No. 879,277. PATENTED FEB. 18, 1908.

A. B. LANDIS.

GRINDING MACHINE.

APPLICATION FILED JULY 5, 1906.

3 SHEETS—SHEET 1.

Fig. 1.

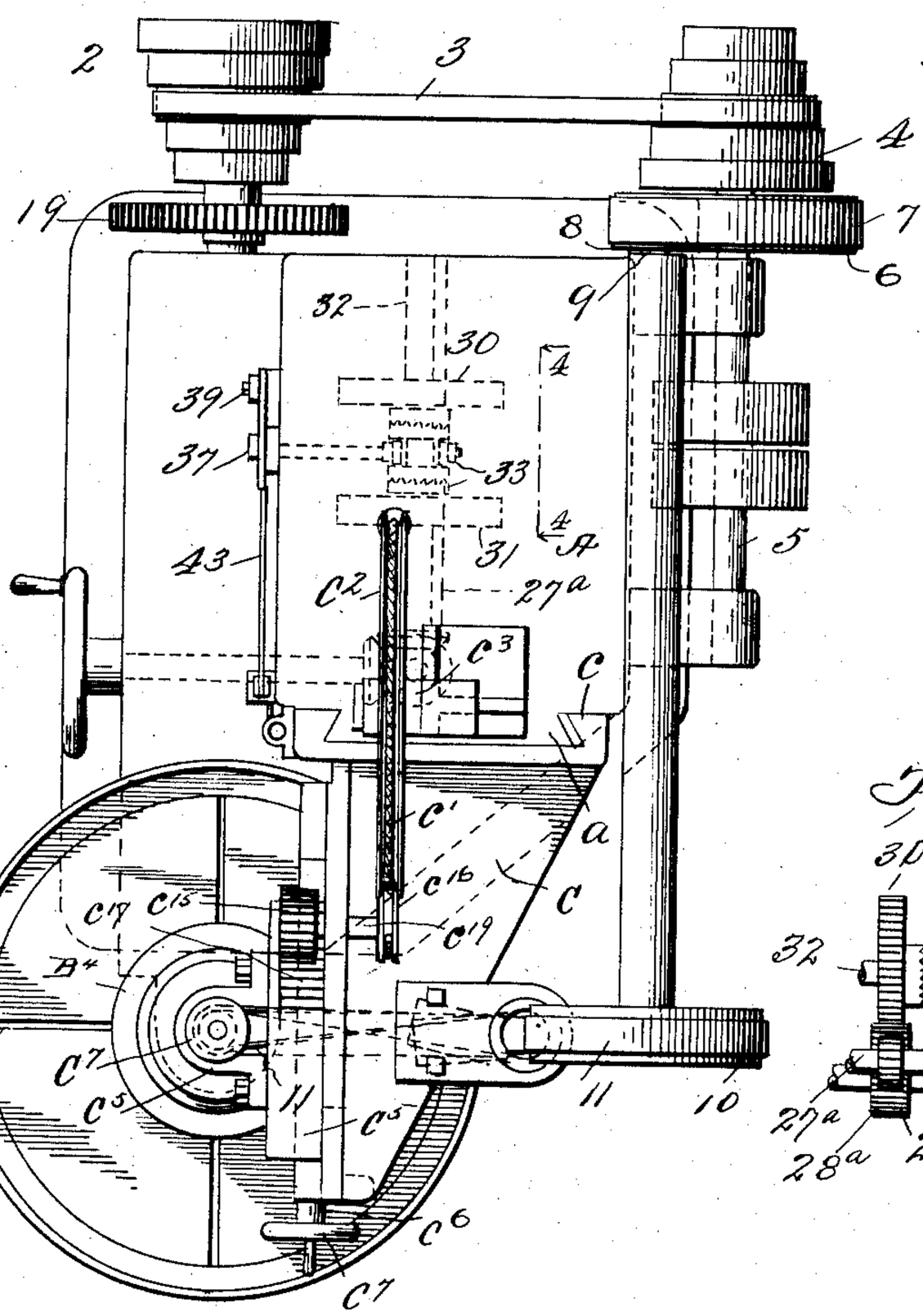
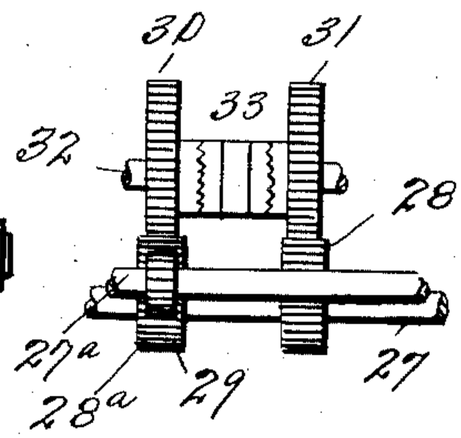


Fig. 4.



