O. J. JOHNSON.

GRINDING MACHINE.

APPLICATION FILED FEB. 5, 1910.

1,014,306.

Patented Jan. 9, 1912.

4 SHEETS—SHEET 1.

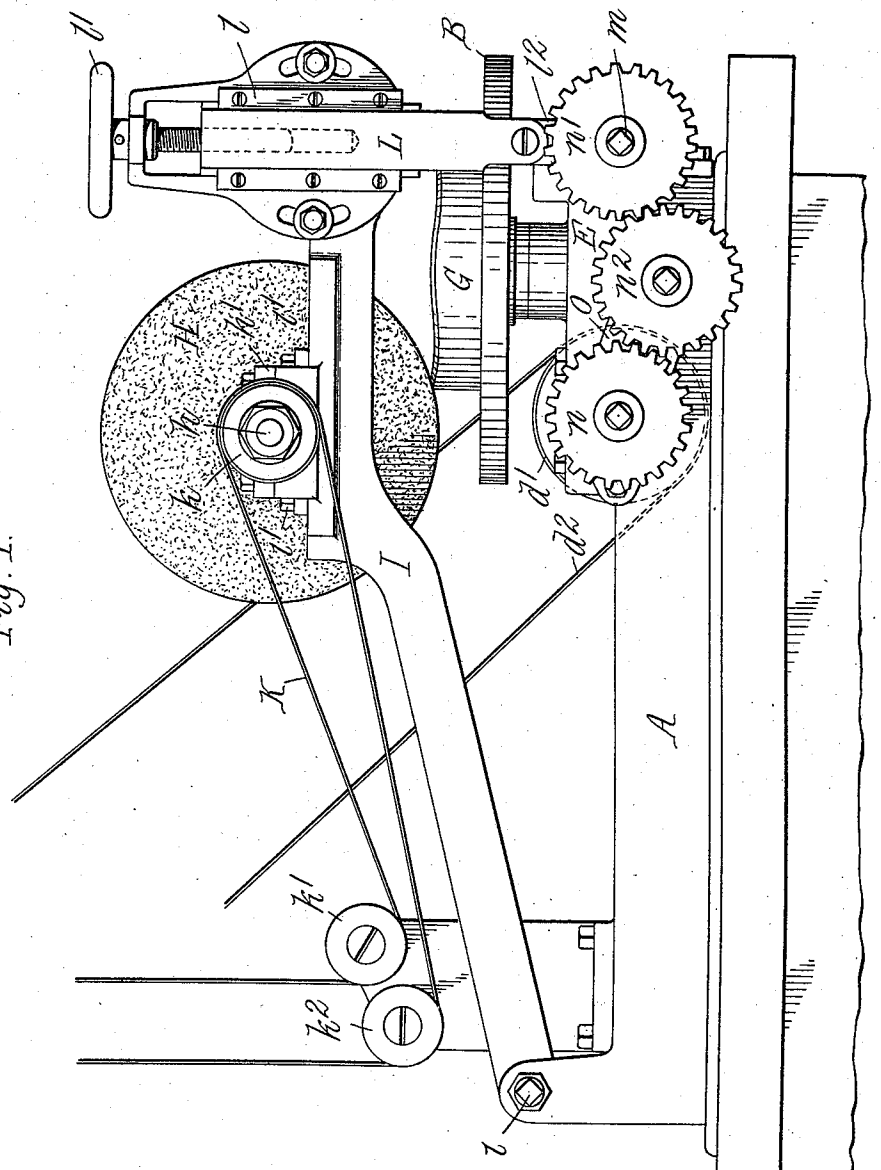

Fig. 1.

Witnesses.
A. G. Dimond.
C. H. Bund.

Inventor.
Oliver J. Johnson,
By Wilhelm, Parker & Hand,
Attorneys.

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4 SHEETS—SHEET 2.

