure with which said tool is pressed against said stone, to form impressions of predetermined depth on said stone.

2. In an apparatus for dressing grind stones, the combination of a dressing tool arranged in operative relation to a stone, and means independent of the pressure exerted by said tool against said stone for pressing said tool for a predetermined interval of time against the surface to be dressed.

3. In an apparatus for dressing grindstones, the combination of a dressing tool, means for pressing said tool against said stone, means for controlling the pressure with which said tool is pressed against said stone, and automatic means independent of the pressure exerted by said tool against said stone for causing said tool to act on said stone for a predetermined interval of time.

4. In an apparatus for dressing grind-

stones, the combination of a dressing tool, power-operated means for pressing said tool against the grindstone, and automatic means for controlling the time during which said power-operated means act on said stone.

5. In an apparatus for dressing grindstones, the combination of a rotary dressing tool extending across the cutting surface of a stone, means for pressing said tool against the surface of said stone, and means for regulating the pressure with which said pressing means press said tool against the stone.

6. In an apparatus for dressing grindstones, the combination of a rotary dressing tool extending across the cutting surface of a stone, means for guiding said cutting tool in its movement toward and from said stone, means for pressing said tool against the surface of said stone, and means for regulating the pressure with which said pressing means press said tool against the stone.

7. In an apparatus for dressing a pulp grindstone, a dressing tool having a plurality of annular ridges which are adapted to form grooves in the stone, and means for supporting said dressing tool relatively to said stone so that the tool may be moved into operative relation to said stone in such a manner that said ridges on said tool will enter into said grooves on said stone.

8. In an apparatus for dressing pulp grindstones, the combination of a dressing tool having a plurality of annular ridges which are adapted to form annular grooves on the surface of the stone, and means for guiding said tool in its movement toward and from the stone so that the ridges of the tool will enter the grooves in the stone when the tool is in operative relation to the stone.

9. In an apparatus for dressing grindstones, the combination of a dressing tool having a plurality of annular ridges which are adapted to form annular grooves in the surface of the stone, and means for pressing said tool against said stone so that said ridges will enter into said grooves.

10. In an apparatus for dressing pulp grindstones, the combination of a dressing tool having a plurality of annular ridges which are adapted to form annular grooves on the surface of the stone, means for guiding said tool in its movement toward and from the stone to cause said ridges to enter into said grooves, and means for pressing said tool against said stone.

11. In an apparatus for dressing a pulp grind stone, the combination of a rotary dressing tool having a plurality of projections adapted to form depressions in said stone, means for pressing said tool for a relatively long interval of time against said stone, and means for guiding said tool toward and from said stone to cause said projections to enter said depressions in the stone.

12. In an apparatus for dressing a pulp grind stone, the combination of a rotary dressing tool having a plurality of projections adapted to form depressions in said stone, means for pressing said tool for a relatively long interval of time against said stone, and means for controlling the relative movement of said grind stone and said tool relatively to each other to cause said projections on the tool to register with the depressions in said stone.

13. In an apparatus for dressing pulp grind stones, the combination of a frame on which a grind stone is mounted, a rotary dressing tool having a plurality of projections adapted to form depressions on said grind stone, means for pressing said tool for a relatively long interval of time against said stone, and means on said frame for guiding said tool relatively to said stone for causing the projections on said tool to enter the depressions on said stone.

14. In an apparatus for dressing a grindstone, the combination of a dressing tool, means for pressing said tool against said grindstone without moving the tool in a direction parallel to the face of said stone, and automatic means for causing said tool to act on said stone with a predetermined pressure.

15. The combination with a grindstone, of a dressing tool therefor, pressure means for pressing said tool into operative relation to said stone with a predetermined pressure, and stop means interposed between said pressure means and said tool and which positively hold said tool against movement away from said stone until the pressure forcing said tool to said stone is withdrawn.

16. The combination with a grindstone, of a dressing tool therefor, yielding pressure means adapted to exert a regulatable predetermined pressure to force said tool against said stone, and stop means interposed between said tool and said pressure means to prevent movement of said tool away from said stone until said pressure means are released.

