

No. 615,811.

Patented Dec. 13, 1898.

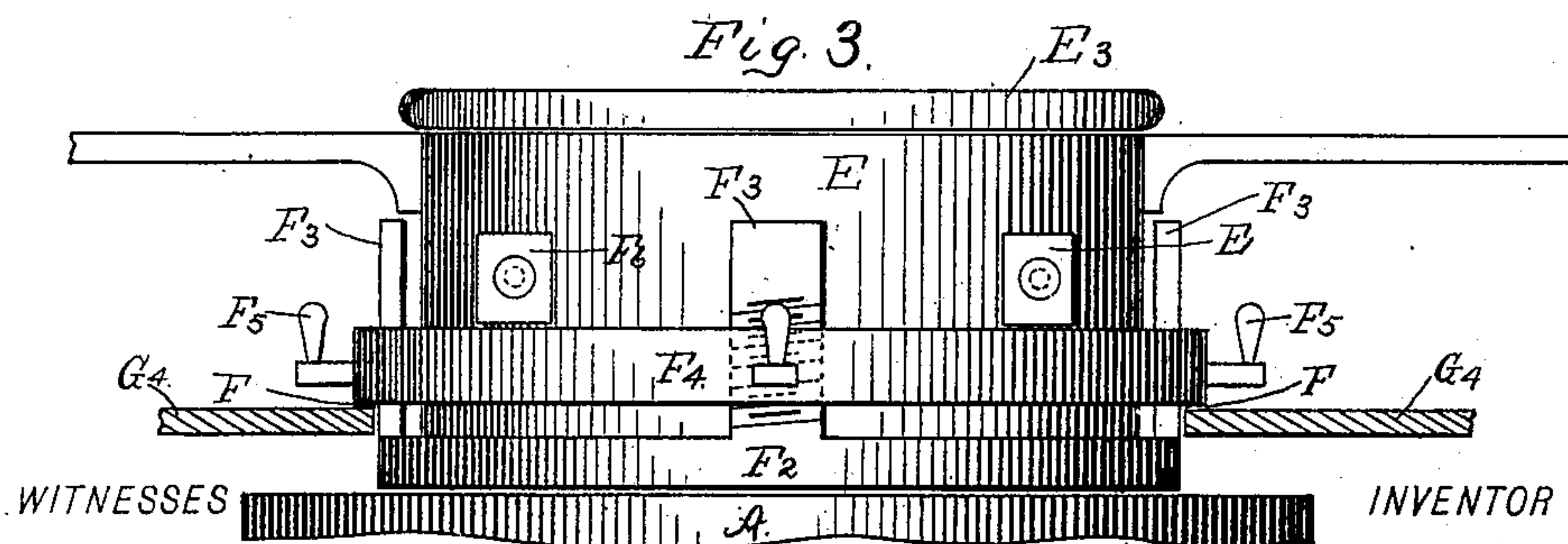
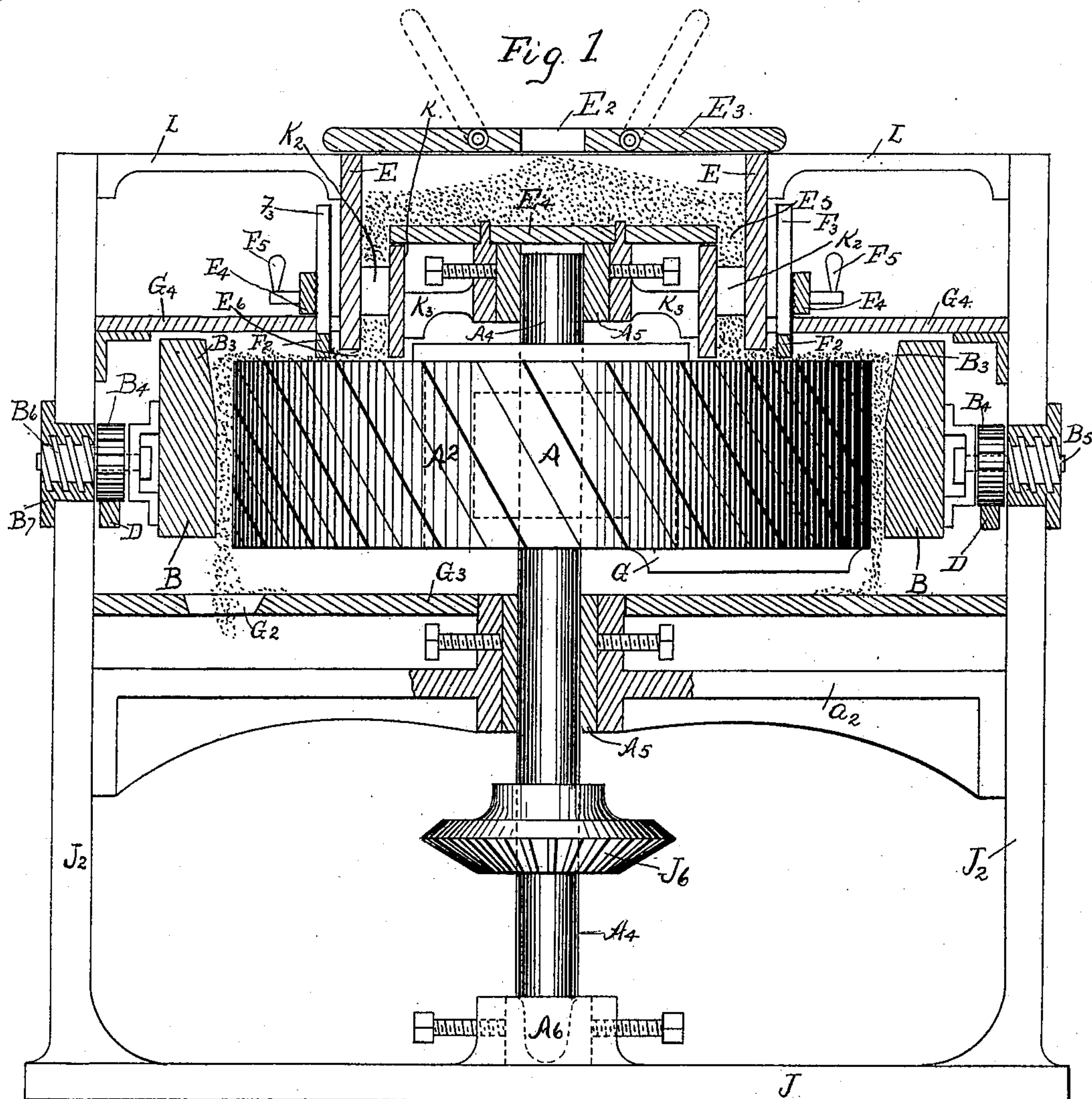
J. W. CUNNINGHAM.

