J. MILLER, JR.

GRINDING OR DRUM SANDING MACHINE.

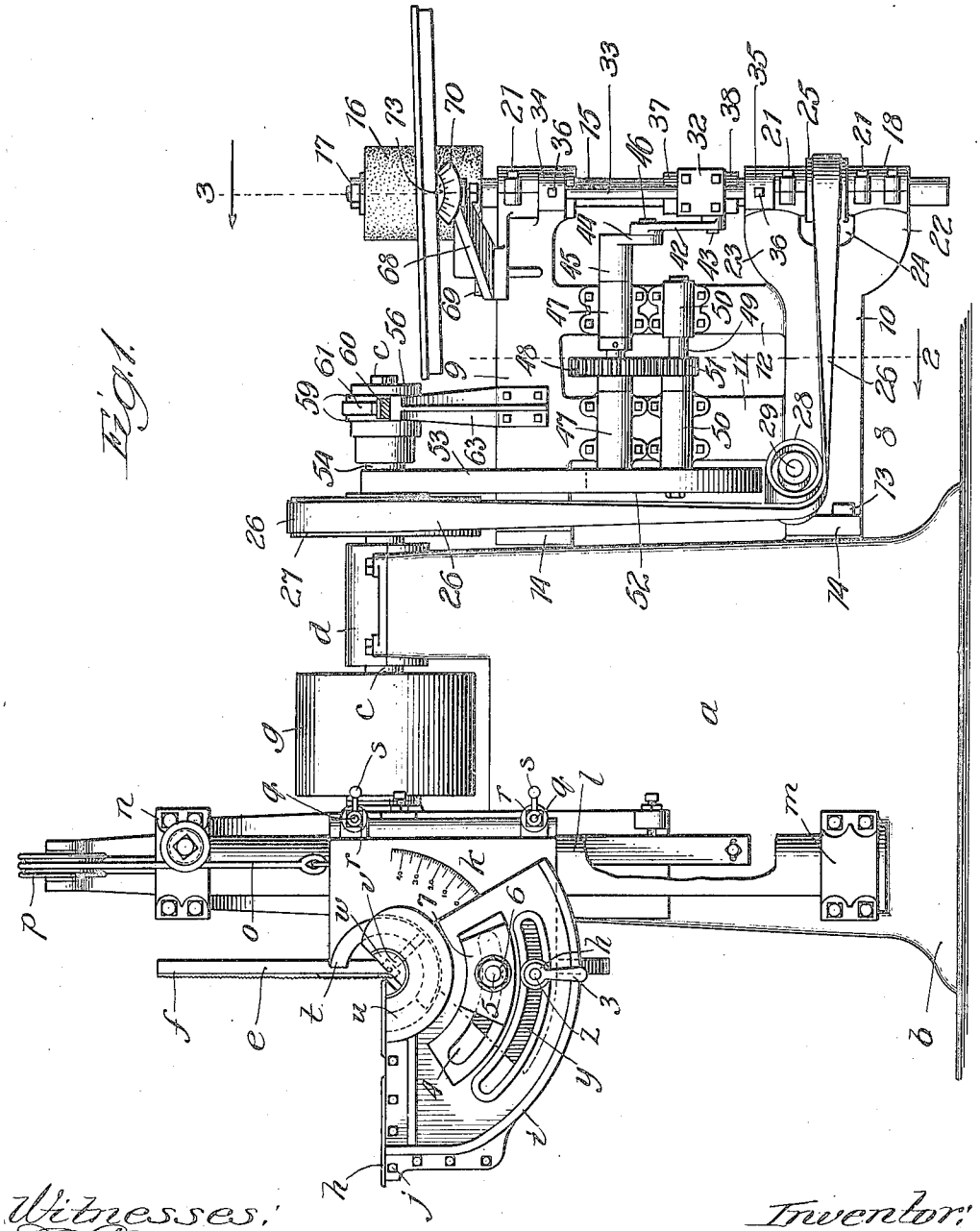
APPLICATION FILED FEB. 19, 1913.

1,107,338.

Patented Aug. 18, 1914.

