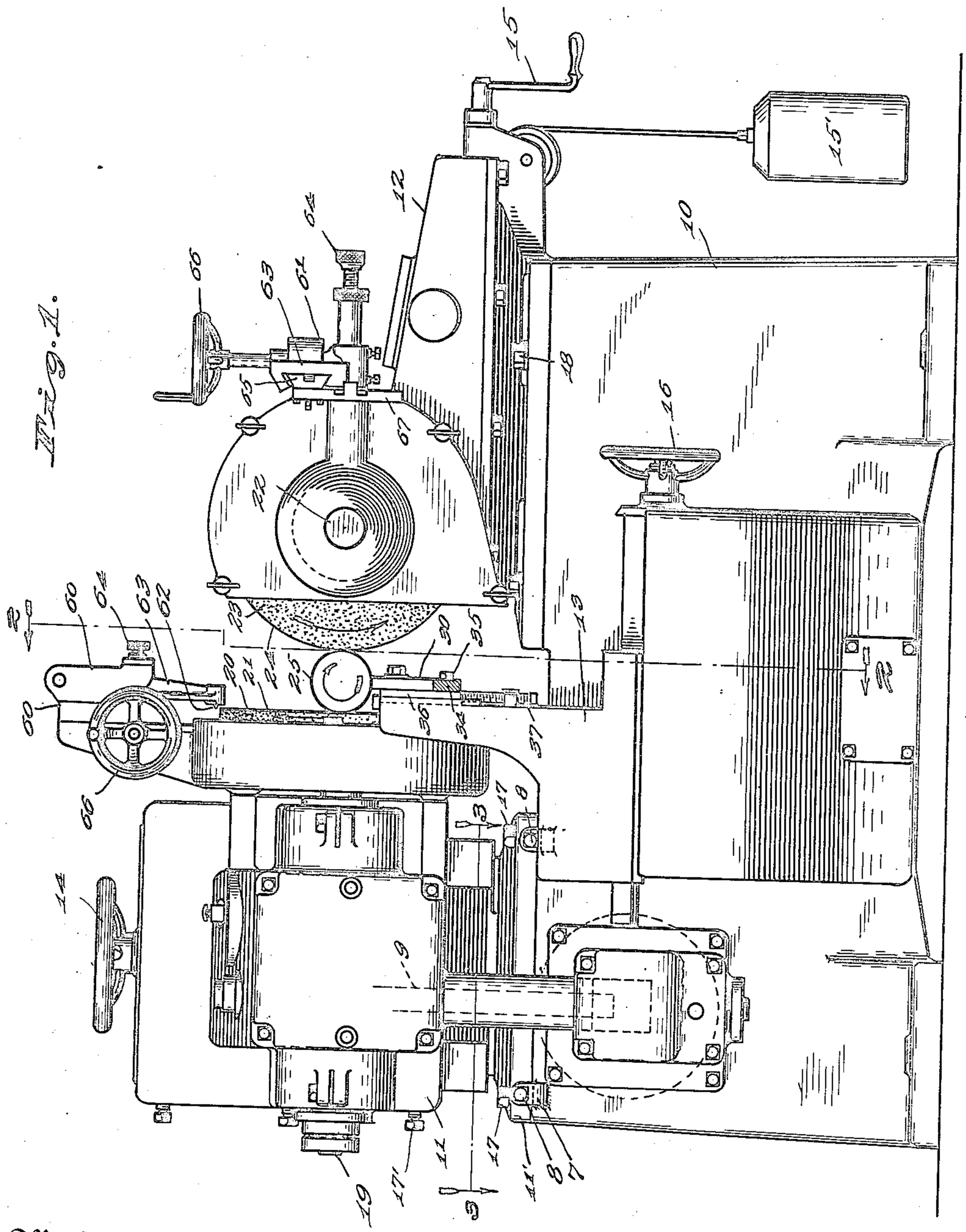
Jan. 2, 1923.

1,440,796

M. O. REEVES.
GRINDING MACHINE.
FILED MAY 19, 1919.

2 SHEETS-SHEET 1

Fig. 1.