GRINDING MILL.

(Application filed June 13, 1896.)

(No Model.)

3 Sheets—Sheet 1.



WITNESSES
Wm. H. McJannett
Carrie C. Olsen.

INVENTOR
Joseph W. Cunningham
 BY
Edgar J. Dyer
 ATTORNEYS.

No. 615,811.

Patented Dec. 13, 1898.

J. W. CUNNINGHAM.

GRINDING MILL.

(Application filed June 13, 1896.)

(No Model.)

3 Sheets—Sheet 2.

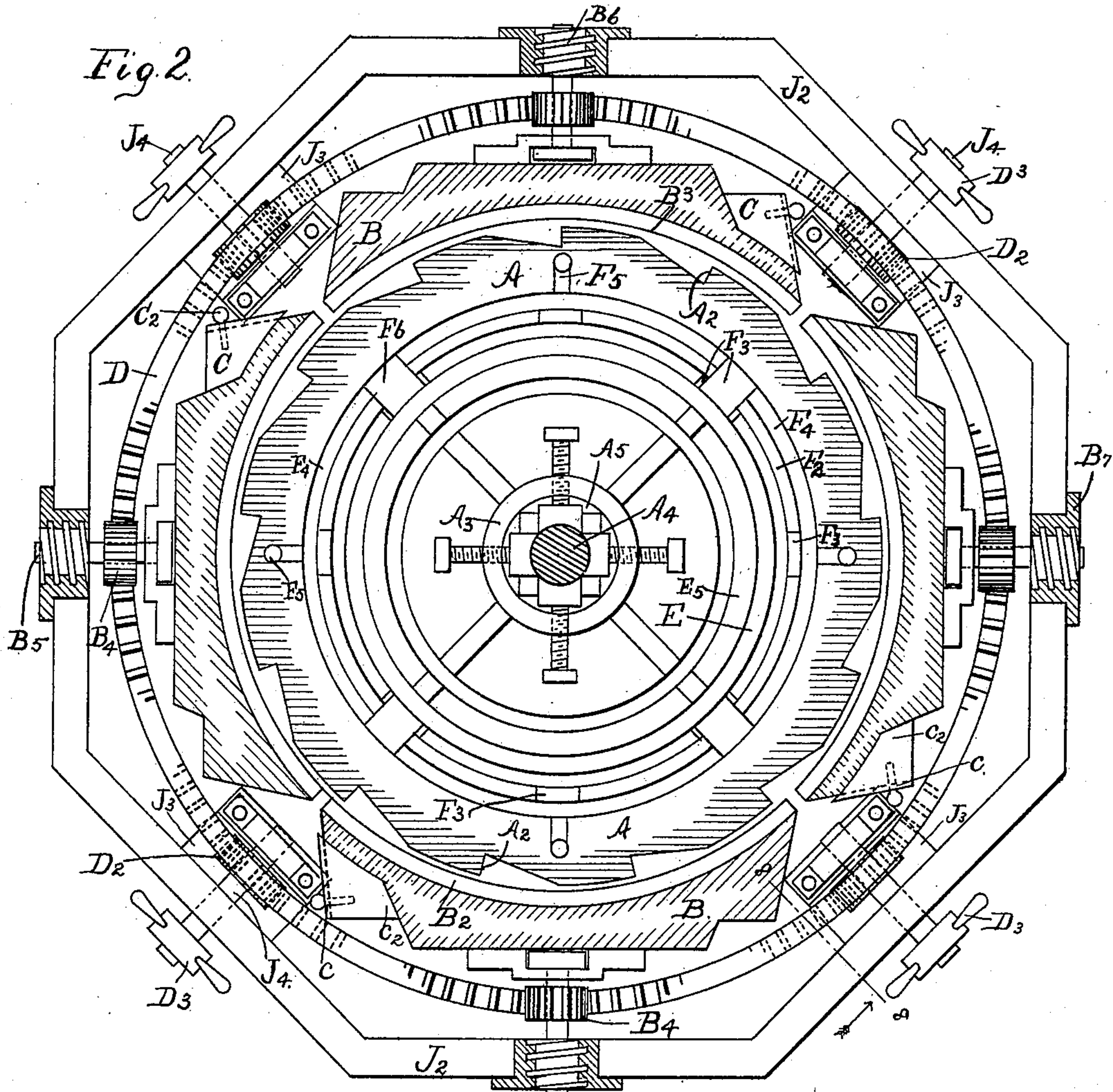
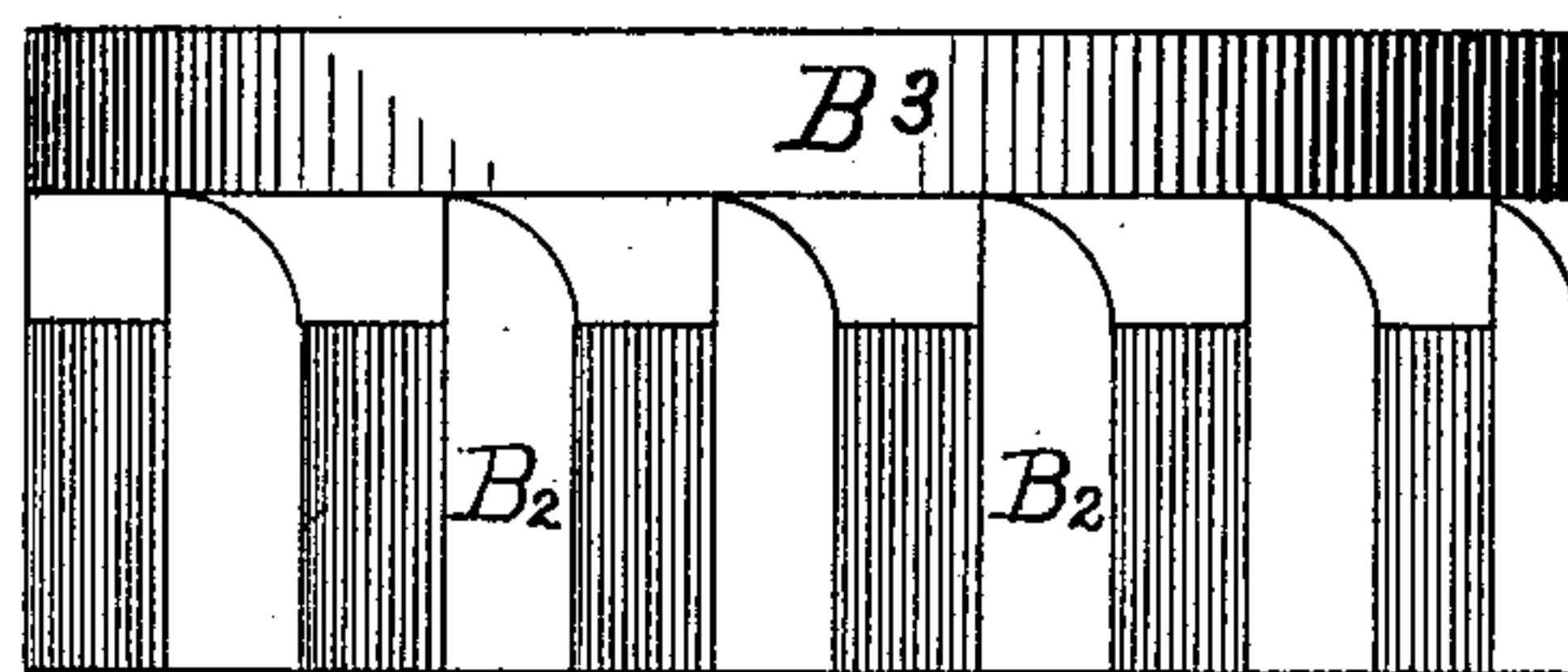