2 SHEETS—SHEET 1.

Fig. 1.



Witnesses:
C. C. Gaylord.
Chas. H. Buell.

Inventor:
John Miller, Jr.,
By Poole & Crowell
Attys.

J. MILLER, JR.

GRINDING OR DRUM SANDING MACHINE.

APPLICATION FILED FEB. 19, 1913.

1,107,338.

Patented Aug. 18, 1914.

2 SHEETS—SHEET 2.

Fig. 3.

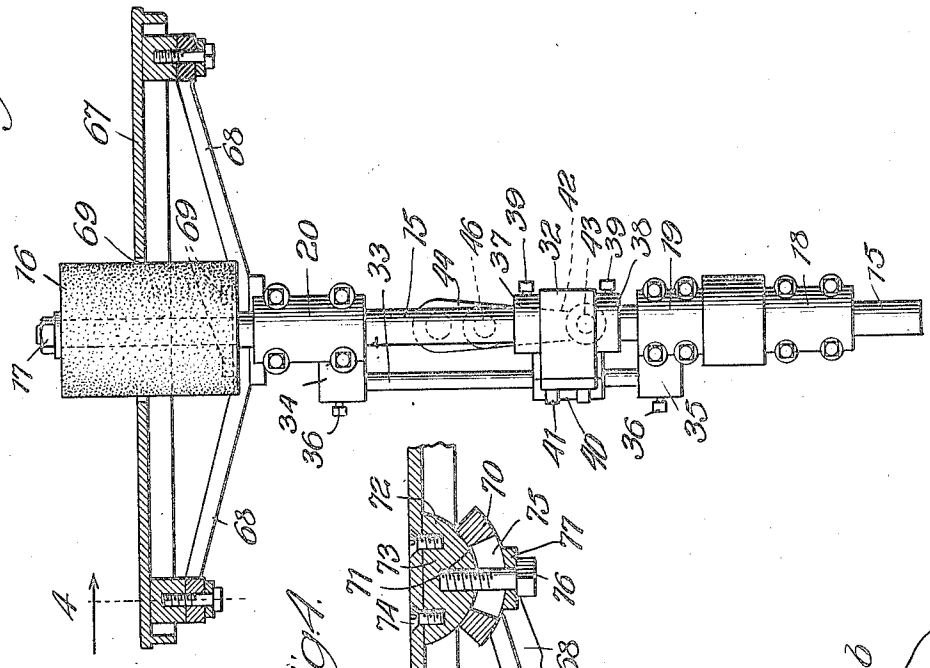
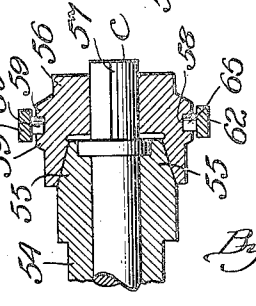


Fig. 4.

Fig. 2.

Fig. 5.



Witnesses:
Chas. H. Bull.

Inventor:
John Miller, Jr.,
By Poole & Crowell
Attys.

UNITED STATES PATENT OFFICE.

JOHN MILLER, JR., OF BELOIT, WISCONSIN, ASSIGNOR TO CHARLES H. BESLY AND COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

GRINDING OR DRUM-SANDING MACHINE.

1,107,338. Specification of Letters Patent. Patented Aug. 18, 1914.

Application filed February 19, 1913. Serial No. 749,385.

To all whom it may concern:

Be it known that I, JOHN MILLER, Jr., a citizen of the United States, and a resident of Beloit, in the county of Rock and State of Wisconsin, have invented certain new and useful Improvements in Grinding or Drum-Sanding Machines; and I, JOHN MILLER, Jr., do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in grinding or drum sanding machines.

The principal object of the invention is to provide a simple, economical and efficient grinding or drum sanding machine.

Other and further objects of the invention will appear from an examination of the following description and claims and from an inspection of the accompanying drawings.

The invention consists in the features, combinations, and details of construction herein described and claimed.

