J. W. HAMPTON.

GRINDING MACHINE.

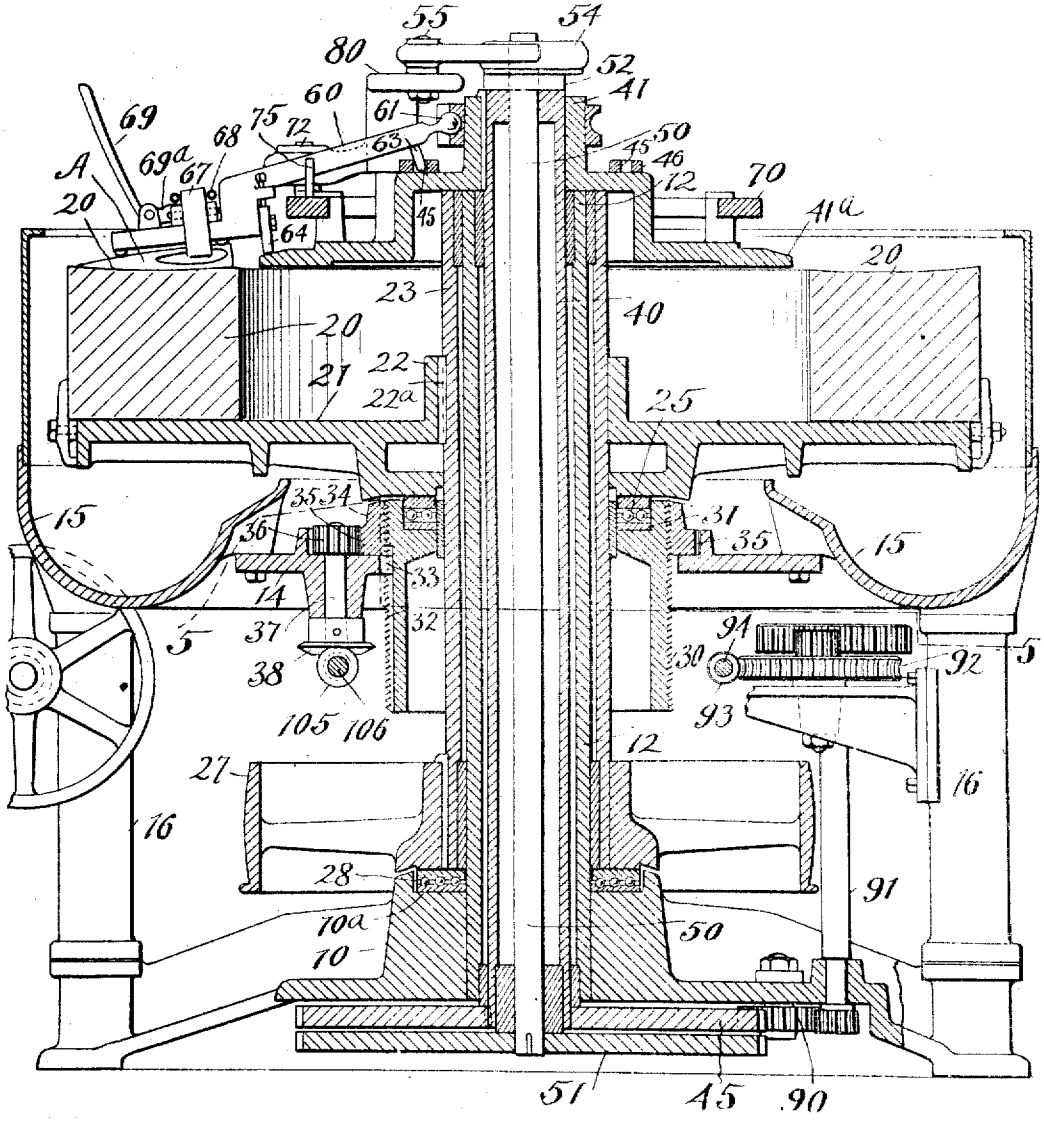
APPLICATION FILED APR. 9, 1917.

1,268,967.

Patented June 11, 1918.