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2 SHEETS-SHEET 2

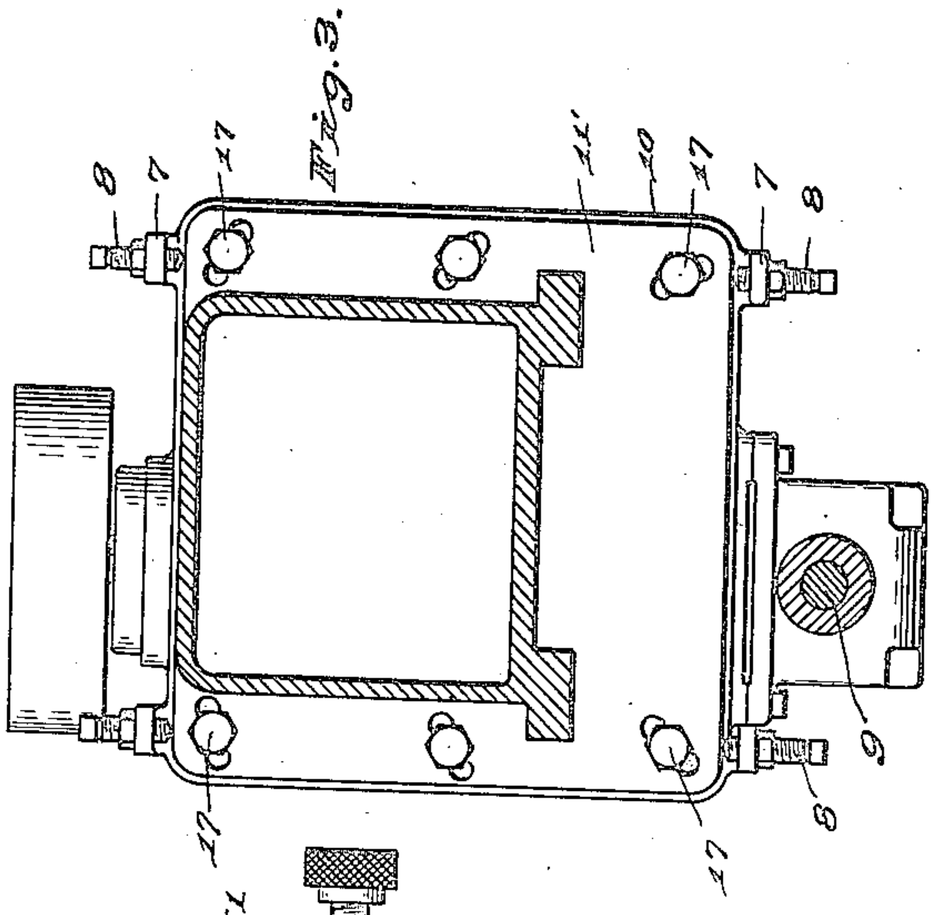

Fig. 3.

