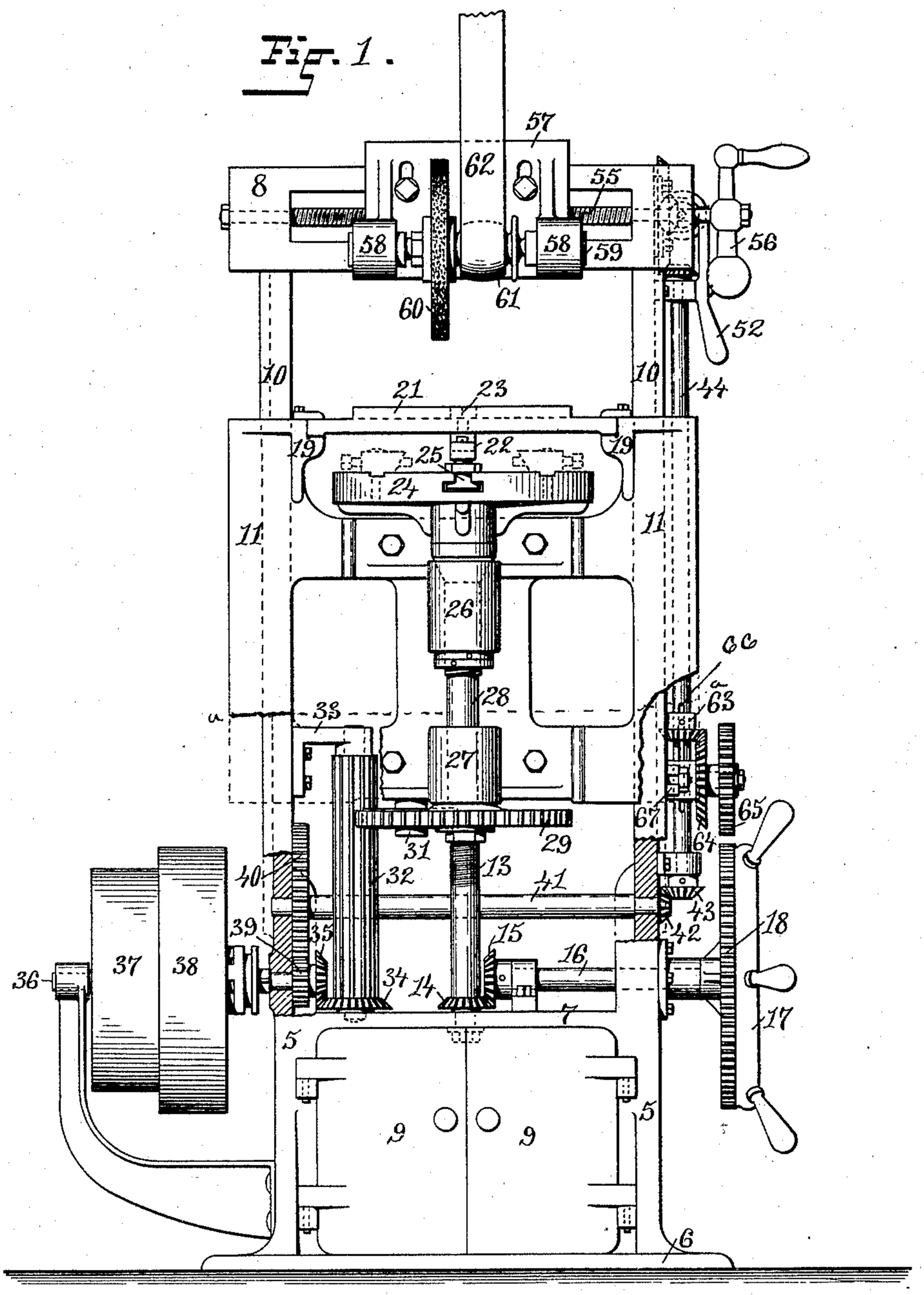
(No Model.) 3 Sheets—Sheet 1.

G. E. WHITEHEAD.

GRINDING MACHINE.

No. 441,997. Patented Dec. 2, 1890.

Fig. 1.



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(No Model.) 3 Sheets—Sheet 2.

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Fig. 2.