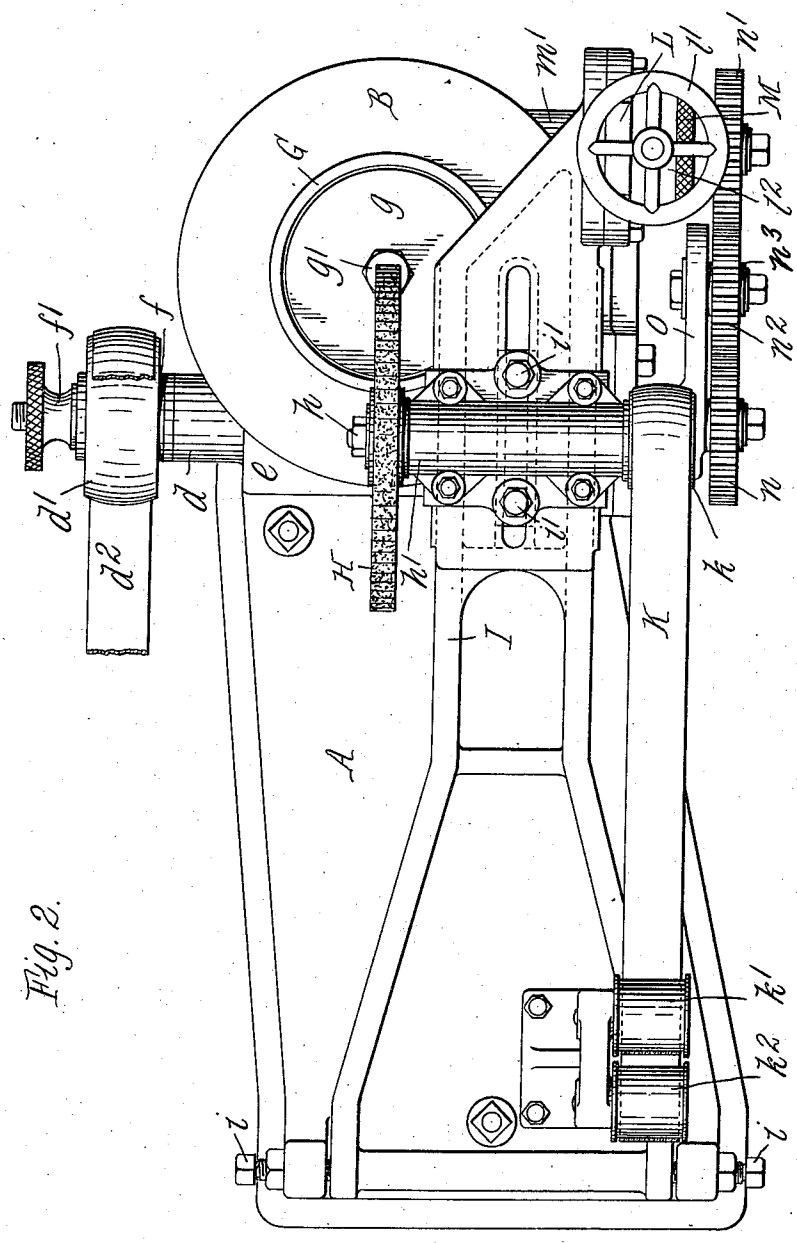

Fig. 2.

Witnesses.
A. G. Dimond.
C. H. Bund.

Inventor.
Oliver J. Johnson,
By William Parker & Hard,
Attorneys.

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

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4 SHEETS—SHEET 3.

Fig. 3.