3 SHEETS—SHEET 1.

Fig. 1.



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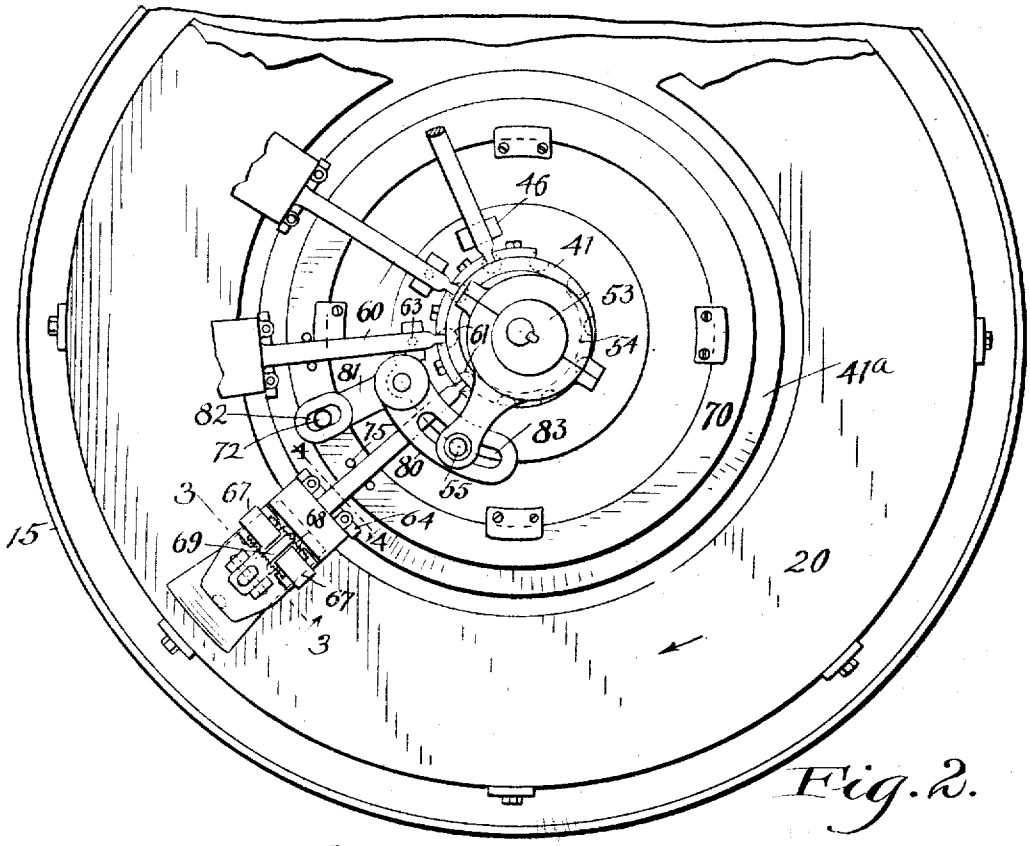


Fig. 2.

Fig. 3.

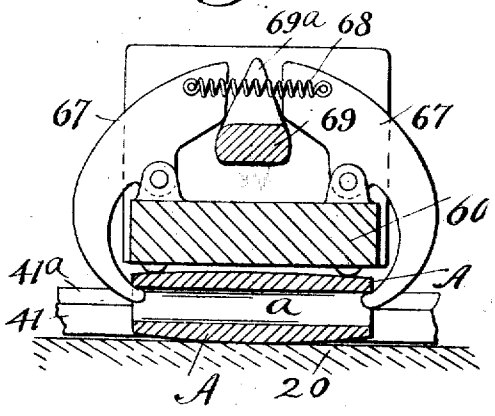
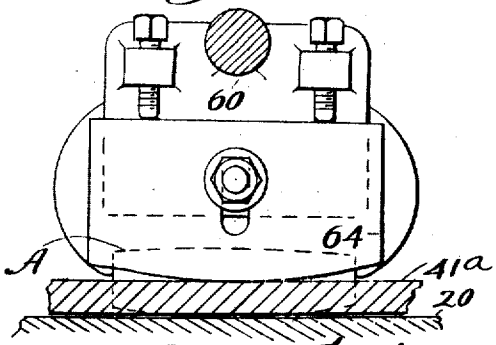


Fig. 4.