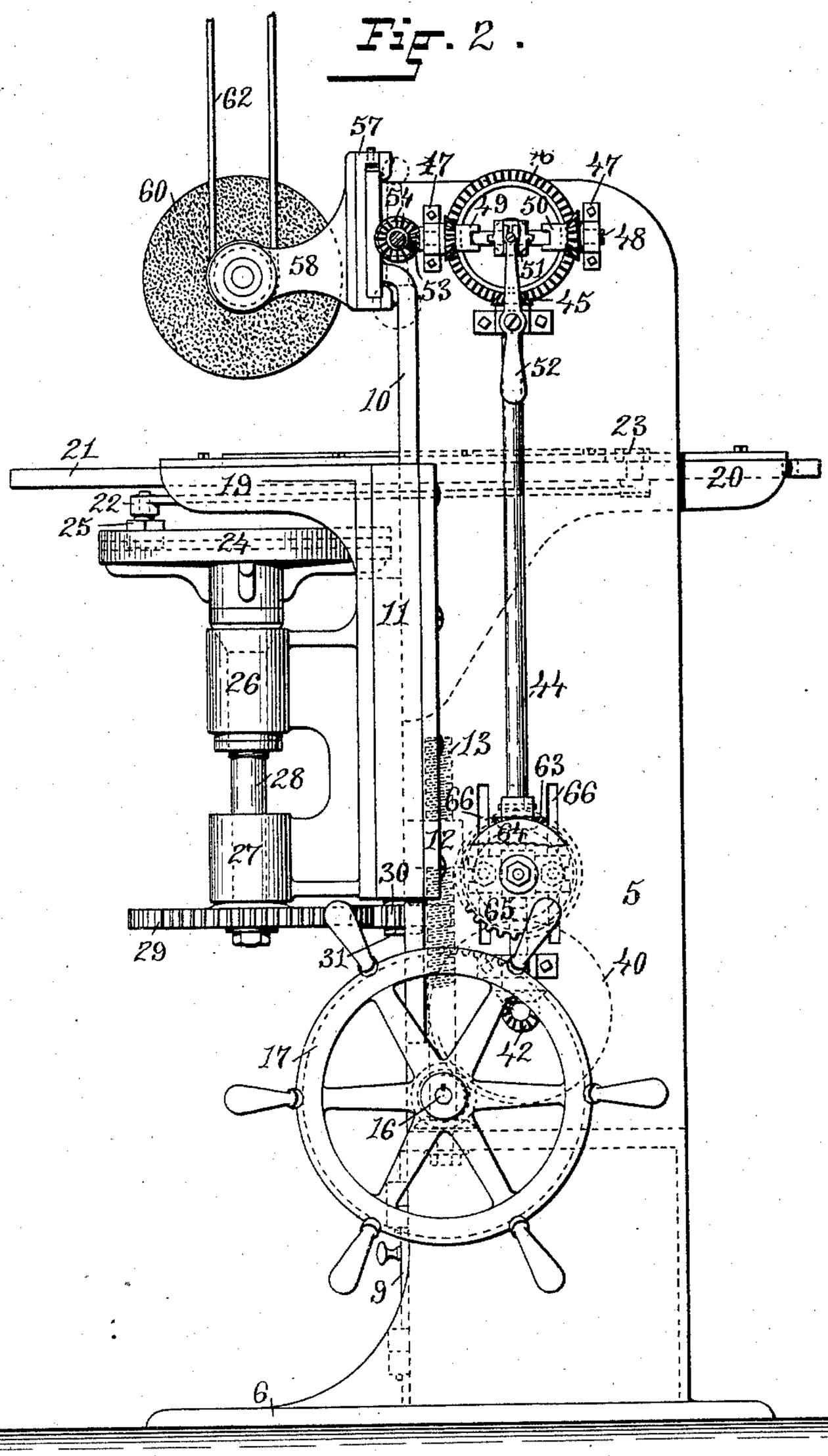

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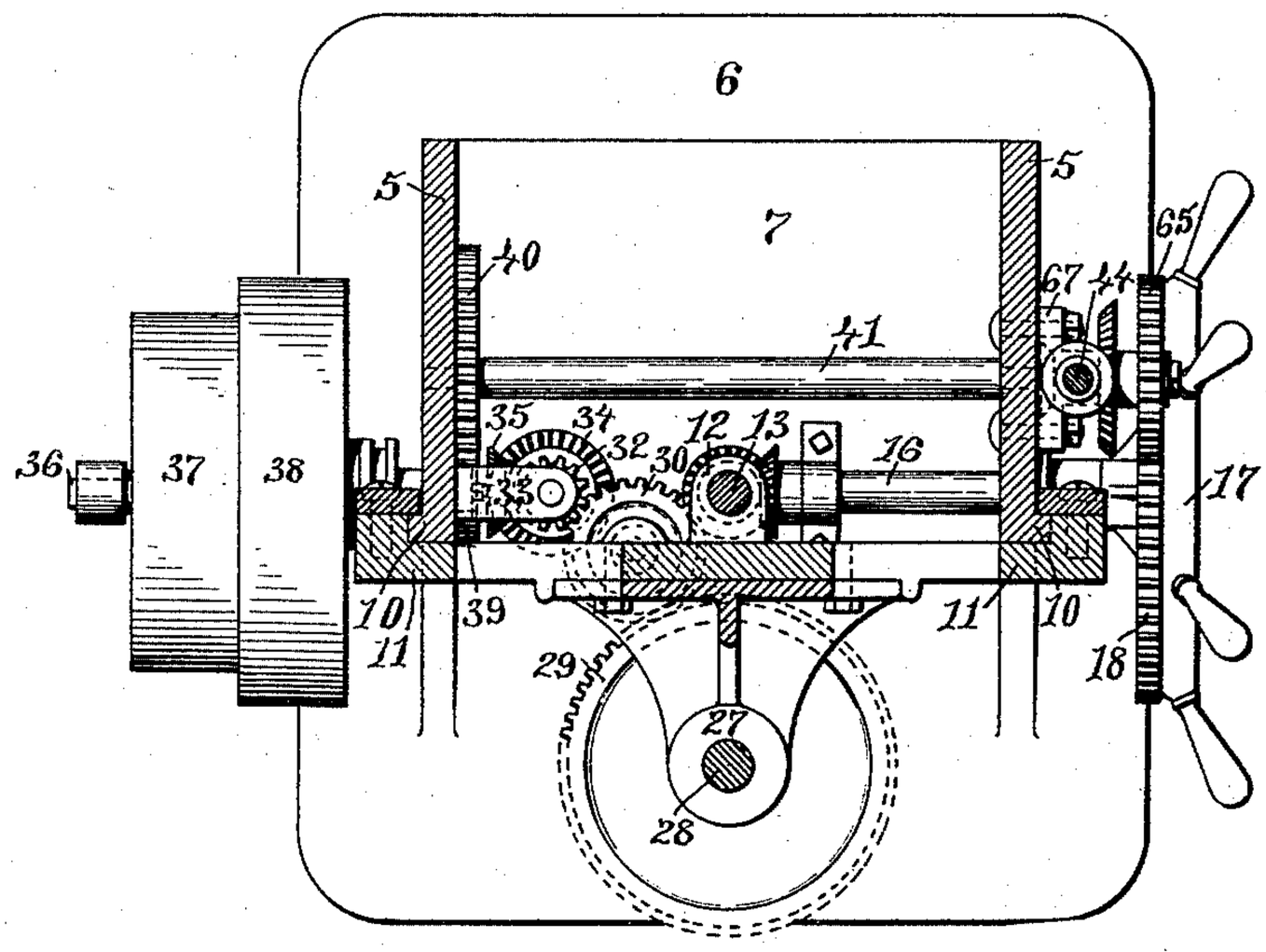
Fig. 3.



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UNITED STATES PATENT OFFICE.

GEORGE EDWARD WHITEHEAD, OF PROVIDENCE, RHODE ISLAND.

GRINDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 441,997, dated December 2, 1890.

Application filed July 1, 1890. Serial No. 357,332. (No model.)

To all whom it may concern:

Be it known that I, GEORGE EDWARD WHITEHEAD, of the city of Providence, county of Providence, and State of Rhode Island, have invented a new and useful Improvement in Grinding-Machines; and I hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification.

This invention has reference to improvements in machines for grinding metal surfaces by means of rotary grinders; and it consists in the novel construction of the machine by which the work can be supported on a horizontal bed and reciprocated or rotated as the nature of the surface may require, and the work and the grinder be automatically moved, as will be more fully set forth hereinafter.

Figure 1 is a front elevation of the machine, shown partly in section. Fig. 2 is a side elevation of the machine. Fig. 3 is a horizontal sectional view of the machine at line *a a* of Fig. 1.

Similar numbers of reference indicate corresponding parts in all the drawings.