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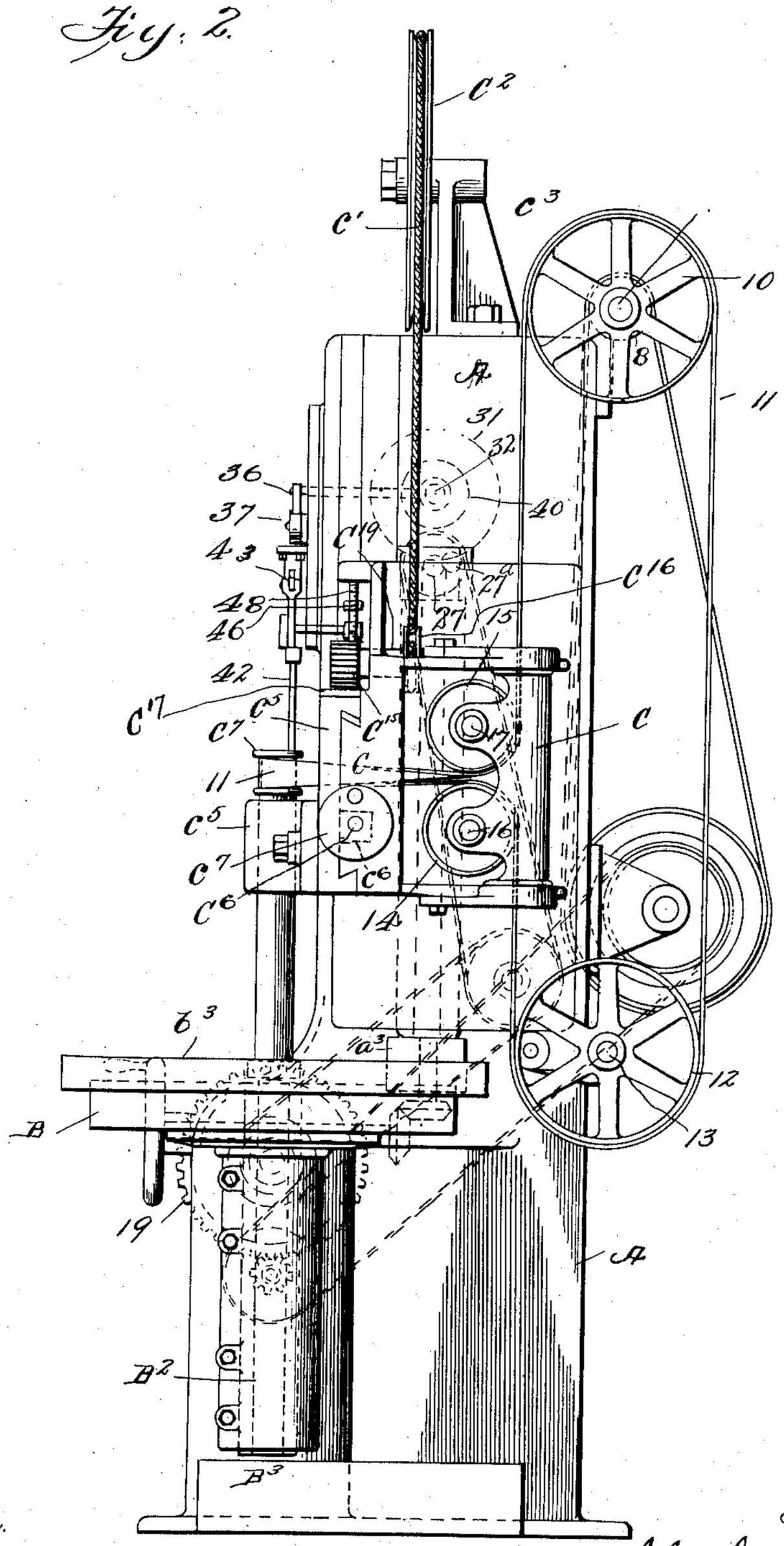
3 SHEETS—SHEET 2.