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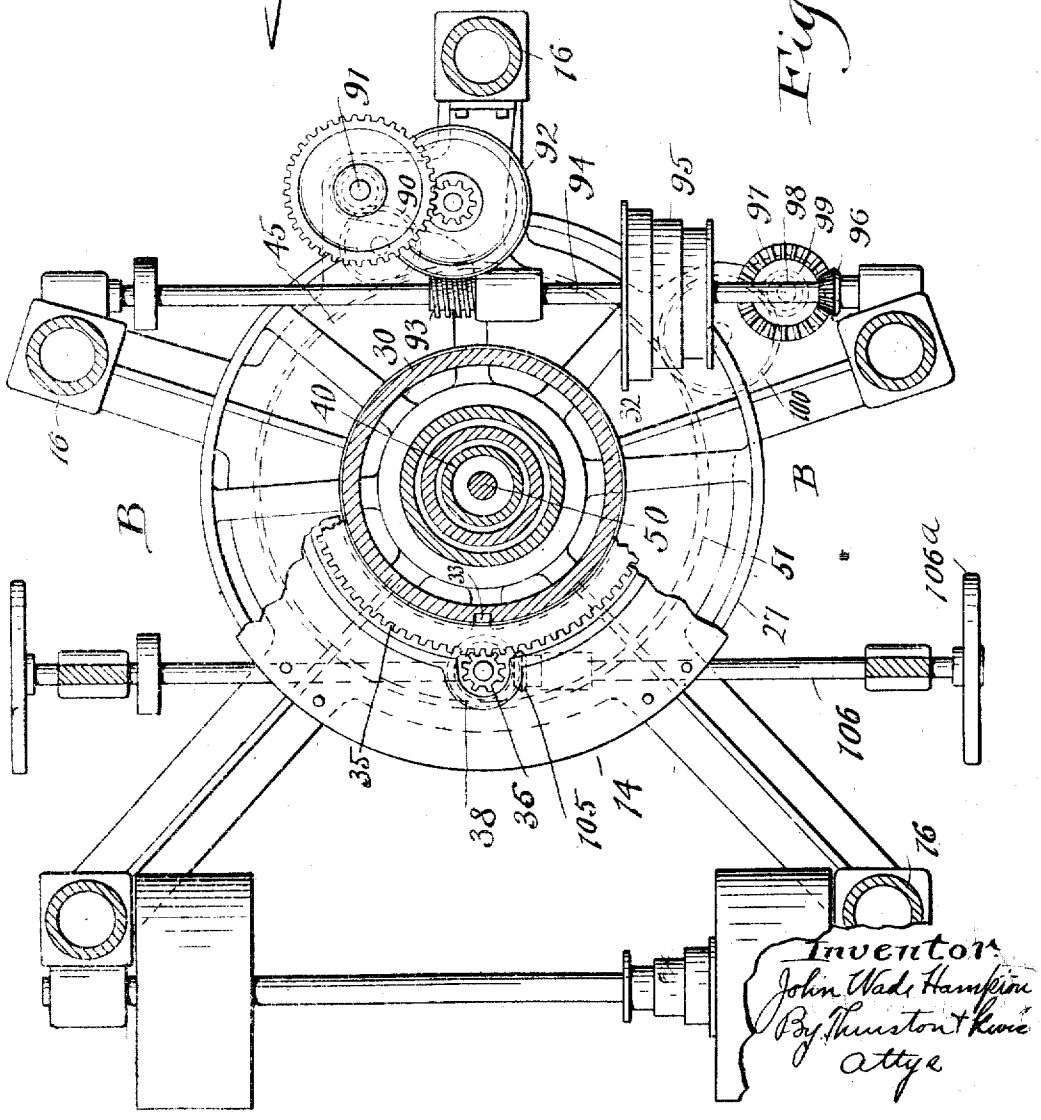
Patented June 11, 1918.

3 SHEETS—SHEET 3.

Fig. 6.