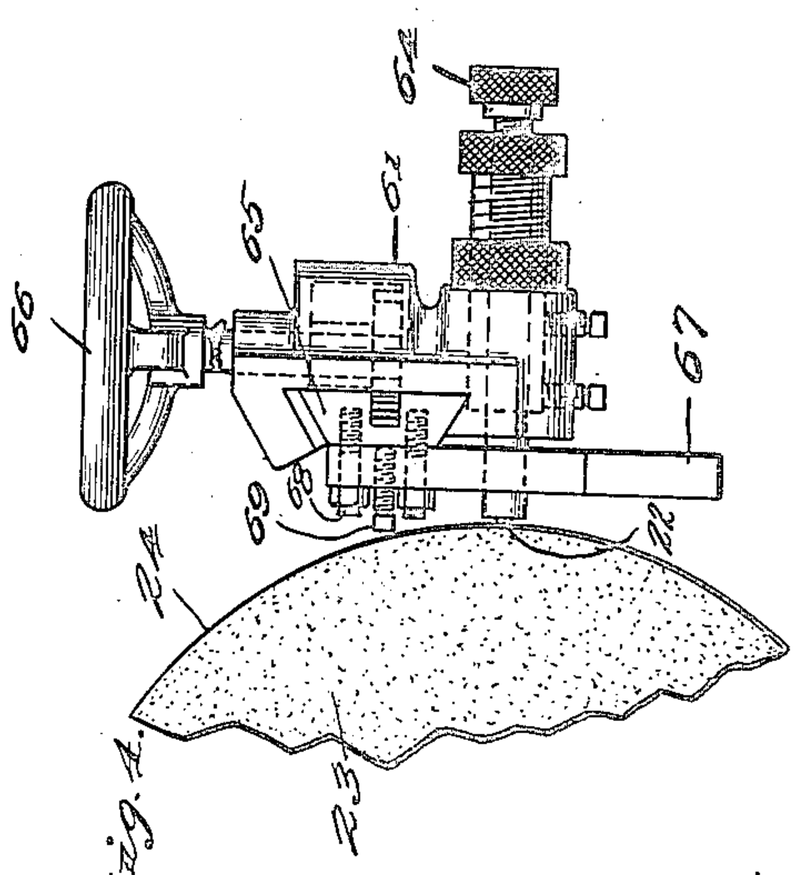

Fig. 4.