Fig. 4.



WITNESSES

Wm. L. McJannet.
Barrie J. Olson.

INVENTOR

Joseph W. Cunningham

BY

Edgar J. [Signature]

ATTORNEYS.

No. 615,811.

J. W. CUNNINGHAM.
GRINDING MILL.

(Application filed June 13, 1896.)

Patented Dec. 13, 1898.

(No Model.)

3 Sheets—Sheet 3.

Fig. 5

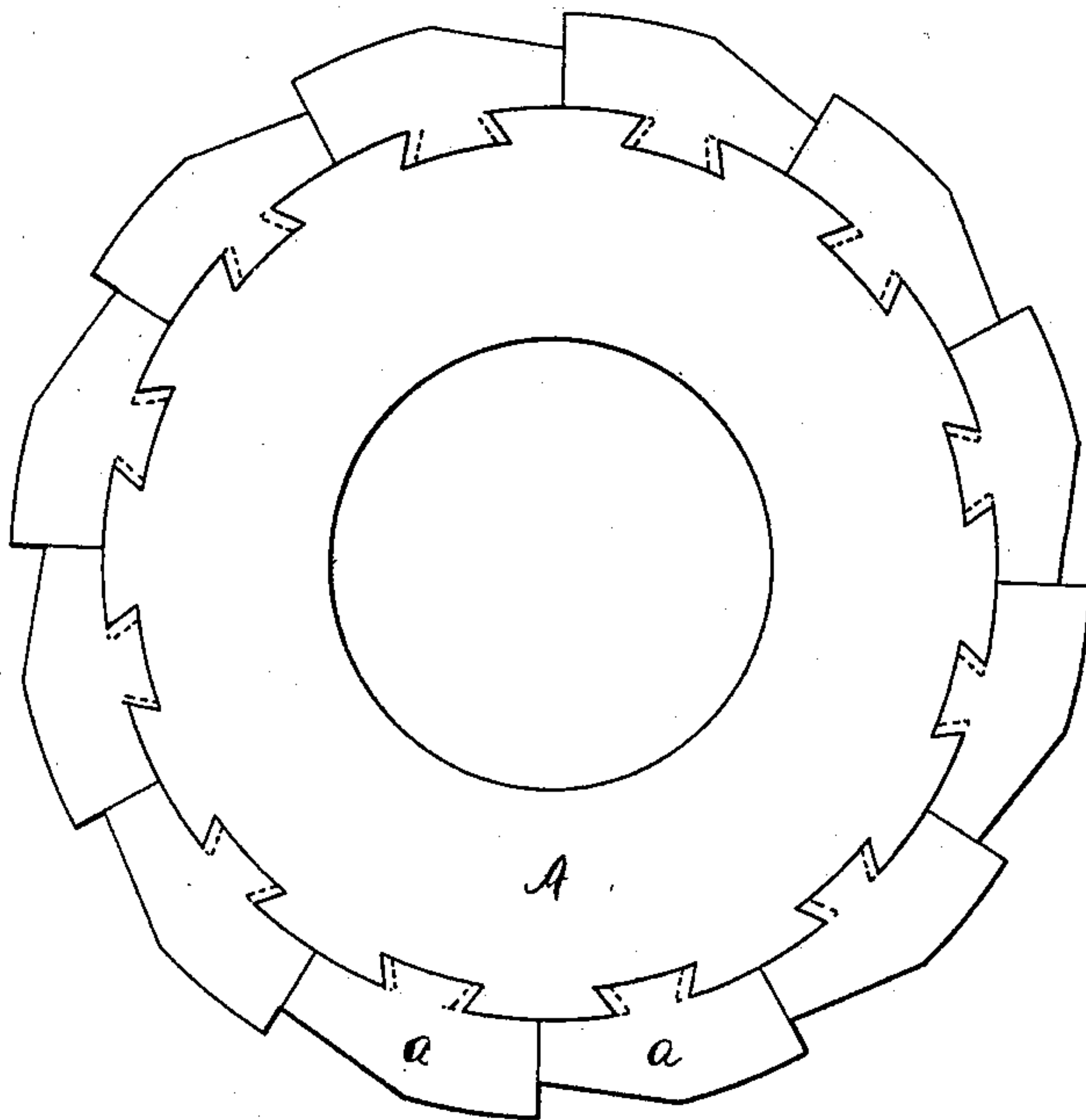