Fig. 5.



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UNITED STATES PATENT OFFICE.

JOHN WADE HAMPTON, OF BEREA, OHIO, ASSIGNOR TO THE CLEVELAND STONE COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO.

GRINDING-MACHINE.

1,268,967. Specification of Letters Patent. Patented June 11, 1918.

Application filed April 9, 1917. Serial No. 160,604.

To all whom it may concern:

Be it known that I, JOHN WADE HAMPTON, a citizen of the United States, residing at Berea, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Grinding-Machines, of which the following is a full, clear, and exact description.

When ax heads, or axes, as they are commonly called and as they will be hereinafter called, come from the forge, they have to be ground into shape and sharpened. The conventional shape to which these ax forgings have to be ground is shown in Figure 6 of the drawings. They are slightly convex on both sides, and the sharpened edge is also slightly convex.

The present invention resides in the machine shown in the drawing, so constructed that a plurality of ax forgings may be put into its embrace after they come from the forge, whereupon the machine will automatically grind them into the required shape so far as concerns the sides and cutting edge thereof.

The invention consists in the construction and combination of parts which are embodied in the machine shown in the accompanying drawings and are hereinafter described, all as definitely pointed out in the appended claims.

In the drawings, Fig. 1 is a vertical sectional view of a machine in which the invention is embodied; Fig. 2 is a plan view of said machine; Fig. 3 is a sectional end view on line 3—3 of Fig. 2 of one of the ax holding arms and an ax held thereby; Fig. 4 is a sectional view of one of the arms in the line indicated by 4—4 on Fig. 2; Fig. 5 is a sectional plan view, the section being in the plane indicated by line 5—5 on Fig. 1; and Fig. 6 is a view of such an ax as may be ground into shape in the machine shown in the other views.

The frame work of the machine includes a base 10 and vertical tubular post 12 which rises from the center of the base, suitable legs 16, an annular trough 15 supported by said legs, an annular table fixed to said trough, and various brackets to be hereinafter referred to to whatever extent may be necessary.

The grindstone 20 is a horizontally disposed annulus; and the grinding of the axes is done by the upper surface of this grindstone which is properly shaped and kept in shape for the purpose. The grindstone is supported upon a rotatable annular platform 21, having a sleeve 22 which embraces and fits upon a vertical rotatable shaft 23 which is concentric with and outside of the post 12; and said sleeve 22 has a sliding driving tongue and groove connection 22^a with this shaft. The platform 21 is supported on an antifriction step bearing 25 carried by a vertically movable externally threaded sleeve 30 which has a sliding engagement with the shaft 23 and has in its top a recess 3 for the reception of the antifriction step bearing 25. This sleeve 30 is concentric with the post 12, and is vertically movable with respect thereto. It passes through a hole in the table 14 and is formed with a vertical groove 32 for the reception of a tongue 33 fixed to that table whereby this sleeve may not rotate. A nut 34 which is screwed onto the sleeve 30 rests and is rotatable upon the table 14. This nut is formed with external gear teeth 35 which are in mesh with a pinion 36 fixed to a vertical shaft 37. This passes through and is rotatably mounted in a bearing which is a part of the table 14. The shaft 37 has at its lower end a beveled gear 38 which meshes with a bevel gear 105 fixed to a horizontal shaft 106, mounted in suitable bearings and having an operating hand wheel on each end. When the shaft 37 is turned, the nut 34 is rotated and the sleeve 30 will thereby be raised with the result of raising the platform 21 and the grindstone thereon. This vertical adjustment of the grindstone is for the purpose of keeping the upper operative face thereof in substantially the same plane as said face is ground off by the operation of the machine.

The shaft 23 has a belt pulley 27 keyed to it near its lower end, and this shaft and pulley are supported by an antifriction step bearing 28 mounted in a recess 10^a in the base 10 of the machine. It is to be understood that a belt will engage with this pulley 27 whereby the grindstone will be turned.