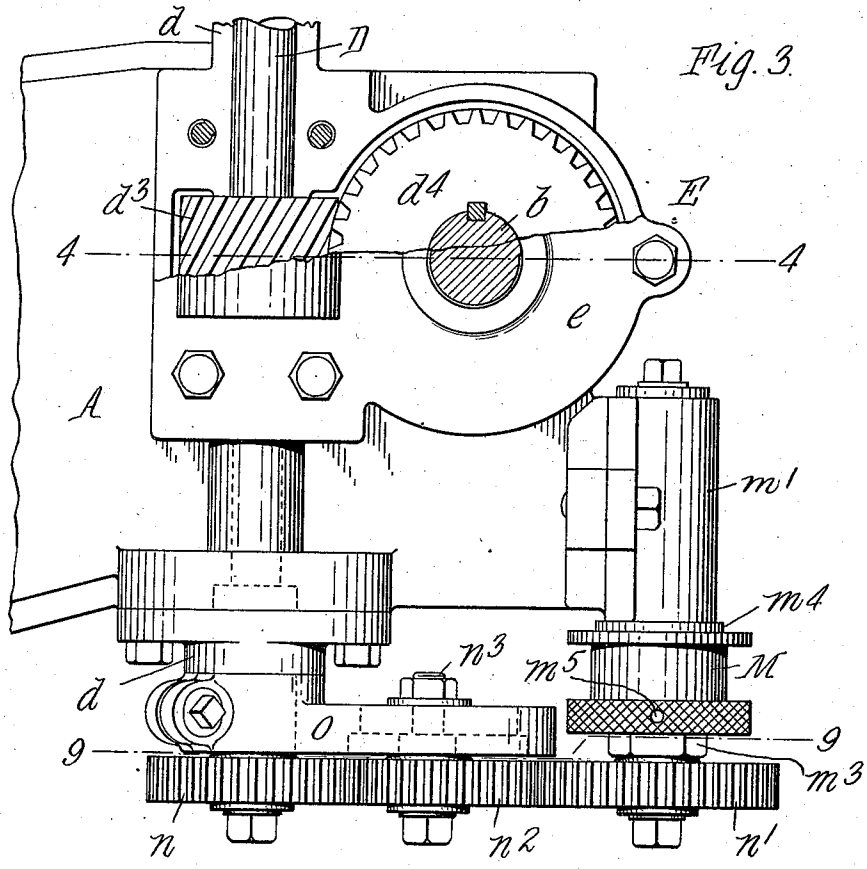
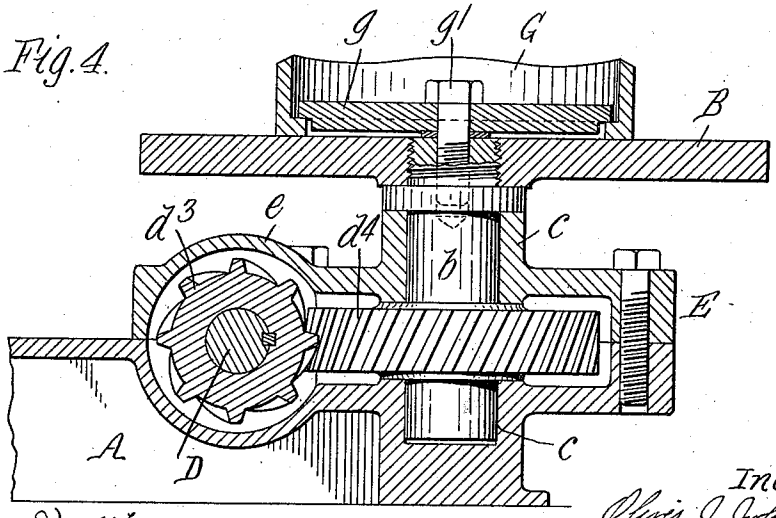


Fig. 4.



Witnesses.
A. G. Dimond.
C. H. Bund.

Inventor.
Oliver J. Johnson.
By Wm. Wallace Parker & Hand
Attorneys.

O. J. JOHNSON.

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4 SHEETS—SHEET 4.

Fig. 5.