17. The combination with a grindstone, of a dressing tool therefor, yielding pressure means adapted to exert a regulatable predetermined pressure to force said tool against said stone, and a cam rotated by said pressure means to move said tool toward the work and to prevent the movement of said tool away from the work until said pressure means are released.

18. In an apparatus for dressing a grind stone, the combination of a dressing tool, means for guiding said tool in its movement toward and from said stone, a cam for moving said tool against said grind stone, means for actuating said cam to press said

tool against said stone, and means for regulating the pressure with which said cam moves said tool into engagement with said stone.

19. In an apparatus for dressing a grindstone, the combination of a dressing tool, bearings for said tool, guides in which said bearings are movable toward and from said stone, cams adapted to actuate said bearings toward and from said stone, a shaft on which said cams are mounted, means for rotating said shaft, and controlling means for regulating the force with which said shaft is rotated.

20. In an apparatus for dressing a grind stone, the combination of a dressing tool, bearings for said tool, guides in which said bearings are movable toward and from said stone, cams adapted to actuate said bearings toward and from said stone, a shaft on which said cams are mounted, power operated mechanism for rotating said shaft, and means for controlling the action of said power operated mechanism.

21. In an apparatus for dressing a pulp grind stone, the combination of a dressing tool having a plurality of projections adapted to form depressions in said stone, means for guiding said tool toward and from said stone to cause said projections to enter said depressions in the stone, and fluid actuated means for pressing said tool against the face of said grind stone.

22. In an apparatus for dressing a grind stone, the combination of a dressing tool, means for guiding said tool in its movement toward and from said stone, fluid operated actuating means for pressing said tool against said stone, and means for regulating the pressure of the fluid on said actuating means to control the pressure with which said tool presses against said stone.

23. In an apparatus for dressing a grindstone, the combination of a dressing tool, means for guiding said tool in its movement in a direction toward and from the surface of said stone, fluid-operated actuating means for pressing said tool against said stone, and means to predetermine the interval of time during which said tool is pressed against said stone.

24. In an apparatus for dressing a grindstone, the combination of a dressing tool, fluid actuated means for pressing said tool against the surface of said grindstone, a valve adapted to be actuated by hand to admit fluid pressure to said actuated means, and automatic means for relieving the pressure on said actuated means, including means which are adjustable in accordance with the interval of time during which the tool is to be pressed against said stone.

25. In an apparatus for dressing a grindstone, the combination of a dressing tool, means for pressing said tool against said stone, means controlled only by an operator for causing said pressing means to move against said stone, and automatic means for interrupting the operation of said pressing means after a predetermined interval of time, including means which are adjustable in accordance with the interval of time during which the tool is to be pressed against said stone.

26. In an apparatus for dressing a grindstone, the combination of a dressing tool, a cylinder, a piston in said cylinder operatively connected with said tool for pressing the same into engagement with said stone, means controlled only by an operator for admitting fluid under pressure to said cylinder, fluid-operated means for discharging fluid from said cylinder, and means adjustable in accordance with the interval of time during which the tool is to be pressed against said stone for controlling the action of said fluid-operated means.

27. In an apparatus for dressing a grind stone, the combination of a dressing tool, a cylinder, a piston in said cylinder operatively connected with said tool for pressing the same into engagement with said stone in a direction substantially at right angles to the face thereof to be dressed, a valve for controlling the flow of fluid to and from said cylinder, means controlled only by an operator for placing said valve into a position to admit fluid to said cylinder to cause said tool to be pressed against said stone, and automatic means for discharging fluid from said cylinder to cause said tool to be withdrawn from said stone.

28. In an apparatus for dressing a grind stone, the combination of a dressing tool, a cylinder, a piston in said cylinder operatively connected with said tool for pressing the same into engagement with said stone, a valve actuating cylinder into which the fluid is discharged from said first mentioned cylinder after the fluid in said first mentioned cylinder has reached a predetermined pressure, and a piston in said valve actuating cylinder which is adapted to engage said valve to move the same into a position to cause said tool to be moved out of engagement with said stone.