Concentrically arranged within the post 12 and rotatably mounted therein is a vertical tubular shaft 40. This shaft has rigidly secured to its upper end a head 41 and this head rests upon the upper ends of the post

12 and the vertical shaft 23, and thereby the tubular shaft 40 is supported in the position shown. A large gear 45 is fixed to the lower end of the shaft 40, and thereby it may be turned by a suitable train of gearing which will be presently described. This vertical shaft 40 may have the desired speed relative to that of the grindstone.

Rotatable in bearings carried by this tubular shaft 40, and concentrically disposed therein, is a shaft 50 which projects at both ends from said tubular shaft and it has a large gear 51 fixed to its lower end whereby it may be rotated. The collar 52 is fixed to its upper end and this rests upon the upper end of the shaft 40 whereby the shaft 50 is maintained in the stated position. There is also fixed to the projecting upper end of the shaft 50 an eccentric 53 which may be a part of the collar 52. All three of the described shafts 40 and 50 and the shaft 23 and with it the grindstone are all rotated in the same direction but at different speeds by suitable mechanism, some of which has already been partly explained.

A plurality of ax holding levers 60 are connected, each by a ball and socket joint 61 with the head 41, and extend from the said ball and socket connection in a substantially radial but downwardly inclined direction toward the upper surface of the grindstone 20; and each of these arms is provided at its free end with means by which to clamp to its under face an ax head to be ground.

There is an oscillating ring 70 mounted upon the head 41 in a horizontal position, said ring being concentric with the post 12. A bell crank lever 80 is pivoted on a vertical axis to the head 40 and one arm 81 of this lever has near its outer end a horizontal slot 82. A vertical pin 72 fixed to the ring 70 projects up into this slot. The other arm of this bell crank lever 80 has a long arc-shaped slot 83. The eccentric 53 above referred to is surrounded by an eccentric strap 54 which is connected with the arm of the lever 80 through which said long arc-shaped slot 83 is formed by means of a pin 55 which may be fixed to the lever 80 at any point in the length of said slot 83. It is obvious, therefore, that as the shaft 50 turns this lever 83 will be rocked, with the result of imparting to the ring 70 a back and forth oscillating movement with respect to the head, the length of which movement may be varied as desired.

It is to be remembered, however, that the pivot of the lever 80 is carried by the head 41, and that this head constantly is rotating because it is fixed to the rotating shaft 40.

Associated with each lever 60 are means carried by this ring 70 for causing said levers to oscillate about their ball and socket connections with the head, said means consisting of two pins 75 which extend upon opposite sides and into engagement with the lever 60.

It is obvious therefore that each ax holding lever 60 will have imparted to it a peculiar motion, namely, it will oscillate on a circular arc of which the center is the center of the ball and socket joint by which it is connected with the head 41, and of course this movement will be imparted to the ax head with the result of grinding the curved cutting edge on said ax.

It is desirable also that the ax shall have a rocking motion from side to side in contact with the grinding face of the grindstone in order to grind the outer face of the ax into the conventional convex shape. This slight rocking motion or twisting of the arm 60 is produced by means of a pin 63 which is fixed to and extends downward from the lever 60 into a hole 45 in a part 46 rigidly fastened to the rotating head 40. This arm 60 oscillates in an arc of which the ball and socket joint is the center. The lower part of this arm 60, or rather the lower end of the pin 63 is restricted in this oscillating movement by its engagement in the hole 45 of the part 46. This rocking motion of each ax in contact with the grindstone causes the side of the ax to be ground into convex form. But the exact shape of this surface is determined by a pattern block 64 fixed to the arm, which block when the surface of the ax is nearly finished will come down into contact with a flange 41^a on the head. The engagement of this pattern block with this flange also limits the downward movement of the arm and ax and therefore determines when the grinding thereof shall cease.

While only one of the ax holding levers 60 is shown completely in the drawings, the places for the connection in the machine of numerous other similar arms are shown; and it is to be understood that ten of these arms more or less are to be pivoted in the described manner to the head 40 and to project therefrom in substantially radial downwardly inclined directions so that the axes fixed to the ends of these arms will engage the top surface of the rotating grindstone.