Fig. 6

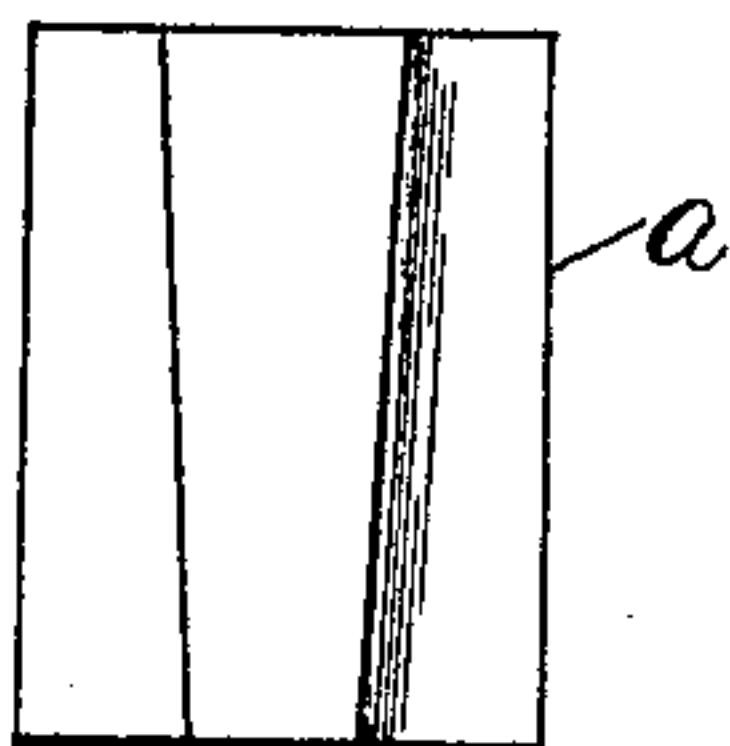


Fig. 7

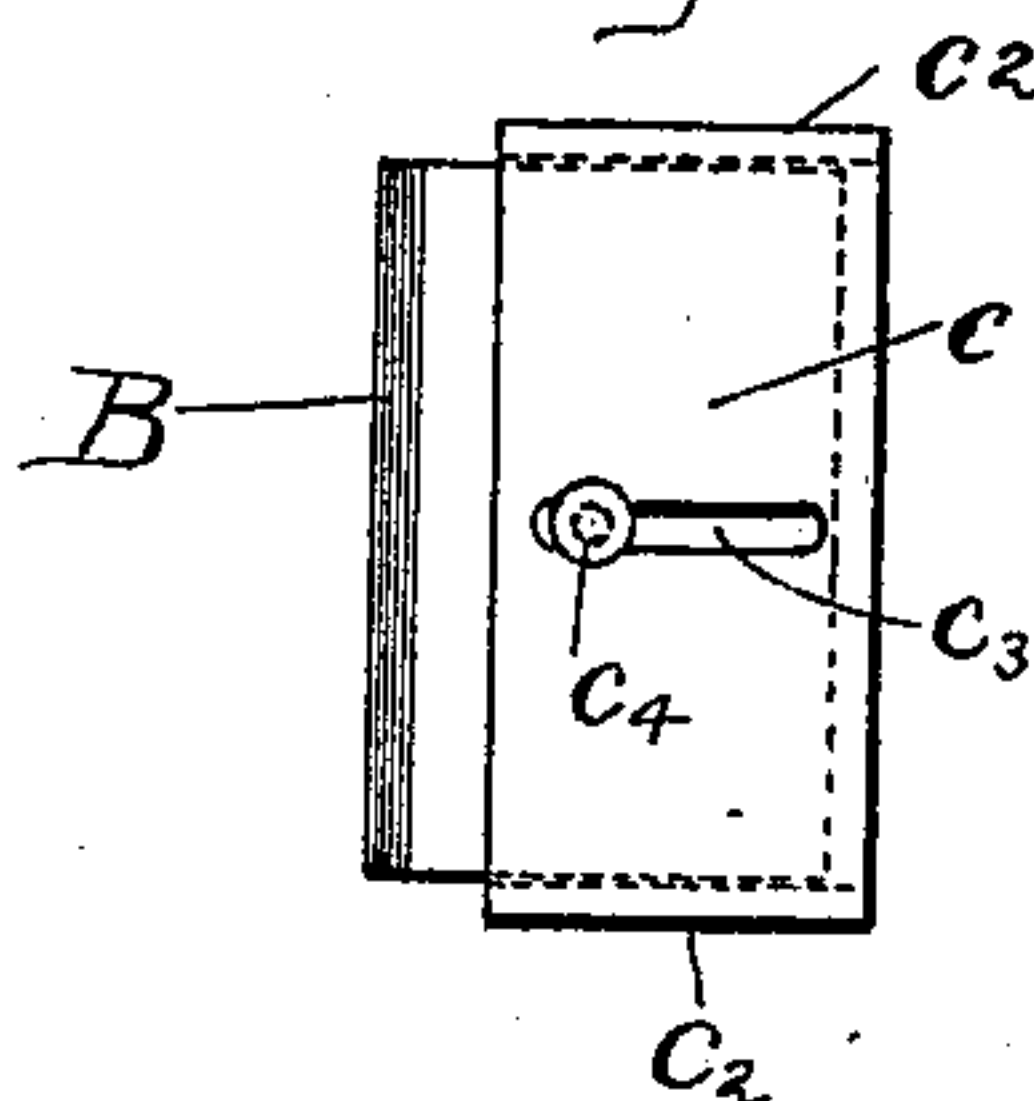
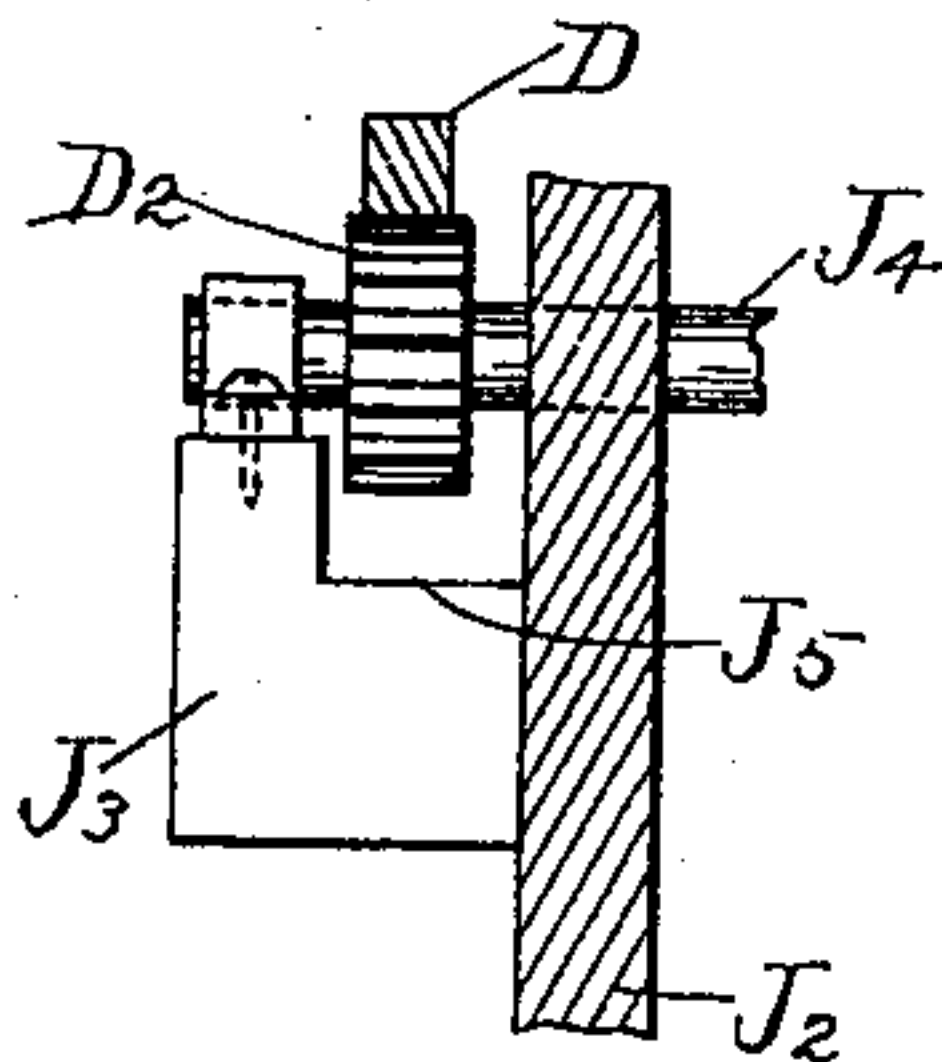