A machine constructed as herein shown and described is adapted to grind and accurately finish both straight and curved inner surfaces, and to enable either straight or curved, inner or outer surfaces of articles to be operated upon, such as patterns, to be so ground and finished as to have the required draft or taper to enable a pattern to be readily withdrawn from the mold in an efficient manner, such draft or taper being accurately produced by mechanical means.

In the accompanying drawings, Figure 1 is a view in side elevation of a grinding machine having a grinding disk for grinding or sanding outer surfaces, and provided with mechanism for grinding or sanding inner surfaces of patterns or other articles; Fig. 2, a view in vertical section taken on line 2 of Fig. 1 looking in the direction of the arrow, and showing the mechanism for operatively connecting the rotative and vertically movable grinding member or drum with the same shaft and source of power which operate the grinding disk; Fig. 3, an enlarged detail view in vertical section taken on line 3 of Fig. 1 looking in the direction of the arrow, showing the tilting or adjustable table in section, and the rotative, vertically movable grinding member or drum and its operating mechanism in elevation; Fig. 4, an enlarged detail view in vertical section, of the table support, and the means for securing the table in different inclined positions with respect to the rotative grinding member or drum; and Fig. 5, an enlarged detail view in vertical section of the friction clutch for operatively connecting the rotative and vertical grinding mechanism or drum with the main operating shaft upon which the grinding disk is mounted.

In constructing a grinding machine in accordance with my invention and improvements, I provide a column or main frame *a* having a base *b* adapted to form a suitable support for the operating mechanism. A horizontal main operating shaft *c* is rotatably mounted upon the column or main frame by means of suitable bearings *d*, and is provided with a grinding disk *e* secured in fixed relation to one end of said shaft and rotatable therewith, said disk being provided with a sheet of sand-paper, emery-paper or emery-cloth *f*, or other form of abrasive material, removably mounted upon the disk or forming a part thereof, and adapted to be used for grinding or sanding the surfaces of articles to be operated upon, such as patterns.

The main operating shaft is operatively connected with a suitable source of power by means of a belt pulley *g* fixed to said shaft and rotatable therewith, or by any ordinary or well known connecting means. A work table *h* is rigidly secured at one end to an arm, which is, by preference, in the form of a vertical segmental plate *i*, by means of lag-screws *j* or in any suitable manner, and a table support in the form of a carriage *k* is slidably mounted upon a vertical shaft or cylindrical column *l* the bottom end of which is supported by means of a bracket *m* and the top end of which is held in position by means of a bracket or strap *n* upon the main frame or column *a*. The brackets or supports *m* and *n* project from the main frame *a* a sufficient distance to provide a space between the vertical fixed shaft or column *l* and the main frame, adapted to permit the

carriage *k* to be moved upward or downward upon the shaft *l* and to be rotated as desired in order to bring the work to be supported by said carriage into any desired position with respect to the grinding disk *e*, or to permit a sheet of abrasive material to be placed upon the disk *c* or removed. A flexible element, such as a wire rope, *o* is connected at one end with the carriage and is passed over and supported by means of a peripherally grooved idler pulley or wheel *p* and its opposite end is connected with a suitable counter-weight (not shown) which may be of any desired form adapted to counter-balance the weight of the table and its carriage or support. Threaded bolts *q* and nuts *r* having levers *s* thereon are adapted to secure the carriage and thereby the work table supported by the carriage in different adjusted positions upon the cylindrical column or fixed shaft *l* by clamping the column-encircling split sleeve or clamping portion of the carriage in clamping engagement with said column.