At the outer end of each of these lever arms 60 are means as stated for holding the ax. These means consist of two jaws 67 pivoted to the arm 60, the lower ends of which are beveled and are adapted to enter the eye *a* of the ax head A, and clamp it up against the under face of the arm 60. A spring 68 connects the upper ends of these two jaws and tends to move them so as to release the ax when permitted so to do. There is, however, a lever 69 pivoted to the arm 60 having a wedge-shaped operating lug 69^a which will go between and

engage the upper ends of these two jaws and move them and hold them in the operative position where they in turn will hold the ax.

The means shown for rotating the tubular shaft 40 consists of a train of gears of which the terminal gear 90 engages the gear 45 on the lower end of this shaft. This train of gears includes the vertical shaft 91, and the other terminal member of this train is a worm wheel 92 which is engaged by a worm 93 on a worm shaft 94 which carries step pulleys 95 by means of which this shaft may be rotated at either of three speeds according to requirements.

The gear 51 which is fixed to shaft 50 also receives its rotary motion from this same shaft 50, through a bevel gear 96 fixed to the said shaft in engagement with a bevel gear 97 that is fixed to a vertical shaft 98 having on its lower end a pinion 99 which in turn engages with a pinion 100 which in turn engages with the gear 51.

The operator of a machine of this sort may stand adjacent either side of the machine adjacent the positions marked B—B on Fig. 5, and he will put into the grasp of each pair of jaws 67 one of the ax heads to be ground, and then allow its weight and the weight of the outer end of the arm 60 to carry the lower face of this ax against the top surface of the grindstone.

The grindstone will be revolving at about three hundred turns per minute. The shaft 40 will be rotated at a speed such that it will turn through one complete revolution or one half a revolution during that period of time required to grind the face of the ax, say about 10 to 14 minutes.

The shaft 50 will be rotated at about seven to nine revolutions per minute. Therefore, while any given arm 60 is being moved around the circle from the point at which the ax is fastened thereto until it gets back to substantially the same point, said lever will be rocked sidewise by the oscillation of the ring 70 from seventy to one hundred and twenty five times, and each time said lever will have the slight rocking movement which will cause the grinding wheel to put the convex face on said ax.

In using the above described machine, the operator stands at or near one or the other of the two positions indicated by B on Fig. 5, where he is within easy reach of one of the hand wheels on the shaft.

As each of the ax holding arms 60 comes to him he puts an ax in the embrace of the clamping devices 67 thereon and lets that ax drop down onto the rotating grindstone; and he does this until each of these arms carries an ax in the position stated. The slowly rotating head carries each of these arms entirely around and back to the starting point. As it is being so carried, it is being oscillated as upon the substantially vertical axis of the ball and socket connection with said head by the oscillating ring 70. At the same time said arm is being oscillated about the longitudinal axis of said arm. At all times the face of the ax is being pressed down by its own weight and the weight of the arm on the upper surface of the rotating grindstone,—with the result that before any arm comes around to the loading position referred to, the face of the ax will have been ground into the desired shape. During the last part of this grinding operation the pattern block will have come into contact with the flange 41ª on head 41, and this engagement accomplishes two useful purposes, viz., first it causes the twisting oscillation of the arm 60 to take place in a precise path such as results in the accurate shaping of the convex surface of the ax; and second, it limits the downward movement of the arm and consequently prevents the grinding away of the ax after it has been ground to the extent desired.

As each arm 60 reaches the loading position, the ax whose surface has been ground will be removed and another ax put in its place. Obviously, therefore, a plurality of axes, as many as there are arms, may be undergoing the grinding operation at the same time. With some jobs, the grinding may be accomplished while the head is turning one half of one revolution. In that event an operator may be stationed at each of the loading positions marked B; and each man will take from each arm the ground ax which the other man put onto said arm.

The rates of rotation of the head 41 and shaft 50 may be easily changed without changing the rate of rotation of the grindstone by shifting the driving belt to one or the other of the cone pulleys 95 on shaft 94.