Fig. 2.



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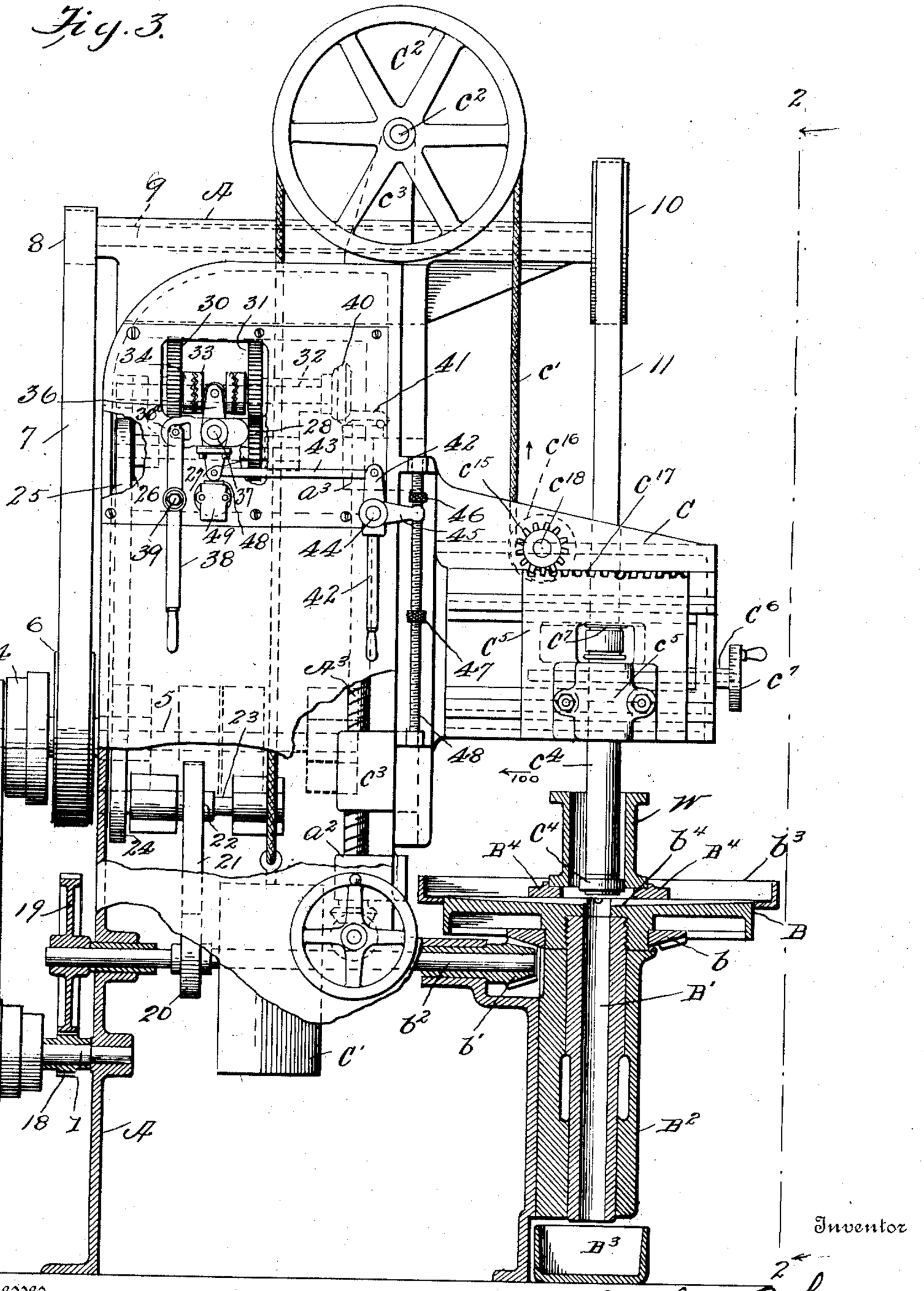
3 SHEETS—SHEET 3.

Fig. 3.



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GRINDING-MACHINE.

No. 879,277. Specification of Letters Patent. Patented Feb. 18, 1908.

Application filed July 5, 1906. Serial No. 324,858.