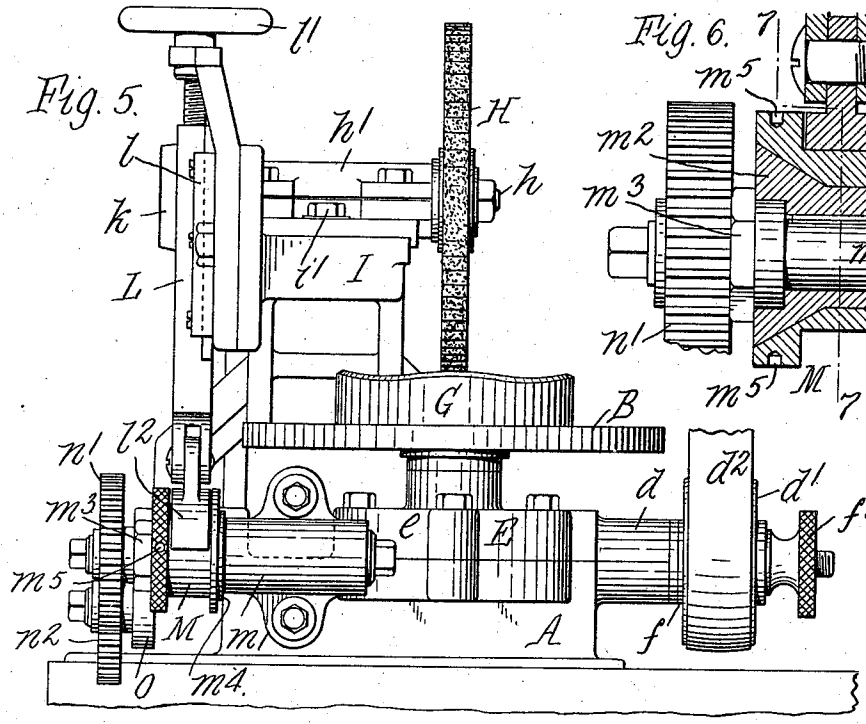


Fig. 6.

Fig. 7.

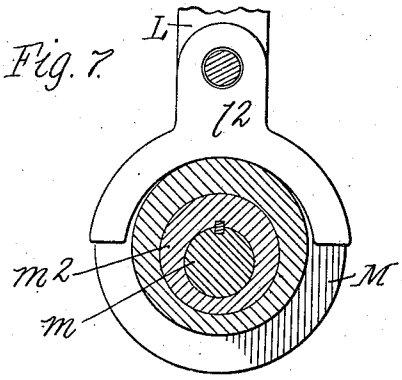


Fig. 8.

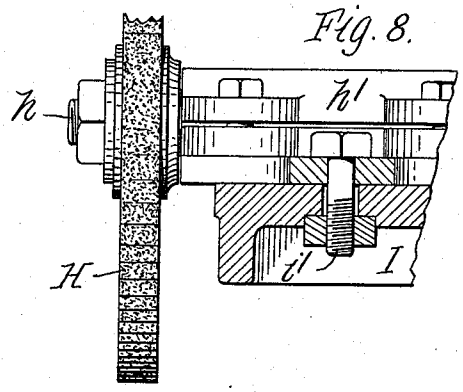
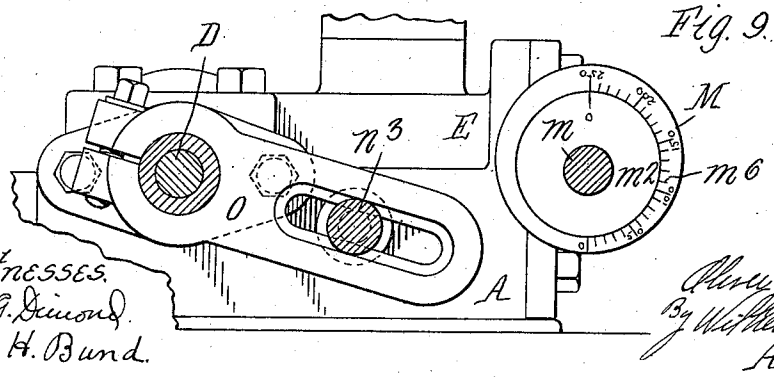


Fig. 9.



Witnesses.
A. G. Dimond.
C. H. Bund.

Inventor.
Oliver J. Johnson,
By Whittemore, Parker & Hard,
Attorneys.

UNITED STATES PATENT OFFICE.

OLIVER J. JOHNSON, OF WHEELING, WEST VIRGINIA.

GRINDING-MACHINE.

1,014,306. Specification of Letters Patent. Patented Jan. 9, 1912.

Application filed February 5, 1910. Serial No. 542,360.

To all whom it may concern:

Be it known that I, OLIVER J. JOHNSON, a citizen of the United States, residing at Wheeling, in the county of Ohio and State of West Virginia, have invented a new and useful Improvement in Grinding-Machines, of which the following is a specification.

This invention relates to metal grinding machines and more particularly to machines for grinding the cutting edges of circular dies of the sort which are employed for cutting can caps and ends from metal sheets. These dies preferably have a cutting edge with one or more raised portions forming shear points, and while machines embodying the invention are primarily intended for grinding such cutting edges, they are nevertheless adapted for grinding flat and regular and irregular curved surfaces on various other articles.