The numbers 5 indicate the two standards forming the vertical support of the machine. The two standards are connected by the extended base 6, the plate 7, and the transverse frame 8 at the upper ends of the standards. The space between the two standards 5, the base 6, and the plate 7 is used as a closet and provided with the doors 9. The front edges of the standards 5 are provided with the ways 10 on which the frame 11 is secured, and on which the frame can be adjusted vertically. The frame 11 is provided with the rearward-projecting boss 12, screw-threaded to form a nut in which the screw-spindle 13 turns. The screw-spindle 13 has a firm support on the plate 7, and is provided at its lower end with the beveled pinion 14, in gear with the beveled gear 15, secured on the end of the shaft 16, which shaft is supported horizontally in suitable bearings and extends to the outside of the standard 5, where it is connected with the hand-wheel 17, having the gear-wheel 18 on its inner side. By turning the hand-wheel to the right the screw-spindle 13 is turned to the left and the frame 11 is raised, while by turning the hand-wheel toward the left the frame is lowered. The frame 11 is provided with the brackets 19, extending toward the front, and the brackets 20, extending toward the rear, provided with ways in which the work-table 21 is supported, and in which the work-table slides. The rear end of the connecting-rod 22 is pivotally connected with the work-table 21 by the bolt 23, and the front end of the connecting-rod 22 is connected with the disk 24 by the adjustable wrist-pin 25, which is secured in the T-shaped groove extending across the center of the disk 24. The disk 24 is also provided with holes or grooves in which suitable clamping devices may be secured, as is shown in broken lines in Fig. 1. The bearings 26 and 27, connected with the frame 11, support the spindle 28, secured at its upper end to the disk 24. The lower end of the spindle 28 has the gear-wheel 29 secured to it. This gear-wheel gears into the idle-wheel 30, journaled on the stud-pin 31, secured to the frame 11. The idle-wheel 30 gears with the barrel-gear 32, stepped at its lower end on the plate 7 and journaled at its upper end in the bracket 33. The lower end of the barrel-gear 32 is provided with the bevel-gear 34, gearing with the beveled pinion 35 on the end of the driving-shaft 36, on which the band-pulleys 37 and 38 are secured. On the shaft 36, near the beveled pinion 35, the spur-gear 39 is secured in gear with the gear 40, secured to the horizontal shaft 41, journaled in the standards 5. To the opposite end of the shaft 41 the beveled pinion 42 gears with the beveled pinion 43 on the lower end of the vertical shaft 44, the upper end of which shaft is provided with the pinion 45, in gear with the bevel-gear 46, across the face of which and supported in the brackets 47 is the shaft 48, on which the two sleeves 49 and 50, each provided with a bevel-gear in mesh with the bevel-gear 46, turn freely. On the shaft 48, between the two sleeves 49 and 50, is the clutch 51, constructed to turn with the shaft and adapted to connect either one of the two sleeves 49 and 50, so as to turn with the shaft in any one of the usual methods used to connect and disconnect such sleeves with or from the shaft. 52 is the clutch-operating lever, by which the clutch 51 is moved to connect with or disconnect

from either one of the sleeves 49 and 50. On the front end of the shaft 48 is the beveled pinion 53, gearing with the beveled gear 54, secured to the leading-screw 55, journaled in the frame 8. To the outer end of the leading-screw 55 crank 56 is secured, by which the screw can be turned by hand. The carriage 57 slides laterally on the frame 8, moved by the leading-screw 55, which extends through a threaded nut on the carriage 57, as is commonly done in the tool-carriages of planing-machines. The carriage 57 is provided with the brackets 58, in which the shaft 59 is journaled. On the shaft 59 the grinding-wheel 60 is secured, and rotary motion is imparted to the shaft by the pulley 61, over which passes the driving-band 62, connecting with a pulley on a counter-shaft placed above the machine. The lower part of the vertical shaft 44 is provided with a longitudinal groove. The sleeve 63, provided with a beveled gear, is connected with the shaft 44 by a pin or spline, which enters the groove, so that the sleeve 63 will turn with the shaft and can be moved on the shaft. The sleeve 63 is geared with the beveled gear 64, which, with the spur-gear 65, is supported on a stud projecting from the bracket 67, adjustably secured by bolts extending through the slots 66 in the standards 5. By loosening these bolts the bracket 67 can be moved down until the spur-gear 65 connects with the gear 18 in the hand-wheel 17.

To enable others skilled in the art to construct and use my invention, I will now more fully describe the operation of the same.