Having described my invention, I claim:—

1. In a machine of the character specified, the combination of a rotatable horizontal grindstone having a shaped top grinding surface, a concentric rotatable head, means to simultaneously rotate said grindstone and head, the former rapidly and the latter slowly, a work holding arm pivoted to said head and extending over and toward said grindstone, means to clamp the work to the under side of the outer end of said arm, and means to oscillate said arm about the substantially vertical axis of the pivotal connection between it and said head as said pivotal connection is being carried around with said head.

2. In a machine of the character specified, the combination of a rotatable horizontal grindstone having a shaped top grinding surface, a concentric rotatable head, means to simultaneously rotate said two parts, the former rapidly and the latter slowly, a work holding arm connected to said head by a pivotal connection which permits the arm

to oscillate its own longitudinal axis, and means to compel said arm to oscillate upon its longitudinal axis and at the same time to go with the head as it is turned about its axis.

3. In a machine of the character specified, the combination of a rotatable horizontal grindstone having a shaped top grinding surface, a concentric rotatable head, means to simultaneously rotate said grindstone and head, the former rapidly and the latter slowly, a work holding arm connected with said head by a ball and socket joint and extending over and toward said grindstone, means to clamp the work to the under side of the outer end of said arm, and means to oscillate said arm about the substantially vertical axis of the universal connection between it and said head.

4. In a machine of the character specified, the combination of a rotatable horizontal grindstone having a shaped top grinding surface, a concentric rotatable head, means for simultaneously rotating said two parts, the former rapidly and the latter slowly, a work holding arm having a universal joint connection with said head and extending over and toward said grindstone, and means to compel said arm to oscillate upon its longitudinal axis and at the same time go with the head as it is turned about its own axis.

5. In a machine of the character specified, the combination of a rotatable horizontal grindstone having a shaped top grinding surface, a concentric rotatable head, means for simultaneously rotating said two parts the former rapidly and the latter slowly, a work holding arm connected with said head by universal joint and extending over and toward said grindstone, means to clamp the work to the under side of the outer end of said arm, means to oscillate said arm about the substantially vertical axis of the universal joint connections between it and the head and to at the same time oscillate the said arm about its own longitudinal axis.

6. In a machine of the character specified, the combination of a rotatable horizontal grindstone having a shaped top grinding surface, a concentric rotatable head, means for simultaneously rotating said two parts, the former rapidly and the latter slowly, a work holding arm connected to said head by a universal joint connection and extending therefrom over and toward said grindstone, a ring supported upon said head, and means for imparting to said ring an oscillating movement relative to said head and concentric with it, and means through which the oscillation of said ring will impart an oscillating movement to the work carrying arm.

7. In a machine of the character specified, the combination of a rotatable horizontal grindstone having a shaped top grinding surface, a concentric rotatable head, means for simultaneously rotating said two parts, the former rapidly and the latter slowly, a work holding arm connected to said head by a universal joint connection and extending therefrom over and toward said grindstone, a ring supported upon said head, and means for imparting to said ring an oscillating movement relative to said head and concentric with it, and other means through which the oscillation of said ring will cause said arm to oscillate about its own longitudinal axis.

8. In a machine of the character specified, the combination of a rotatable horizontal grindstone having a shaped top grinding surface, a concentric rotatable head, means for simultaneously rotating said two parts, the former rapidly and the latter slowly, a work holding arm connected to said head by a universal joint connection and extending therefrom over and toward said grindstone, a ring supported upon said head, and means for imparting to said ring an oscillating movement relative to said head and concentric with it, and other means through which the oscillation of said ring will cause said arm to oscillate about its own longitudinal axis, a pattern plate fixed to said work holding arm, and a flange carried by said head with which said pattern plate will engage when the operation of grinding is nearly completed.

9. In a machine of the character specified, the combination of a rotatable horizontal grindstone having a shaped top grinding surface, a concentric rotatable head, means for simultaneously rotating said two parts the former rapidly and the latter slowly, a work holding arm connected to said head by a universal joint connection and extending therefrom over and toward said grindstone, a ring supported concentrically upon said head and engaging said arm, a bell crank lever pivoted to said head, a connection between said ring and one arm of said bell crank lever, and means engaging the other lever arm to cause said lever to oscillate upon its pivotal support.