The table *h* and segmental plate *i* are supported upon the carriage *k* so as to have rotative movement in a vertical plane by means of an arcuate flange *t* upon the carriage or block *k* and extending at right angles to the vertical face of the latter. This flange is formed in the arc of a circle having its center in a horizontal line and, by preference, in the plane of the working face of the grinding disk when the carriage and work table are in their normal or operative position. The segmental plate *i* is provided on its inner face with an arcuate groove *u* (see Fig. 1) adapted to admit and slidably engage the flange *t* which forms a support and guide for the rotative plate *i*. A bolt *v* in threaded engagement with the flange *t* and having its headed end in engagement with a parti-cylindrical block *w* serves to hold the segmental plate with its groove *u* in rotative engagement with the flange *t*. The segmental plate *i* is provided with a segmental groove *y* through which a bolt *z* mounted in the carriage extends, and a nut 2 having a lever 3 thereon is in threaded engagement with said bolt and movable into and out of clamping engagement with the segmental plate *i*. A similar segmental or curved groove 4 in the plate *i* is adapted to admit a bolt 5 on the carriage *k* and a nut 6 and block 7 are held by said bolt in a position to enable the plate *i* to be clamped in any position to which it is adapted to be adjusted. The work table *h* is thus adapted to be tilted and removably secured and supported in different inclined positions with respect to the grinding disk, and is movable up and down with the carriage *k* and rotative in a horizontal plane upon the upright fixed shaft *l*.

The above described mechanism is illustrated and described in detail in Patent No. 1,029,882, issued to me and in my name, and dated June 18th, 1912, for improvements in disk grinders.

A bracket or main frame portion 8 comprising an upper bracket arm 9 and a lower bracket arm 10 connected by mea of upright frame portions 11 and 12, is mounted upon the main frame or column *a* and secured to the latter by means of bolts 13 which extend through flanges 14 and in threaded engagement with the main frame, or the bracket may be secured in position by any desired ordinary or well known securing means (see Figs. 1 and 2). This bracket projects endwise beyond the end of the main operating shaft *c* and forms a support for a rotatable upright shaft 15 and a cylindrical grinding member or drum 16 so as to rotate with the shaft and be moved upward and downward or reciprocated during its rotative movement. I prefer to connect the cylindrical grinding member 16 in fixed relation to the shaft by means of a nut 17 in threaded engagement with the upper end of the shaft and adapted to hold the grinding member or drum removably on the shaft. The shaft is rotatably supported upon the bracket by means of suitable journal bearings 18, 19 and 20 comprising bearing blocks or journal members which are secured to the bracket by means of bolts 21, and are, by preference, adapted to support the shaft in such a manner as to permit it as well as the cylindrical grinding member or drum 16 thereon, to have both rotative and endwise or vertical movement, thus enabling inner surfaces, whether straight or curved, to be ground or sanded with great accuracy and uniformity by the rotative and reciprocating movement of the peripheral abrasive surface of the cylindrical grinding member, which is provided with a peripheral surface portion or member formed of sand-paper, emery-paper, or cloth carborundum, or other suitable abrasive substance. The lower bracket arm 10 has forked arms 22 and 23 which provide a space 24 therebetween, and a belt pulley 25 located between said forked arms is secured to the shaft by means of a spline or feathered connection (not shown) and which may be of any ordinary, desired or well known form adapted to permit the shaft to move up and down with respect to the pulley and to be rotated with and by means of the latter. A driving belt 26 has its lower portion upon and in operative engagement with the pulley 25 and its upper portion passes over a driving belt wheel or pulley 27 which is fixed to the rotary main driving shaft *c*, already described, one lap of said belt being passed around an idler pulley 28 which is rotatably supported upon

the bracket by means of a stub shaft 29, and another lap of which passes around a similar idler 30 which is rotatably supported by means of a similar stub shaft 31 (see Figs. 1 and 2). The rotative and vertically movable shaft 15 upon which the grinding member or drum 16 is mounted is thus operatively connected with the main driving shaft *c* and is adapted to be driven thereby, and to be operatively connected with and driven by the same source of power which operates said main driving shaft.