29. In an apparatus for dressing a grind stone, the combination of a dressing tool, actuating means operated by fluid pressure for pressing said tool against said grind stone, a valve for controlling the flow of fluid pressure to and from said actuating means, said valve being adapted to be placed by hand only into a position to cause said tool to be pressed against said stone, fluid pressure actuated means for placing said valve into a position to cause said tool to be withdrawn from said stone, and means adjustable in accordance with the interval of time during which it is desired to have said

tool in engagement with said stone, to control the action of said fluid pressure actuated means.

30. In an apparatus for dressing a grind stone, the combination of a dressing tool, actuating means operated by fluid pressure for pressing said tool against said grind stone, a valve for controlling the flow of fluid pressure to and from said actuating means, said valve being adapted to be placed by hand into a position to cause said tool to be pressed against said stone, fluid-pressure-actuated means for placing said valve into a position to cause said tool to be withdrawn from said stone, and means for admitting fluid pressure from said tool actuating means to said valve actuating means.

31. In an apparatus for dressing a grind stone, the combination of a dressing tool, actuating means operated by fluid pressure for pressing said tool against said grind stone, a valve for controlling the flow of fluid pressure to and from said actuating means, said valve being adapted to be placed by hand into a position to cause said tool to be pressed against said stone, a valve actuating cylinder, a piston in said cylinder, and means for admitting fluid from said actuating means to said cylinder for causing said piston to move said valve into a position to cause said actuating means to move said tool out of engagement with said stone.

32. In an apparatus for dressing a grind stone, the combination of a dressing tool, actuating means operated by fluid pressure for pressing said tool against said grind stone, a valve for controlling the flow of fluid pressure to and from said actuating means, said valve being adapted to be placed by hand into a position to cause said tool to be pressed against said stone, a valve actuating cylinder, a piston in said cylinder, and a valve for admitting fluid to said cylinder after said actuating means have moved said tool into engagement with said stone, for causing said piston to shift said first mentioned valve into a position to cause said tool to be withdrawn from said stone.

33. In an apparatus for dressing a grind stone, the combination of a dressing tool, actuating means for pressing said tool against said grind stone, and controlling means for causing said actuating means to withdraw said tool from said stone, said controlling means being placed into operation when said tool engages said stone, and causing the withdrawing of said tool from said stone after a predetermined interval of time, independent of the movement of said tool.

34. In an apparatus for dressing a grind stone, the combination of a dressing tool, actuating means for pressing said tool against said grind stone, and a fluid-pressure-actuated controlling device which is placed into operation when said tool engages said stone and which causes said tool to be withdrawn after a predetermined interval of time, independent of the movement of said tool.

35. In an apparatus for dressing a grind stone, the combination of a dressing tool, actuating means for pressing said tool against said grind stone, a fluid-pressure-operated controlling device for causing said actuating means to withdraw said tool from said stone, and a valve for controlling the flow of said fluid to said controlling device for regulating the time during which said tool remains in engagement with said stone.

36. In an apparatus for dressing a grind stone, the combination of a dressing tool, actuating means operated by fluid pressure for pressing said tool against said grind stone, a valve for controlling the flow of fluid pressure to and from said actuating means, said valve being adapted to be placed by hand into a position to cause said tool to be pressed against said stone, a cylinder, a piston in said cylinder adapted to actuate said valve, and means for permitting fluid to enter said piston when the fluid in said actuating means attains a predetermined pressure, for causing said piston to move said valve into a position for causing said tool to be withdrawn from said stone.

37. In an apparatus for dressing a grind stone, the combination of a dressing tool, actuating means operated by fluid pressure for pressing said tool against said grind stone, a valve for controlling the flow of fluid pressure to and from said actuating means, said valve being adapted to be placed by hand into a position to cause said tool to be pressed against said stone, a cylinder, a piston in said cylinder adapted to actuate said valve, means for permitting fluid to enter said cylinder when the fluid in said actuating means attains a predetermined pressure, for causing said piston to move said valve into a position for causing said tool to be withdrawn from said stone, and means for controlling the rate of flow of said fluid to said cylinder.