To all whom it may concern:

Be it known that I, ABRAHAM B. LANDIS, a citizen of the United States, residing at Waynesboro, in the county of Franklin and State of Pennsylvania, have invented certain new and useful Improvements in Grinding-Machines, of which the following is a specification.

The object of my said invention is to provide a grinding machine especially adapted for grinding the interior surfaces of cylindrical parts held or supported in a vertical position, the invention consisting in the particular construction and arrangement of parts whereby such a machine is provided for such a use, all as will be hereinafter more fully described and claimed.

Referring to the accompanying drawings which are made a part hereof and on which similar reference characters indicate similar parts, Figure 1 is a top or plan view of a grinding machine embodying my said invention, Fig. 2 a side elevation of the same as seen when looking in the direction indicated by the arrows from the dotted line 2—2 in Fig. 3, Fig. 3 a front elevation of said machine with portions shown in section and part of the casing broken away to illustrate the construction more clearly, and Fig. 4 a fragmentary detail of the clutch forming part of the reversing mechanism.

In said drawings the portions marked A represent the main supporting frame of the machine, B the work-supporting table, and C the grinding wheel carriage.

The main supporting frame A is a casting of suitable size and shape to support the different parts of the mechanism employed. It is of considerable height as shown, made necessary by the character of the machine, as will be presently described.

The work-supporting table B is of a disk formation and mounted upon a hollow spindle B′ journaled in a bearing B^2 on the side of frame A. It is provided on its under side with a bevel gear wheel b with which a similar gear b' on a driving shaft b^2 engages. Said table is provided with a rim b^3 for catching the water used in the grinding operation. The top surface of said table has grooves b^4 which are inclined toward its center, leading to a central aperture through the hollow spindle B′ and provides a discharge for the water into a tank B^3 located beneath the lower end of said spindle, as shown. Clamping devices B^4 for holding the work W are adjustably mounted in the radial grooves b^4 in the top of said table B and are thus adapted to hold work of any size desired.

The grinding wheel carriage C is a casting of suitable form to carry the mechanism mounted thereon and is mounted upon a projecting rib a on the side of the frame A, by means of dove-tailed shaped flanges c which fit over correspondingly shaped edges of said rib. It is counter-balanced by a weight C′ connected thereto by a cable c' attached to said weight at one end and its other end being attached to one side of a grooved pulley c^{16}, on the end of a shaft c^{18}, which is mounted in a bearing in a lug c^{19} on the top of carriage C. Said cable passes over a grooved pulley C^2 mounted on a shaft c^2 in suitable brackets c^3 on the top of frame A. The movement of said carriage and the mechanism carried thereby is thus rendered comparatively easy. A lug C^3 is cast on the inside face of said carriage near its lower end and projects through a vertical way in the adjacent side of the frame. It is internally screw-threaded and a screw-threaded shaft A^3 mounted in suitable bearings a^2 and a^4 on the inside of said frame, passes through said lug with its threads engaging the threads thereof. By this means the travel of said carriage is provided for as will be presently more fully described. The grinding wheel C^4 is mounted upon a spindle c^4 journaled in suitable bearings c^5 in a slider C^5 mounted to slide on a transverse way on the front face of carriage C. Said slider C^5 is provided with a lug c^6 internally screw-threaded with which a screw-threaded rod C^6 engages. Said screw-threaded rod C^6 has a crank or hand-wheel c^7 on its outer end by which it may be turned and said slider adjusted to feed the grinding wheel to the work. A rack c^{17} is mounted on the top of said slider and a pinion c^{15} on shaft c^{18} meshes therewith. It will thus be seen that as the weight C′ through the cable c' pulls upwardly it operates through the pulley c^{16} and the rack and pinion connection to hold the slider and grinding wheel away from the work, serving to take up all back-lash and prevent the grinding wheel from being jarred into the work to mar it, thus insuring a smooth and even operation of the machine. A pulley

C^7 is mounted on the grinding wheel spindle c^4 by which the power is applied for driving said grinding wheel.