One of the objects of the invention is to produce a practical and efficient machine for grinding the cutting edges of dies, which is universally adjustable for grinding dies of different dimensions and to produce other straight edges or edges having one or more shear points, or elevated portions, as may be required.

Other objects of the invention are to produce a grinding machine of the character stated which is of simple, compact, inexpensive and durable construction, and is adapted to be quickly and easily adjusted for grinding different articles; and also to improve grinding machines in the respects hereinafter described and set forth in the claims.

In the accompanying drawings, consisting of four sheets: Figure 1 is a side elevation of a grinding machine embodying the invention. Fig. 2 is a plan thereof. Fig. 3 is a fragmentary plan thereof, partly in section, on an enlarged scale. Fig. 4 is a fragmentary sectional elevation in line 4—4, Fig. 3. Fig. 5 is an end elevation thereof. Fig. 6 is a detail sectional elevation of the controlling device for the grinding wheel. Fig. 7 is a sectional elevation thereof in line 7—7, Fig. 6. Fig. 8 is a detail sectional elevation of the securing means for the bearing for the grinding wheel. Fig. 9 is a fragmentary sectional elevation of the machine in line 9—9, Fig. 3.

Like reference characters refer to like parts in the several figures.

A represents the base or frame of the machine, which may be of any suitable construction, either formed with a supporting stand or adapted to be secured on a suitable support or bench, as preferred.

B represents a rotary work table or plate on which the die or article to be ground is secured and by which it is rotated during the grinding operation to present successive portions of the article to the grinding wheel. In the construction illustrated, this table is screwed on the upper end of a vertical spindle or shaft b which is journaled in a suitable bearing c on the base A of the machine, and is geared to a horizontal drive shaft D which is journaled in suitable bearings d on the base A and is provided at one end with a pulley d' for a driving belt d^2. Preferably the drive shaft is geared to the table spindle by a worm d^3 and worm wheel d^4 which run in oil in a closed housing E formed by a hollow portion of the stationary base A and having a removable cover plate e, see Fig. 4. The pulley d' is preferably mounted loosely on the end of the drive shaft between a collar f and a nut f' screwed on the end of the shaft. The pulley can be secured to turn with the shaft by tightening this nut f', or it can be released to run loosely on the shaft by unscrewing the nut.

G represents the die or article to be ground which is secured on the table B in any suitable way, for instance, by a clamping plate g which bears on an internal shoulder of the die and is forced toward the table to clamp and hold the die by a central screw g' passing through a hole in the clamping plate into a threaded hole in the upper end of the table shaft.

The invention is not limited to the particular manner of securing and revolving the die or article, and the means described or any other suitable means for the purpose can be employed.

H represents the grinding wheel which may be of any usual or suitable construction. The grinding wheel is secured to a shaft h which is journaled in a bearing or box h' carried by a supporting frame or arm I, which is pivoted at one end by screw pivots i to the base A of the machine, or the grinding wheel can be otherwise mounted to move vertically toward and from the work table. The grinding wheel is also adjustable horizontally over the table toward and from the center thereof so as to properly engage the edges of dies or other articles of different

diameters. As shown in Figs. 2 and 8, the bearing box for the grinding wheel shaft is adjustably secured on the movable frame I by bolts i' passing through an elongated slot in the frame.

The grinding wheel may be driven by any suitable means which will permit the described vertical movement of the wheel toward and from the table and the horizontal adjustment thereof over the work table. A drive belt K is shown passing around a pulley k on the grinding wheel shaft and around guide sheaves k' k^2 journaled on a bracket or support rising from the base A adjacent to the pivoted end of the movable frame I.