38. In an apparatus for dressing a grind stone, the combination of a dressing tool, a cylinder, a piston adapted to move said tool into engagement with said grind stone, means for controlling the flow of fluid to said piston, a second cylinder, a piston in said second cylinder adapted to actuate said controlling means to cause said tool to be moved out of engagement with said stone, connections for admitting fluid from said first mentioned cylinder to said second cylinder, and a valve for controlling the flow of fluid to said second cylinder.

39. In an apparatus for dressing a grind stone, the combination of a dressing tool, a cylinder, a piston adapted to move said tool into engagement with said grind stone,

means for controlling the flow of fluid to said piston, a second cylinder, a piston in said second cylinder adapted to actuate said controlling means to cause said tool to be moved out of engagement with said stone, connections for admitting fluid from said first mentioned cylinder to said second cylinder, a valve which is unseated by pressure in said first mentioned cylinder to permit fluid to flow to said second cylinder, and means for adjusting the extent to which said valve may be opened.

40. In an apparatus for dressing a grind stone, the combination of a dressing tool, actuating means for pressing said tool against said grind stone, a fluid-pressure-operated controlling device for causing said actuating means to withdraw said tool from said stone, a valve for controlling the flow of fluid to said controlling device, and means for adjusting the extent to which said valve may be opened to regulate the time during which said tool remains in engagement with said stone.

41. In an apparatus for dressing a grind stone, the combination with a dressing tool, bearings for said tool, guides in which said bearings are movable toward and from said stone, cams rotatably journaled in said guides, and yokes with which said cams engage and which are slidable in said bearings and connected with said guides.

42. In an apparatus for dressing a grind stone, the combination with a dressing tool, bearings for said tool, guides in which said bearings are movable toward and from said stone, cams adapted to actuate said bearings toward and from said stone, parts with which said cams engage and adjustable connections between said parts and said cams.

43. In an apparatus for dressing a grind stone, the combination with the frame of the grind stone, of a dressing tool slidably mounted on said frame to move toward and from said stone, guides mounted on said frame in which said tool is slidably arranged, cams pivotally mounted on said frame and adapted to move said dressing tool toward and from said stone, and adjustable connections between said cams and said tool.

44. In an apparatus for dressing a grind stone, the combination with the frame of the grind stone, of a dressing tool slidably mounted on said frame to move toward and from said stone, guides mounted on said frame in which said tool is slidably arranged, cams pivotally mounted on said frame, yokes slidably mounted in said guides and actuated by said cams, and an adjustable connection between said yokes and said dressing tool.

45. In an apparatus for dressing a grind stone, the combination of a dressing tool movable toward and from said grind stone, cams for moving said tool toward and from said stone, a shaft on which said cams are mounted, a cylinder, and a piston in said cylinder adapted to actuate said cam shaft by causing said tool to be moved toward and from said grind stone.

46. In an apparatus for dressing a grind stone, the combination of a dressing tool movable toward and from said stone, cams for moving said tool toward and from said stone, a shaft on which said cams are mounted, a cylinder, a piston in said cylinder, a rack connected with said piston, and a gear mounted on said cam shaft and engaging said rack, for causing said piston to rotate said cam shaft to actuate said dressing tool.

47. In an apparatus for dressing grind stones, the combination of a dressing tool arranged in operative relation to said stone and having tapering projections thereon adapted to enter the surface of the stone, means for pressing the tool against the surface to be dressed, and adjustable means which can be regulated in accordance with the hardness of the stone and the shape of the projections on said tool to control the extent to which said tool is pressed against said stone to produce at different times impressions of uniform depth on said stone.

48. In an apparatus for dressing grind stones, the combination of a dressing tool arranged in operative relation to said stone, means for pressing said tool against the surface to be dressed, and means for regulating the length of time during which said tool acts on said stone to produce depressions of predetermined proportions on said stone.

49. The combination with a grindstone, of a dressing tool therefor, fluid pressure means for pressing said tool against the stone, and stop means interposed between said fluid pressure means and said tool to prevent an eccentricity of the stone from moving said tool away from said stone against the action of said fluid pressure means.

Witness my hand this 26th day of March 1918.

RALPH R. ROBERTS.

Witnesses:
F. E. PROCHNOW,
M. J. PITMAN.