In order to provide means for reciprocating or automatically raising and lowering the shaft 15 and the cylindrical grinding member or drum thereon during the rotation of the same, a cross-head 32 is slidably mounted upon an upright guide rod 33 which is supported in parallel relation to the shaft 15 by means of brackets or supporting frame members 34 and 35. The upper and lower ends, respectively, of said guide rod are secured in the sockets formed by said brackets 34 and 35 by means of set-screws 36. This cross-head 32 is provided with a vertical opening therethrough forming a journal bearing through which the shaft 15 extends, and said shaft is provided with an upper collar 37 and lower collar 38 secured in fixed relation to the shaft by means of set-screws 39. These collars are in position to engage the upper and bottom surfaces of the cross-head, and hold the latter therebetween and in operative engagement with the shaft so as to permit the rotation of the shaft in the cross-head and the upward and downward or reciprocatory movement of the shaft and the cross-head together. The cross-head is provided with a split sleeve portion 40 having a vertical opening through which the vertical guide rod 33 extends. This sleeve portion may comprise a removable metallic strap or bearing block which is secured to the main body of the cross-head by means of screws 41, or in any ordinary or well known manner. A link or connecting rod 42 is pivotally connected at its lower end with said cross-head and thereby with the shaft by means of a pivot pin 43, and is connected at its upper end with the crank arm 44 of a horizontal crank shaft 45 by means of a crank pin 46 on said crank arm, said shaft 45 being supported upon the bracket 8 by means of bearings 47. A spur gear 48 is secured upon and in fixed relation to the crank shaft 45 between the upright bracket members 11 and 12, and a counter-shaft 49 is mounted in parallel relation to the shaft 45 and rotatably supported by means of bearings 50 upon the upright bracket members 11 and 12, and a toothed pinion 51 is mounted upon and in fixed relation to said counter-shaft and in toothed engagement with the spur gear wheel 48. The shaft 49 is provided with a belt pulley or driving wheel 52 which is fixed to and rotatable with said counter-shaft, and a belt 53 upon said belt pulley extends over and in operative engagement with the periphery of a pulley 54 upon the main driving shaft *c*. The belt pulleys or wheels 54 and 27 upon the driving shaft *c* may be connected in fixed relation to each other, and are so mounted upon the main driving shaft as to permit the rotation of the latter when not operatively connected with said shaft. Suitable clutch mechanism, hereinafter described, is provided, for the purpose of operatively connecting and disconnecting said pulleys and shafts, thereby operatively connecting the rotative reciprocating grinding member or drum with the main operating shaft and enabling it to be disconnected therefrom, as desired. This friction clutch may be of any desired, ordinary or well known form and, as here shown, consists of a clutch member 55 secured in fixed relation to pulleys 27 and 54 or integral with one of said members, and adapted to permit the rotation of the shaft *c* with respect to the pulleys, when said pulleys are stationary and the clutch members out of engagement with each other. The clutch member 55 is provided with a frictional surface which is, by preference, conical and adapted to frictionally engage the adjacent concave friction surface of a movable or outer clutch member 56 which is mounted upon the shaft *c* and movable longitudinally thereof into and out of frictional engagement with said clutch member 55. The clutch member 56 is connected with the shaft *c* by means of a spline or feather 57 in such a manner as to rotate with the shaft and be movable longitudinally of the shaft during its rotation (see Figs. 1, 2 and 5). The clutch member 56 is provided with a peripheral annular slot or groove 58 between annular peripheral shoulder or flange portions 59, and an operating lever 60 having forked end portions or arms 61 and 62, is pivotally supported upon a bracket arm or frame portion 63 by means of a vertical pivot 64. Clutch-engaging fingers or studs 65 and 66 project inward from said arms into said peripheral slot and between and in engagement with said annular shoulders or flanges, for moving the clutch member 56 into and out of frictional engagement with the clutch member 55.

A work table 67 is supported by bracket arms 68 which are secured to the upper arm 9 of the bracket 8 by means of bolts 69 or in any desired ordinary manner. These bracket arms 68 extend on opposite sides of the axial center of the upright shaft 15 and of the rotative reciprocating grinding member 16. The upper end of each of said arms is provided with means for forming an ar-