10. In a machine of the character specified, the combination of a rotatable horizontal grindstone having a shaped top grinding surface, a concentric rotatable head, means for simultaneously rotating said two parts the former rapidly and the latter slowly, a work holding arm connected to said head by a universal joint connection and extending therefrom over and toward said grindstone, a ring supported concentrically upon said head and engaging said arm, a bell crank lever pivoted to said head, a connection between said ring and one arm of said bell crank lever, and means engaging the

other lever arm to cause said lever to oscillate upon its pivotal support, a concentric vertical shaft, an eccentric fixed thereto, an eccentric strap about said eccentric, and an adjustable connection between said eccentric strap and the other arm of said bell crank lever.

11. In a machine of the character specified, the combination of a rotatable horizontal grindstone having a shaped top grinding surface, a concentric rotatable head, means for simultaneously rotating said two parts,—the former rapidly and the latter slowly, a plurality of work holding arms connected to said head by universal joint connections and extending therefrom over and toward said grindstone, a ring concentrically mounted upon said head, means to oscillate said ring about its axis relative to said head, and means producing an operative engagement between said ring and all of said work holding arms.

12. In a machine of the character specified, the combination of a rotatable horizontal grindstone having a shaped top grinding surface, a concentric rotatable head, means for simultaneously rotating said two parts, —the former rapidly and the latter slowly, means to adjust said grindstone vertically upward, a work holding arm connected with said head by a ball and socket joint and extended over and toward said grindstone, means to clamp the work to the under side of the outer end of said arm, and means to oscillate said arm about the substantially vertical axis of the universal connection between it and said head.

13. In a machine of the character specified, the combination with a base having an upright cylindrical post, a shaft rotatably mounted around and upon said post, a grindstone supporting platform which embraces said shaft and has a sliding driving connection therewith, a step bearing supporting said platform, an annular grindstone supported upon said platform having a shaped top grinding surface, a tubular shaft concentrically mounted within said post, a head fixed to the projecting upper end of said shaft, a work holding arm connected with said head by universal joint connection and extending therefrom over and toward the grindstone, a ring concentrically mounted upon said head, connections between it and said arm, a shaft concentrically mounted within the head carrying tubular shaft, a bell crank lever pivoted to said head and operatively connected with said oscillating ring, an eccentric fixed to the projecting upper end of said central shaft means connecting it with the other arm of said bell crank lever, and means for rotating the said three shafts at different rates of speed.

14. In a machine of the character specified, the combination of a base having a cylindrical tubular upright post, a tubular shaft around and rotatably mounted upon said post, a platform around and concentric with said shaft and having a sliding driving connection therewith, a step bearing for said platform, a vertically adjustable member supporting said step bearing, means to adjust said member vertically, and means to rotate said shaft.

15. In a machine of the character specified, the combination of a base having a cylindrical tubular upright post, a tubular shaft around and rotatably mounted upon said post, a platform around and concentric with said shaft and having a sliding driving connection therewith, a step bearing for said platform, an externally threaded cylindrical tubular member supporting said step bearing, means to prevent the rotation of said member, a rotatable threaded nut having external gear teeth which is screwed onto said member, a fixed table on which said nut is supported, a pinion engaging said nut, and means to rotate said pinion.

16. In a machine of the character specified, the combination of a rotatable horizontal grindstone, a concentric rotatable head, and a concentric rotatable shaft, means to simultaneously rotate said three rotatable members at different rates of speed, the grindstone rapidly, the head very slowly, and the shaft at an intermediate rate, a ring mounted concentrically upon said head and capable of oscillation thereon about its axis, a bell crank lever pivoted on a vertical axis to said head and connected with said ring, an eccentric fixed to the rotatable shaft, an eccentric strap embracing the same and connected with the other end of said bell crank lever, a plurality of work holding arms pivoted to said head and extending outward therefrom over said ring and downward to the top surface of the grindstone, means carried by the outer ends of these arms for holding the work, and means carried by said oscillating ring engaging the several arms to cause the arms to oscillate on their pivotal connection with said head.

In testimony whereof, I hereunto affix my signature.

JOHN WADE HAMPTON.