A power shaft 1 is journaled in suitable bearings on one side of the frame and provided with a cone-pulley 2 from which a belt 3 runs to a cone-pulley 4 on a counter-shaft 5, which is mounted in suitable bearings and extends across the frame of the machine. A pulley 6 is mounted alongside said pulley 4 and is connected by a belt 7 with a pulley 8 on the outer end of a shaft 9 journaled on the top of the machine. The opposite end of said shaft 9 has a pulley 10 from which a belt 11 runs to the pulley C^7 on the grinding wheel spindle c^4, passing over an idler pulley 12 on a shaft 13 mounted in bearings on the back of the machine at a point below the pulley C^7 and passing between idler pulleys 14 and 15 on horizontal shafts 16 and 17 mounted on a bracket carried by the carriage C. Said belt 11 passes through between said idlers 14 and 15 and is given a half twist and passes over said pulley C^7. By this arrangement said belt 11 maintains its normal tension and position regardless of the vertical movement of the carriage and does not interfere with said movement. A pinion 18 is also mounted upon power shaft 1 and meshes with a gear wheel 19 on the transverse driving shaft b^2 which has the pinion b' on its opposite end and operates to drive the work supporting table B. Another pulley 20 is mounted on said shaft b^2 and is connected by a belt 21 with a pulley 22 on a short shaft 23 mounted in suitable bearings in the frame. Said shaft 23 has a pulley 24 connected by a belt 25 with a pulley 26 on a transverse shaft 27, which has two pinions 28 and 29 mounted thereon.

Pinion 28 meshes with a loosely mounted gear wheel 31 on shaft 32 mounted in suitable bearings adjacent to and parallel with said shaft 27. Pinion 29 meshes with a pinion 28^a on a parallel shaft 27^a, which has a pinion 30^a, which meshes with the loosely mounted gear wheel 30 on shaft 32. Said gear wheels 30 and 31 are each provided with a clutch part on their respective hubs and either may be coupled to the shaft 32 by a sliding double-faced clutch part 33, which is mounted between them on said shaft by means of a spline. Said clutch part 33 is operated by means of a shifting fork 36 mounted on a pivot 37 and connected by a link 43 to an operating lever 42 mounted on a pivot 44. Said shaft 32 is provided with a bevel gear 40 which meshes with a bevel gear 41 on the upper end of shaft A^3, which thus serves to drive said shaft and traverse the carriage C up and down on the bed A, the clutch part 33 being shifted from one of the gear wheels 30 or 31 to the other, to reverse the travel of the carriage at the points desired. Said clutch part 33 may be automatically shifted by means of an arm 45 projecting at an angle from lever 42 and adapted to contact with the stops 46 and 47 adjustably mounted on a rod 48 on the side of the carriage C. By this means the stops 46 and 47 may be located at the points required to throw the lever and shift the travel of the carriage to suit the length of the work, as will be readily understood. A spring mounted block 48 in a casing 49 on the side of the frame is adapted to bear against the lower end of the shifting lever 36. Its upper end is concaved so as to hold said lever in a vertical position as shown in Fig. 3, in which position both clutch parts are out of engagement. When thrown in one direction or the other the lower end of said lever will pass over one or the other of the corners of said spring block, which will thus hold said shifting lever in position to hold the clutch part in engagement until forcibly released. A lever 38 mounted on a pivot 39 carries a lug or roller on its upper end which engages with a T-shaped slot in the end of an angle arm 36^a of shifting-fork 36 and is adapted to lock the parts in fixed position when desired.

In operation, the work being secured on the table B by means of a clamp B^4 the mechanism is adjusted as indicated most plainly in Fig. 3, the stops 46 and 47 being arranged to automatically shift the direction of travel of carriage C to suit the length of the work being ground. The slider C^5 is operated by means of the hand wheel c^7 to feed the grinding wheel to the work as before described, and the operation proceeds as fully hereinbefore explained.

Having thus fully described my said invention, what I claim as new and desire to secure by Letters Patent, is:—

1. A grinding wheel comprising a supporting frame having a vertical way or track thereon, a grinding wheel carriage mounted to slide vertically on said way or track, a slider on said grinding wheel carriage mounted to slide transversely thereof, a grinding wheel spindle mounted in bearings on said slider, a rotary table for supporting the work, and the various operating mechanisms, substantially as set forth.

2. In a grinding machine, the combination of the supporting frame, the grinding wheel carriage mounted to slide vertically on said frame, means for traversing said carriage up and down, the slider mounted on said carriage to slide transversely thereof, means for sliding said slider, the grinding wheel spindle mounted in bearings on said slider, the grinding wheel on said spindle, means for driving the same, the work supporting table, and

means for rotating said table, substantially as set forth.