ticulate or adjustable connection or joint between said work table and said arms or stationary support adapted to enable the work table to be tilted or adjusted to any desired incline or angle and securely supported either in horizontal or in any desired inclined position to which it is adapted to be adjusted. The upper surface of the work-table encircles the cylindrical grinding member 16 and is thus adapted to be adjusted to and supported in any desired inclined position with respect to the abrasive rotative and reciprocating periphery of said grinding member, or in position to extend at any desired angle with respect to the axis of rotation of the rotative reciprocating grinding member or drum. Articles to be operated upon are thus enabled to be supported upon the table with the surface to be ground or sanded held at any desired angle or degree of inclination in engagement with the cylindrical outer abrasive surface of the rotative reciprocatory grinding tool or drum which extends through and is movable upward and downward within a central opening 69 in the work-table. In order to enable this to be accomplished in a simple and efficient manner, the outer end of each bracket arm 68 is provided with a bearing member 70 having an inner concave, curved or arcuate upper bearing surface 71 in supporting engagement with a lower curved, cylindrical or arcuate bearing surface 72 of a depending bearing member or block 73 which is fixed to and adapted to be rocked or tilted with the table 67 to any desired angle or inclination with respect to the axis of rotation of the tool 16 and shaft 15. These depending members 73 are located on diametrically opposite sides of the axial center of the grinding member or drum 16 and of the shaft 15, and the bearing surfaces 71 and 72 of the bearing members 70 and 73 are each in the arc of a circle the center of which is, by preference, in the same horizontal plane with the upper surface of the work-table and in the same vertical plane and at right angles with respect to the axial center of the tool 16 and shaft 15. The axial centers of said shaft and tool or grinding drum are thus located between the centers or axes of rotation of the bearing members 73. The bearing members 73 may be secured to the table by means of screws 74. The stationary members 70 are each provided with a slot 75 which is in a vertical plane at right angles to the axis of rotation of the table or bearing members 73. Through each of these slots extends a depending headed bolt 76 which is in threaded engagement with the corresponding depending bearing member 73 and in position to move longitudinally of the slot 75 when the work-table 67 and the bearing members 73 are tilted or adjusted to different inclines or different adjusted positions with respect to the bearing members 70, and a washer 77 is interposed between the heads of the respective bolts 76 and the adjacent bearing member 70. By turning the bolts 76 in one direction the bearing members 70 and 73 are released or sufficiently loosened to permit the table to be tilted or adjusted to any desired position or incline, and by turning the bolts in the opposite direction the table may be secured and firmly supported in any desired adjusted position or incline, and the work or material operated upon held at any desired incline and in engagement with the abrasive surface of the grinding member or drum 16 during the rotative and upward and downward movements of the latter. Articles to be operated upon, such as patterns, are thus enabled to be held at any desired angle or inclination with respect to and in engagement with the abrasive surface of the rotary reciprocating tool, whether the surfaces to be ground are straight or curved. Inner surfaces curved or straight, as well as outer surfaces, are thus enabled to be held in position to be engaged and uniformly ground by the tool at any desired angle so as to provide the desired draw or taper of greater uniformity and formed with greater accuracy than is possible to be obtained by guiding the articles to be operated upon manually or by any known means.

I claim:

1. In a grinding machine, the combination of a rotary grinding tool having a cylindrical peripheral surface of abrasive material, an endwise movable, rotative spindle in concentric relation to and rotatable with said tool, a frame provided with stationary bearings in which said spindle rotates and has endwise movement, means for rotating the spindle embracing a rotative member, surrounding said spindle; there being parts on the frame arranged on each side of said rotative member and acting to hold the same from endwise movement with the spindle, and means for reciprocating said spindle longitudinally during the rotation thereof.

2. In a machine of the class described, the combination of a frame, a longitudinally movable, rotary spindle, fixed bearings on the frame for said spindle, a rotary grinding member secured in fixed concentric relation to and movable with the spindle, means for rotating the spindle and thereby the grinding member supported by the spindle, a crank shaft arranged transversely to said spindle and having a crank arm, a non-rotative bearing block mounted on said spindle, a guide member secured to said frame and arranged parallel to said spindle, said bearing block having sliding engagement with said guide member, means hold-

ing the spindle from endwise movement relatively to the bearing block, means affording operative connection between said crank arm and said bearing block, and means for rotating the crank shaft, to reciprocate the spindle during the rotation of the latter.