Fig. 8



WITNESSES

Wm. H. McJannett,
Carrie C. Allen.

INVENTOR

Joseph W. Cunningham,

BY

Adair & Co.
ATTORNEYS.

UNITED STATES PATENT OFFICE.

JOSEPH WILLIAM CUNNINGHAM, OF FREEMANTLE, WESTERN AUSTRALIA.

GRINDING-MILL.

SPECIFICATION forming part of Letters Patent No. 615,811, dated December 13, 1898.

Application filed June 13, 1896. Serial No. 595,490. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH WILLIAM CUNNINGHAM, a subject of Her Majesty the Queen of Great Britain and Ireland, residing at Nairn street, Freemantle, in the Colony of Western Australia, have invented a new and useful Improvement in Grinding-Mills, of which the following is a specification.

My invention relates to a new and improved grinding or crushing mill; and the object thereof is to provide an improved mill or machine of this class involving a grinding-cylinder having grooved recesses or channeled spirals in its outer or grinding face in connection with surrounding blocks having their interior faces formed with vertical grooves or channels, said surrounding blocks being radially adjustable without stopping the mill, thus allowing either fine or coarse grinding at the will of the miller, a further object being to provide a mill of this class having improved means for feeding the grain into the grinding interval or space and for regulating the flow thereof; and with these and other objects in view the invention consists in the construction, combination, and arrangement of parts hereinafter described and claimed.

The invention is fully disclosed in the following specification, of which the accompanying drawings form a part, in which like letters of reference refer to the same parts wherever found throughout the several views, and in which—

Figure 1 is a side elevation, partly in section, of a mill embodying my invention, the section shown being a central vertical one; Fig. 2, a sectional plan view with a part of the frame and the top cover or guard-plate of the mill and the hopper removed; Fig. 3, a side elevation of the hopper and the grain-regulator and showing also a part of the grinding-cylinder and the top or guard plate of the mill, said top or guard plate of the mill being in section; Fig. 4, an inside and partial sectional view of one of the radially-adjustable grinding-blocks which I employ; Fig. 5, a plan view of the grinding-cylinder, showing a modified form of construction; Fig. 6, a detail thereof in elevation; Fig. 7, an end view of one of the radially-adjustable grind-

ing-blocks, and Fig. 8 a section on the line 8 8 of Fig. 2.