3. In a grinding machine, the combination, of the supporting frame, the grinding wheel carriage mounted to slide vertically on one side of said frame, the slider mounted to slide transversely on said carriage, the grinding wheel spindle journaled in bearings on said slider, the grinding-wheel on said spindle, and means for traversing said carriage, adjusting said slider and driving said grinding-wheel, substantially as set forth.

4. In a grinding machine, the combination, of the supporting frame, the grinding wheel carriage mounted to slide vertically on one side of said frame, traversing mechanisms for said carriage, the slider mounted to slide transversely on said carriage, means for adjusting said slider, the grinding wheel carried by said slider, means for driving said grinding wheel, the work support, and means for rotating said work support, substantially as set forth.

5. In a grinding machine, the combination, of the supporting frame, the work-holding table mounted on a hollow-spindle in bearings on one side of said frame, the top of said table having slots inclined toward its center and having a perforation leading to the hollow spindle, a gear on said table, a driving shaft having a gear meshing with said gear, work holding clamps on the top of said table, the carriage, the mechanism for traversing said carriage up and down, the slider, means for sliding said slider transversely, the grinding-wheel on said slider, and means for driving said grinding wheel, substantially as set forth.

6. In a grinding machine, the combination, of the supporting frame, the rotary work holding table mounted on a spindle in bearings on one side of said frame, means for rotating the same, the grinding-wheel carriage mounted to slide up and down on a way on one side of said frame, a balancing weight connected to said carriage, means for traversing said carriage up and down, the slider on said carriage, the grinding wheel journaled in bearings on said slider, and means for driving said grinding wheel, substantially as set forth.

7. In a grinding machine, the combination, of the supporting frame, the work-supporting table, the vertically adjustable carriage mounted on said frame above said table and connected to a counter-balance, traversing mechanism, means for reversing the motion of said traversing mechanism, the slider on said carriage, the grinding wheel on a spindle journaled in bearings on said slider, and driving mechanism connected therewith, substantially as set forth.

8. In a grinding machine, the combination, of the supporting frame, the work support on one side, the carriage mounted to slide vertically on one side of said frame above said work support, gearing connected therewith for traversing said carriage, reversing mechanism, means for automatically operating said reversing mechanism, the slider, the grinding wheel thereon, and the operating mechanism, substantially as set forth.

9. In a grinding machine, the combination, of the supporting frame, the work support, the grinding wheel carriage, mounted to slide vertically on said frame, the traversing mechanism for said carriage comprising a screw rod mounted in bearings on the frame and engaging with a nut part on the carriage, gearing for driving said screw-rod, reversing mechanism, and adjustable trips carried by said carriage in position to strike and operate said reversing mechanism, substantially as set forth.

10. In a grinding machine, the combination, of a frame having a vertical guide-way, a carriage mounted to reciprocate thereon, a weight for counter-balancing said carriage, a slider on said carriage carrying the grinding wheel, and a connection between said weight and said slider for holding the grinding wheel away from the work, substantially as set forth.

11. In a grinding machine, the combination, of the frame having a vertical guide-way, the carriage mounted to reciprocate thereon, the slider on said carriage, the grinding wheel on said slider, and a counter-balancing weight connected to said carriage and to said slider to hold it away from the work, substantially as set forth.

12. In a grinding machine, the combination, of the frame having a vertical guide-way, the work holding table, the carriage mounted to reciprocate on said vertical guide-way, the slider on said carriage having the grinding wheel mounted thereon, a weight and connections between said weight and said carriage and said slider, whereby said carriage is balanced and said slider is held away from the work, substantially as set forth.

13. In a grinding machine, the combination, of the frame, a vertically reciprocating carriage thereon, a slider on said carriage carrying the grinding wheel, and a weight connected to balance said carriage and cause a thrust in one direction upon said slider, substantially as set forth.

14. In a grinding machine, the combination, of the frame, the vertically reciprocating carriage, the slider thereon carrying the grinding wheel, a rack on said slider, a pinion mounted on a shaft journaled in bearings on said carriage and engaging said rack, a pulley

on said pinion-shaft, a weight for counterbalancing said carriage, and a flexible connection attached to said weight at one end and to said pulley at the other and running over an intermediate pulley on the frame, substantially as set forth.

In witness whereof I have hereunto set my hand and seal at Waynesboro, Pennsylvania, this 7th day of June, A. D. 1906.

ABRAHAM B. LANDIS. [L. s.]

Witnesses:
J. L. LEMMON,
ALF. N. RUSSELL.