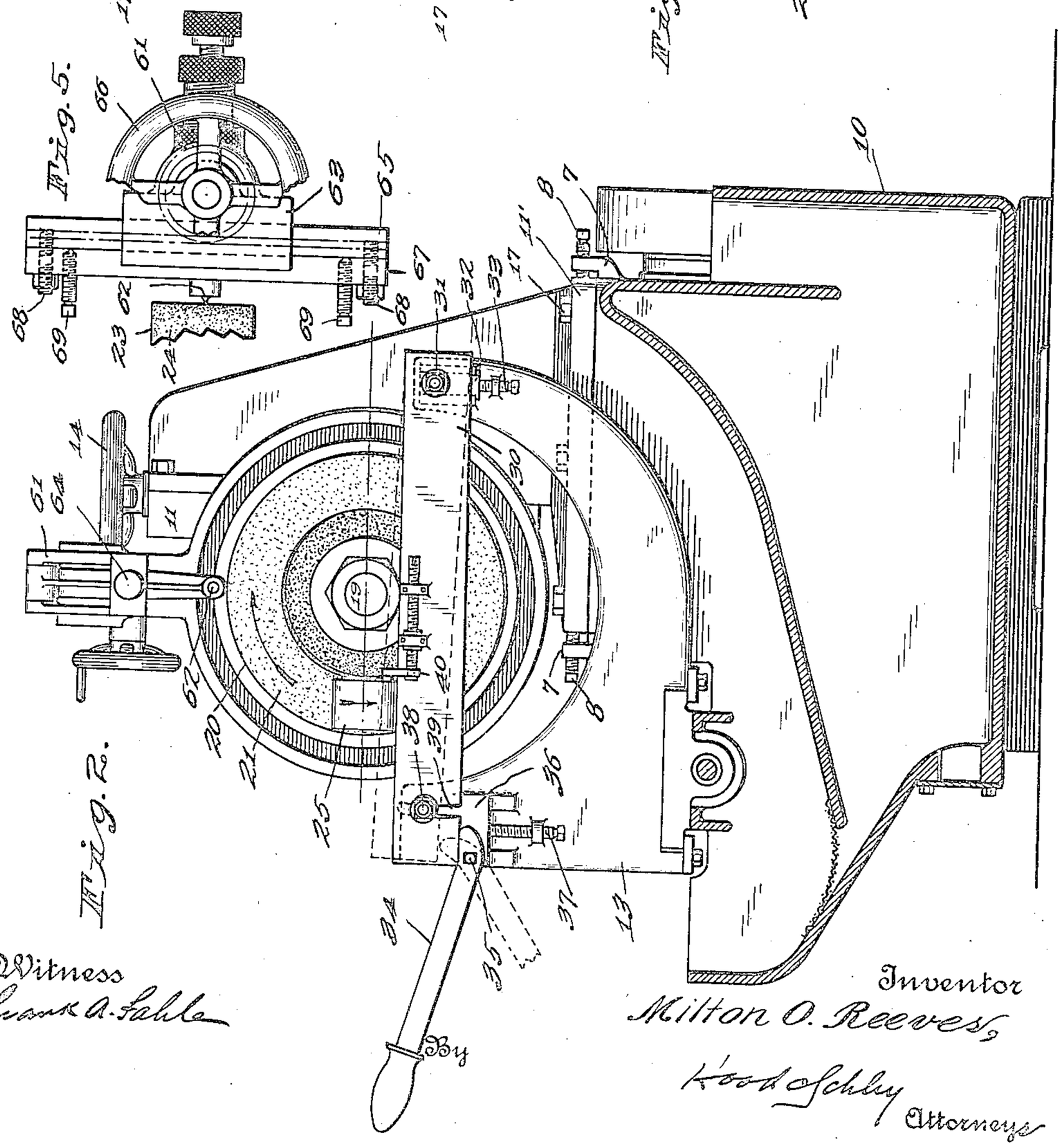

Fig. 2.

Fig. 5.

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Patented Jan. 2, 1923. 1,440,796

UNITED STATES PATENT OFFICE.

MILTON O. REEVES, OF COLUMBUS, INDIANA, ASSIGNOR TO REEVES PULLEY COMPANY, OF COLUMBUS, INDIANA, A CORPORATION OF INDIANA.

GRINDING MACHINE.

Application filed May 19, 1919. Serial No. 298,008.

To all whom it may concern:

Be it known that I, MILTON O. REEVES, a citizen of the United States, residing at Columbus, in the county of Bartholomew and State of Indiana, have invented a new and useful Grinding Machine, of which the following is a specification.

It is the object of my invention to provide a grinding machine for accurately grinding round articles, of any size, and whether cylindrical or conical, with precision, and especially one wherein the starting or stopping of the grinding action on such round articles, or both the starting and the stopping thereof, may be accurately made along a considerable length or the entire length of such articles by putting them transversely into or out of grinding position, whereby the grinding is not affected by any slight inaccuracies at isolated points in the original shapes of such articles.

My present invention is in some respects based on that set forth in my prior Patent No. 1,264,129, granted April 23, 1918.

The accompanying drawings illustrate my invention. In such drawings, Fig. 1 is a front elevation of a grinding machine embodying my invention; Fig. 2 is a section on the line 2—2 of Fig. 1; Fig. 3 is a section on the line 3—3 of Fig. 1; Fig. 4 is an enlarged front elevation of the dressing device of the grinding wheel; and Fig. 5 is a plan of the mounting of the slide bar of such dressing device.

On the base 10 are carried three adjustable frames 11, 12, and 13, the first of which is adjustable vertically by an adjusting wheel 14 and the other two of which are independently adjustable longitudinally of the base 10 by a crank 15 and a hand wheel 16 respectively. One or the other of the frames 11 and 12, or both of them, are also adjustable angularly about a vertical axis. As shown, this angularly adjustable frame is the frame 11, which for this purpose is mounted on a sub-frame 11′ on which it is vertically adjustable by the hand wheel 14, and this sub-frame 11′ is angularly adjustable, as shown about a vertical driving shaft 9 extending upward from the base 10, by adjusting screws 8 carried by upwardly extending fingers 7 from the base 10 and co-operating with the edges of the sub-frame 11′. The frames 11, 11′, and 12 are arranged to be clamped in adjusted position by suitable clamping screws 17, 17′, and 18 respectively. The vertically adjustable frame 11 carries a longitudinally extending horizontal shaft 19, which in this case is driven from the vertical driving shaft 11 by any suitable gearing, such as a worm gearing, which does not interfere with the vertical adjustment of the frame 11. On its end toward the frame 12, the shaft 19 has mounted thereon a wheel 20, preferably an abrasive wheel, which on one end has an annular face 21. The wheel 20 is the feed wheel, and in the grinding operation is driven at a comparatively slow speed in the direction of the arrow. The longitudinally adjustable frame 12 is adjustable toward and from the feed wheel 20 by the crank 15, and for accuracy of adjustment, to take up all lost motion, is associated with a weight 15′ which tends to move it away from the feed wheel and so holds it to one limit of the lost motion which would otherwise be permitted by its adjusting mechanism. This frame 12 carries a horizontal shaft 22 transverse to the direction of adjustment of such frame and to the shaft 19, but the horizontal angle between such two shafts is slightly variable by the screws 8. The shafts 19 and 22 may be driven in any suitable way which allows the adjustment of the frames 11 and 12, the shaft 19 being shown as being driven from the vertical shaft 9, though this is not essential. The shaft 22 carries an abrasive wheel 23, having a peripheral grinding face 24, and is driven at comparatively high speed in the direction of the arrow. The abrasive wheel 23 is the grinding wheel. The peripheral face 24 of the grinding wheel 23 where it moves downward opposes the annular working face 21 of the feed wheel 20 where it moves upward, to provide between them a grinding throat in which the grinding of the round articles 25 occurs. The width of this grinding throat is adjustable by shifting the frame 12 by the crank 15. The narrow point of the grinding throat is in the horizontal plane through the axis of the grinding wheel 23 when the face 21 is flat and vertical, as I usually have it, as such plane is then perpendicular to the working face 21 of the feed wheel 20 at the grinding throat. The height of the shaft 19 with respect to this