The supporting frame I for the grinding wheel is movably supported by a driven eccentric, cam or controlling device whereby the grinding wheel is raised and lowered one or more times during each revolution of the work table B and die for forming raised portions or shear points on the die, or whereby the grinding wheel may be retained always at the same elevation for grinding a straight edge. In the machine shown, a supporting leg L, Figs. 1 and 5, which is slidably mounted in guides l on the free end of the movable frame I and is adapted to be adjusted vertically in the guides by a hand screw l', bears at its lower end by a pivoted shoe l^2 on an eccentric or cam M secured on a driven horizontal shaft m which is journaled in a suitable bearing m' on the base A. The grinding wheel can be adjusted vertically by the hand screw l', as required to cause it to properly engage the work, and it is also fed downwardly from time to time as the grinding proceeds by turning the hand screw. The eccentric M, Figs. 6 and 7, is preferably mounted eccentrically to its periphery and loosely on a bearing sleeve m^2 which is splined on the shaft m to turn therewith. This bearing sleeve is adapted to be moved endwise on the shaft and is provided with a tapering or conical portion fitting in a correspondingly shaped portion of the hole in the eccentric. A nut m^3 screwed on the threaded end of the shaft at the outer end of the bearing sleeve is adapted to force the sleeve into the eccentric M and clamp the latter tightly between the conical portion of the sleeve and a flange or collar m^4 on the shaft to thereby rigidly hold the eccentric. By loosening the nut m^3 the eccentric is freed so that it can be rotatably adjusted on the bearing sleeve for the purpose of increasing or decreasing the throw of the eccentric and consequently the rise and fall of the pivoted frame I and the grinding wheel mounted thereon. By thus mounting the eccentric M on a bearing sleeve which is eccentric to the shaft and also to the eccentric itself, it is possible to adjust the eccentric so that it will be either concentric with the shaft, in which case it will produce no vertical motion of the movable frame I and grinding wheel, or to adjust the eccentric to a position of greater or less eccentricity for producing a correspondingly longer or shorter up and down motion of the movable frame and grinding wheel. The eccentric M shown has end flanges between which the bearing shoe l^2 is guided, and has holes m^5 in one of these flanges for the engagement of a spanner wrench for turning the eccentric to adjust it. As shown in Fig. 9, the eccentric is also provided on its outer end with a graduated scale m^6 coöperating with an index mark on the bearing sleeve to facilitate the adjustment of the eccentric. The described manner of adjustably mounting the eccentric is desirable, but other means enabling similar adjustments of the eccentric could be used.

In order to drive the eccentric at different speeds relative to the speed of the work table so as to cause one or more up and down movements of the grinding wheel during each revolution of the work table for producing one or more shear points on the die, a change speed drive gearing for the eccentric is employed. The gearing shown consists of gear wheels n and n' on the drive shaft and eccentric shaft m respectively and meshing with an intermediate idle gear wheel n^2. The idle gear wheel n^2 is journaled on a stud n^3 which is adjustable toward and from the drive shaft D on a slotted arm O, Figs. 3 and 9, which has a split end adjustably clamped by a screw on a stationary bearing sleeve which projects from the base A concentric with the drive shaft D, whereby the idle wheel can be caused to properly mesh with different sized gears on the drive and eccentric shafts. The drive gears for the eccentric can be changed in a well known manner to cause one, two or more revolutions of the eccentric M and a corresponding number of up and down movements of the grinding wheel for each revolution of the work table.

In the operation of the machine the die is secured on the work table B and the grinding wheel set to properly engage the edge of the die, as shown in Fig. 1, by adjusting the bearing for the grinding wheel shaft in or out on the movable frame I according to the diameter of the die, and turning the hand screw l' to adjust the grinding wheel to the height of the die. If the die is to be ground with one or more shear points or raised portions, the eccentric M is adjusted to have the proper throw to produce the desired height of the shear points and change speed gears are used which will cause the eccentric to revolve one or more times to each revolution of the work table, depending upon the required number of shear points

on the die. The machine is then started and the grinding wheel is gradually fed toward the work by turning the hand screw l' until the work is ground to the required size and shape. If it is desired to grind a flat edge or surface, the eccentric is adjusted to a position concentric with its shaft, when it will hold the grinding wheel at the same elevation throughout the revolution of the work table, thereby producing a straight edge or surface. By employing controlling devices having different regular or irregular shaped peripheries, edges or surfaces of various different regular or irregular shapes can be produced.

I claim as my invention:

1. In a grinding machine, the combination of a movable work table, a grinding wheel which is mounted to move toward and from the work table at an angle to the plane of movement of said work table, and a driven device which supports said grinding wheel and which by its motion causes said grinding wheel to alternately approach and recede from said work table, substantially as set forth.