My improved grinding-machine is designed to automatically grind the surface of any article, and to this purpose, when surfaces the length of which is greater than their width are to be ground, I secure the work on the table 21 in the usual manner, move the carriage 57, with the grinding-wheel, to one side of the surface to be ground, and then raise the work, with the table 21 and the frame 11, by turning the hand-wheel 17, and through it the screw-spindle 13, to the required height to enable the grinding-wheel to cut away the amount of metal required to produce the desired surface. When all the parts are thus adjusted, the machine is started, the motion of the driving-shaft is transmitted through the beveled gears, the barrel-gear 32, the intermediate gear, and the gear 29 to the spindle 28 and disk 24, imparting rotary motion to the disk, which motion is transmitted by the connecting-rod 22 to and changed into the reciprocating motion of the table 21 and the work. Continuous rotary motion is imparted to the grinding-wheel by the belt 62, and at the same time a gradual lateral motion across the work is imparted to the carriage 57 and the grinding-wheel by the motion transmitted from the driving-shaft to the horizontal shaft 41, the vertical shaft 44, and the leading-screw by the intermediate gears above described, so that any width or length of surface within the capacity of the machine will be traversed and ground by the grinding-wheel. When the surface to be ground is nearly square or round, it can be more accurately and more quickly ground by securing the work directly on the disk 24, having first removed the table 21 and the connecting-rod. The work is secured to the disk 24 in the same manner as work is usually secured—by clamp-bolts or by a chuck—the carriage 57 is moved to one side of the work, the work adjusted to the grinder, and the machine started. When the grinding-wheel has now reached the center of the disk 24 in its lateral traverse, the whole surface of the work secured on the disk will have been ground, and thus double the surface traversed by the grinding-wheel will be ground when the work is rotated on the disk 24. When a conical surface is to be ground, the bracket 67 is loosened, and the bracket, with the gears 64 and 65, is moved down, so that the gear 65 meshes with the gear 18. The sleeve 63 is now moved down, so that the gear on the sleeve meshes with the bevel-gear 64, so that rotary motion is imparted to the hand-wheel 17, and through the gears to the screw-spindle 13, to gradually raise the frame 11, and with the frame the disk 24 and the work on the same. If the grinding-wheel is started from the center of the work, a conical surface will thus be ground.

The gear 65 is secured by a screw and nut and can be quickly exchanged for a gear of greater or less diameter, so that by using a wheel of the proper diameter any desired conical surface may be ground, as by the change of the gear 65 the relative speed of the hand-wheel 17 and the raising of the work can be accurately adjusted.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In a grinding-machine, the combination, with the frame of the machine, the leading-screw, and the carriage supporting the grinding-wheel, of the vertically-adjustable frame 11, the horizontally-reciprocating work-table 21, the disk 24, and the connections between the disk and the bed, the spindle 28, the driving-shaft provided with the band-pulley, the barrel-gear 32, and intermediate gears constructed to impart reciprocating motion to the work, as described.

2. The combination, with the standards 5, base 6, plate 7, and frame 8, of the vertically-adjustable frame 11, provided with the brackets 19 and 20, and ways 10, the reciprocating horizontal work-table 21 and mechanism for operating the same, the screw-spindle 13, the shaft 16, the hand-wheel 17, and the gears 14 and 15, constructed to adjust the work, as described.

3. The combination, in a grinding-machine, with the frame of the machine, of the carriage 57, having bearings for the shaft of the grinding-wheel 60, and a pulley for turning the same, the beveled gears 54, 53, 46, and 45, the geared sleeves 49 and 50, and clutch 51,

the vertical shaft 44, the shafts 41 and 36, and the intermediate gears constructed to automatically traverse the grinding-wheel, and the horizontal work-support moving in a vertically-adjustable slide constructed to adjust the work with reference to the grinding-wheel, as described.

4. The combination, in a grinding-machine provided with a horizontal disk constructed to support the work, and mechanism for turning the disk, of the frame 11, the screw-spindle 13, the gears 14 and 15, the shaft 16, gear 18, and mechanism connecting the driving-shaft with the leading-screw of the bracket 67, the gear 64, the gear 65, and the adjustable geared sleeve 63, constructed to connect the mechanism for turning the leading-screw to move the grinding-wheel laterally with the mechanism for adjusting the work vertically, so as to move the work vertically while the grinding-wheel is moved laterally to grind a conical surface, as described.

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