horizontal plane is adjustable by the hand wheel 14, to get any desired variation from vertical in the direction of movement of the face 21 at such plane in order to get when desired a feed component of such movement along the grinding throat. The angle between the two abrasive surfaces 21 and 24 at the grinding throat may be adjusted by the screws 8 to make such surfaces parallel or slightly converging, the convergence being usually toward the back of the machine; this makes it possible to grind cylindrical or slightly conical articles as desired.

The round articles 25 to be ground are supported in the grinding throat on a feed bar 30, which is carried by the longitudinally adjustable frame 13, on which both ends of the feed bar are supported. To obtain this support, the frame 13 is in the shape of an inverted horseshoe, as is apparent from Fig. 2. The rear end of the feed bar 30 is pivotally mounted on the rear prong of this horseshoe, on a pivot bolt 31 which is carried by a slide 32 which is vertically adjustable by a temper screw 33. The front end of the feed bar 30 rests on the short end of a lever 34 and overlaps the pivot point 35 of such lever, and this lever is carried by a slide 36 which is vertically adjustable by a temper screw 37. The feed bar as a whole may be vertically adjusted by the temper screws 33 and 37. In addition, it may be tilted by raising and lowering its front end by the lever 34, the downward limit of such tilting movement being when the lower edge of such feed bar rests on the upper edge of the short end of such lever to a point above the pivotal center 35 of such lever. The front end of the feed bar 30 is guided in its movements by a bolt 38 carried by the slide 36 and co-operating with an arc-shaped slot 39 in said feed bar. The feed bar 30 may be provided on its upper face with a stop 40, which is preferably removable but which when in place projects up behind an article 25 to be ground to limit the movement of such article along such feed bar. This stop 40 is used or is omitted in accordance with the nature of the work being ground, as is hereinafter apparent. The feed bar may be made in a single piece, such as for the sake of simplicity is shown in the drawings; or may have any desired removable and replaceable and adjustable parts, such as some or all of those set forth in my co-pending application Ser. No. 298,007, of even filing date herewith.

The vertically adjustable frame 11 and the longitudinally adjustable frame 12 are provided with suitable dressing devices 60 and 61 respectively, for dressing the working surfaces 21 and 24 of the wheels 20 and 23 for any positions of such frames, so that such dressing may be done without disturbing the adjustment of such wheels. Each of these dressing devices comprises a cutting diamond 62, carried in a suitable movable frame 63 so that the depth of cut may be adjusted by an adjusting screw 64 and the movable frame 63 may be moved along a suitable slideway 65 by a hand wheel 66 to cause the cutting diamond to travel across the face 21 or 24 to true it. The angle of one or both of the slideways 65 may be made adjustable with relation to the axis of the associated wheel. As shown, the slideway 65 for the grinding wheel 23 is shown as the one which is so adjustable. This adjustability may be obtained in various ways, but it is shown as being obtained by mounting the slideway 65 at each end on a supporting bar 67 by two screws 68 provided with lock nuts and extending from the slideway 65 through the supporting bar 67, and a push screw 69 located between the two screws 68 and acting to push the associated end of the slideway 65 away from its supporting bar 67. By manipulating the screws 68 and 69, either or both ends of the slideway 65 may be pushed away from its supporting bar by a controlled distance, and yet held firmly, though preferably only one end is so pushed away while the other end is held tight against such supporting bar. This adjustment of the screws 68 and 69 adjusts the angle between the slideways 65 and the shaft 22, so that by such adjustment and the subsequent manipulation of the associated hand wheel 66 the face 24 may be made either cylindrical or slightly conical as required. This gives another means for making the two working faces 21 and 24 at the grinding throat parallel or converging. This control of the relation of these cutting faces at the grinding throat may be obtained by either varying the surface 24 or by manipulating the screws 28 to vary the horizontal angle of the shaft 19, or by both, supplementing each other.