2. In a grinding machine, the combination of a rotary work table, a driven grinding wheel, one of said parts being mounted to move toward and from the other at an angle to the plane of rotation of the work table, and a driven mechanism which rotates said work table and includes a rotary device which causes said movably mounted part to alternately approach and recede from said other part during the rotation of said work table, substantially as set forth.

3. In a grinding machine, the combination of a rotary work table, a driven grinding wheel, one of said parts being mounted to move toward and from the other, and driven mechanism which rotates said work table and causes said movably mounted part to alternately approach and recede from said other part during the rotation of said work table, and which is adjustable to cause a greater or less number of movements of said movably mounted parts during a predetermined rotation of said work table, substantially as set forth.

4. In a grinding machine, the combination of a movable work table, a driven grinding wheel which is mounted to move toward and from said work table, and driven mechanism which moves said work table and causes said grinding wheel to alternately approach and recede from said work table and which is adjustable to cause a greater or less number of movements of the grinding wheel during a predetermined movement of said work table, substantially as set forth.

5. In a grinding machine, the combination of a rotary work table, a grinding wheel which is mounted to move toward and from the work table at an angle to the plane of rotation of said work table, and a driven rotary device which by its rotation causes said grinding wheel to approach and recede from said work table, substantially as set forth.

6. In a grinding machine, the combination of a movable work table, a grinding wheel which is mounted to move toward and from the work table, and a driven device which controls the position of the grinding wheel relative to the work table and is adjustable to maintain the grinding wheel at a constant distance from the table or to cause the grinding wheel alternately to approach and recede from said work table, substantially as set forth.

7. In a grinding machine, the combination of a rotary work table, a grinding wheel which is mounted to move toward and from the work table, a driven controlling device which causes the grinding wheel to approach and recede from the work table, and means for changing the speed of the controlling device relative to that of the table for causing the grinding wheel to approach and recede from the work table a greater or less number of times during a revolution of the table, substantially as set forth.

8. In a grinding machine, the combination of a rotary work table, a grinding wheel which is mounted to move toward and from the work table, a driven eccentric for causing the grinding wheel to approach and recede from the work table, and means for regulating the throw of the eccentric, substantially as set forth.

9. In a grinding machine, the combination of a rotary work table, a grinding wheel which is mounted to move toward and from the work table, a driven eccentric for causing the grinding wheel to approach and recede from the work table, means for regulating the throw of the eccentric, and means for changing the speed of the eccentric, substantially as set forth.

10. In a grinding machine, the combination of a rotary work table, a grinding wheel which is mounted to move toward and from the work table, an eccentric for causing the grinding wheel to approach and recede from the work table, a driven shaft for said eccentric, and an eccentric sleeve on said shaft on which said eccentric is rotatably adjustable for regulating the throw of the eccentric, substantially as set forth.

11. In a grinding machine, the combination of a rotary work table, a grinding wheel which is mounted to move toward and from the work table, an eccentric for causing the grinding wheel to approach and recede from the work table, a driven shaft for said eccentric, and an eccentric sleeve on said shaft on which said eccentric is rotatably adjustable for regulating the throw of the eccentric, said eccentric sleeve being

movable longitudinally on said shaft for securing the eccentric when adjusted, substantially as set forth.

12. In a grinding machine, the combination of a work table, a drive shaft geared to the work table for rotating it, a grinding wheel which is mounted to move toward and from the work table, a driven controlling device which causes the grinding wheel to approach and recede from the work table, and a change speed gearing between said drive shaft and said controlling device for driving the latter at different speeds relative to the speed of the work table, substantially as set forth.

13. In a grinding machine, the combination of a rotary work table, a driven grinding wheel, a driven controlling device for causing a relative motion of the grinding wheel toward and from the work table, a supporting device for the grinding wheel which bears on said controlling device, and means for adjusting said supporting device to move the grinding wheel toward the table, substantially as set forth.

Witness my hand in the presence of two subscribing witnesses.

OLIVER J. JOHNSON.

Witnesses:
J. F. BYCOTT,
J. O. PARK.