3. In a grinding machine, the combination of a rotary grinding member, an upright spindle in concentric relation to and rotatable with said rotary grinding member, a supporting frame provided with stationary bearings in which said spindle has rotative and endwise sliding movement, means for rotating said spindle, embracing a rotative driving member engaging the spindle; there being parts on the frame arranged on opposite sides of said rotative member and acting to hold the same from endwise movement with said spindle, a crank shaft rotatably mounted in said frame, and means for operatively connecting the crank shaft with said upright shaft, embracing a non-rotative bearing block movable endwise with said spindle.

4. In a grinding machine, the combination of a rotary grinding member having a peripheral portion formed of abrasive material, a stationary frame, an upright, endwise movable, rotative spindle mounted in the frame in concentric relation to and connected with said rotary grinding member, a main operating shaft, means for operatively connecting said spindle with the main operating shaft, a non-rotative bearing block mounted on the frame and moving endwise with said spindle, a crank shaft, a link having one end pivotally connected with the bearing block and having its opposite end pivotally connected with the crank shaft, and means operatively connecting the crank shaft with said main driving shaft.

5. In a machine of the class described, the combination of a frame, a longitudinally movable, rotary spindle, stationary bearings on the frame for said spindle, a rotary grinding member secured in fixed concentric relation to and movable with the spindle and having a peripheral portion formed of abrasive material, a crank shaft extending at right angles with respect to the spindle and having a crank arm adjacent to the spindle, a non-rotative bearing block mounted on the frame and having endwise movement with said spindle, a link having one end operatively connected with said bearing block, and having its opposite end pivotally connected with said crank, a counter-shaft rotatably mounted in parallel relation to the crank shaft, gear mechanism operatively connecting the crank shaft with said counter-shaft, a main driving shaft, means for operatively connecting said driving shaft with the spindle for rotating the latter, and means for operatively connecting the counter-shaft with the main driving shaft and disconnecting it therefrom.

6. In a machine of the class described, the combination of a frame, a longitudinally movable, rotary spindle mounted in suitable bearings in the frame, a rotary grinding member secured in fixed concentric relation to and movable with the spindle, means for rotating said spindle and thereby the grinding member mounted thereon, collars upon the spindle, a non-rotative bearing block surrounding said shaft between said collars, a shaft rotatably supported by the frame, means affording operative connection between said shaft and said bearing block, means for rotating the spindle, and means for rotating said shaft, to reciprocate the spindle and rotary grinding member during the rotation of the same.

7. In a machine of the class described, the combination of a frame, a longitudinally movable, rotary spindle mounted in suitable bearings in the frame, a rotary grinding member secured in fixed concentric relation to and movable with the spindle and having a peripheral portion formed of abrasive material, means for rotating the spindle and thereby the grinding member supported by the spindle, a crank shaft extending at right angles with respect to the spindle and having a crank arm adjacent to the spindle, a non-rotative bearing block surrounding and having endwise movement with said shaft, a fixed guide rod parallel with said shaft, with which said bearing block is engaged, a link having one end operatively engaged with said bearing block and having its opposite end pivotally connected with said crank, and means for rotating the crank shaft, to reciprocate the spindle during the rotation of the latter.

8. In a machine of the class described, the combination of a frame, a longitudinally movable, rotary spindle, fixed bearings on the frame for said spindle, a rotary grinding member secured in fixed concentric relation to and movable with the spindle and having a peripheral portion formed of abrasive material, a crank shaft rotatably mounted in the frame at right angles to the axis of said spindle and having a crank arm, a non-rotative bearing block having sliding movement on the frame in a direction parallel with the spindle, means holding the spindle from endwise movement relatively to said bearing block, an operative connection between said crank-arm and said bearing block, a counter-shaft rotatably mounted in parallel relation to said crank shaft, gear mechanism operatively connecting the crank shaft with the counter-shaft, a main driving shaft, means for operatively connecting the counter-shaft with the main driving shaft

and disconnecting it therefrom, a pulley mounted upon and rotatable with said spindle, and means for operatively connecting said pulley with said main driving shaft and disconnecting it therefrom.

In testimony, that I, JOHN MILLER, Jr., claim the foregoing as my own invention I affix my signature in the presence of two witnesses, this 14th day of February A. D. 1913.

JOHN MILLER, JR.

Witnesses:
M. C. PIERCE,
E. M. VAN LONE.