In operation, the feed bar 30 is raised by the lever 34, and the article 25 to be ground is placed upon it above the grinding throat. Then by manipulation of the lever 34 such feed bar is lowered to bring the article 25 to be ground into the grinding throat. The article is then caught between the faces 21 and 24, which have previously been adjusted into the desired relationship to each other, and is slowly rotated by their combined action, but particularly by the feed face 21, and is very accurately ground to roundness by the grinding face 24. This roundness may be either cylindrical or conical, as desired, depending upon the relation of the faces 21 and 24 as controlled by the screws 8, 68, and 69, and by the hand wheel 14. If the article 25 is cylindrical, the stop 40 need not be used on the feed bar 30, but the article 35 may be allowed to take

any position it wishes along the throat. Indeed, I frequently prefer to have the article 25 fed along the throat and discharged therefrom by a forward feeding action obtained from the face 21, in which case the faces 21 and 24 at the grinding throat may be either parallel or converged. This forward feeding action is obtained by adjusting the height of the shaft 19 by the hand wheel 14 so that the axis of such shaft is slightly below the horizontal plane of the grinding throat and of the axis of the grinding wheel 23, as then the movement of the face 21 at such horizontal plane where it operates on such article 25 has a slight component lengthwise of the throat and feeds the article along the throat. If the cylindrical article is not fed along the grinding throat, the faces 21 and 24 are parallel at such throat, and the article 25 when ground is removed from the grinding throat by tilting the feed bar upward. In grinding conical articles, however, the two surfaces 21 and 24 are convergent along the grinding throat; then I prefer to use the stop 40, so as to hold the articles 25 in a definite position on such throat. At the same time, I may adjust the axis of the shaft 19 so that it lies in the horizontal plane of such throat, in which case there is no feeding component given to the article 25 tending to move it along such throat, or I may adjust such shaft 19 so that its axis is slightly below such horizontal plane in order to produce a slight feeding component on the article 25 just sufficient to hold it firmly against the stop 40. In grinding conical articles, the article when ground is removed by tilting the feed bar 30 upward by the lever 34. This may also be done with cylindrical articles, especially when the stop 40 is used, as may be done, though in grinding cylindrical articles the stop 40 may be omitted and the articles discharged from the throat by being fed along the throat by a feeding action of the feed wheel 21.

I claim as my invention:

1. In a grinding machine, the combination of a grinding wheel having a peripheral grinding face, a feed wheel having an annular end face, the axes of said two wheels being transverse to each other and arranged so that a point on the grinding face of the grinding wheel opposes a point on the feed face of the feed wheel to form a grinding throat between them, and a feed bar for supporting articles to be ground in said grinding throat, the axes of said two wheels being relatively adjustable to vary the angular relation of the faces of said wheels at the grinding throat.

2. In a grinding machine, the combination of a grinding wheel having a peripheral grinding face, a feed wheel having an annular end face, the axes of said two wheels being transverse to each other and arranged so that a point on the grinding face of the grinding wheel opposes a point on the feed face of the feed wheel to form a grinding throat between them, and a feed bar for supporting articles to be ground in said grinding throat, the axis of said feed wheel being angularly adjustable about an axis transverse to the axes of both wheels.

3. In a grinding machine, the combination of a grinding wheel having a peripheral grinding face, a feed wheel having an annular end face, the axes of said two wheels being transverse to each other and arranged so that a point on the grinding face of the grinding wheel opposes a point on the feed face of the feed wheel to form a grinding throat between them, and means for varying the angle between the peripheral grinding face of the grinding wheel and the annular end face of the feed wheel at such grinding throat.

In witness whereof, I have hereunto set my hand at Indianapolis, Indiana, this 15th day of May, A. D. one thousand nine hundred and nineteen.

MILTON O. REEVES.