In the practice of my invention I provide a grinding-cylinder A, which is rigidly mounted on a vertical shaft A⁴, which is placed in a frame comprising a base J and casing J², which is preferably octagonal in form and which is provided with a transverse bracing-plate a². The shaft A⁴ is journaled in a suitable bottom bearing A⁶ and intermediate and top bearings A⁵, and said shaft is provided above the bottom bearing with a beveled gear J⁶, through which power is applied in the ordinary manner.

Formed on the periphery of the grinding-cylinder A are inclined channels or spiral grooves A², which act as and constitute a portion of the grinding or crushing surface of the mill, and, if desired, these spiral grooves or channels A² may be formed in separate detachable blocks a, as shown in Fig. 5, which may be connected with the roller in any desired manner, but which are preferably connected therewith by means of wedge-shaped tongue-and-groove joints; but these connections form no part of this invention, and said detachable blocks a may be connected with the cylinder A by any preferred means, and by means of this arrangement or construction when the grooves or channels become worn the blocks may be replaced.

The casing J² is provided on its inner face or faces, at about a level with the lower edge of the cylinder A, with inwardly-directed lugs or projections J³, which are secured thereto or formed thereon and which are provided in their upper sides with angular recesses J⁵, as shown in Fig. 8, and short shafts J⁴ are journaled on these lugs or projections J³ and project through the casing J², and each of said shafts is provided with a pinion D², which moves in the corresponding notch or recess J⁵, and the outer end of each of said shafts is provided with a handle D³.

A large gear-ring D is mounted within the casing J² and rests upon the pinions D² and operates in connection therewith, and mounted in the casing J², above the lugs or projections J³, are bearings B⁷, and these bearings preferably equal in number the shafts J⁴, and each of said bearings carries a shaft B⁵,

which is provided with a screw-head B⁶, and the bearings B⁷ are also screw-threaded interiorly, and the heads B⁶ of the shaft B⁵ are adapted to turn in said bearings, and mounted
 5 on each of said shafts and adjacent to the inner face of said casing is a pinion B⁴, which engages with the large gear-ring D, which is provided with gear-teeth on both its upper and lower sides.

10 Suitably secured to the inner end of each of the shafts B⁵ is a grinding-block B, and the inner faces of these blocks B are circular in form to correspond with the outer surface of the grinding-cylinder A, and said blocks are
 15 provided in their inner or grinding faces with vertical flukes or grooves B², and said blocks are also provided in their inner faces with an annular cut-away or lead-away portion B³.

The blocks B may be removed when their
 20 faces are worn, and adjustably secured to the blocks B or to one end of each are slides C, which are preferably provided with wings or flanges C², which overlap the upper and bottom sides of said blocks, and these slides C
 25 are so connected with the blocks B that they may be moved in or out as the blocks B are moved out or in, so as to close the spaces between said blocks formed by the outward movement thereof, in order to present an un-
 30 broken grinding-surface surrounding the cylinder A. These slides C may be supported in any desired manner; but in Fig. 7 I have shown one of said slides provided with a slot C³, through which passes a set-screw C⁴, by
 35 means of which the slide may be secured in place; but any preferred means for adjusting the slide C or for connecting it with the block B may be employed.

Mounted below the cylinder A and surrounding the shaft A⁴ is a reception-tray G³, having a discharge-opening G² at one side thereof, and secured to the underside of the cylinder A is a collector G, adapted to sweep
 45 the crushed or ground grain through said discharge-opening.

Above the cylinder A is a hopper E, into which the grain is fed through the opening E² in the hinged door or cover E³, and inclosing the bottom of the hopper E and secured
 50 to the casing J is a top or guard plate G⁴, between which and the hopper is an annular space, and mounted over the top bearing A⁵ of the shaft A⁴ is a guard-plate E⁴, designed to protect the said top bearing of the shaft
 55 A⁴ from the grain. The top or guard plate G⁴ is designed to cover and protect the parts of the mill between the hopper and the casing and to cover and protect the grinding interval or space between the cylinder A and
 60 the blocks B and also to form a support for the ring or band F⁴, and beneath the hopper is an annular space E⁶, and below the top or guard plate G⁴ is an annular band F², which is intended to regulate the flow of grain
 65 through said annular space, and the annular band F² is provided with upwardly-directed

arms or projections F³, which pass through a space between the top or guard plate G⁴ and the hopper E, and these arms or projections are screw-threaded on their outer faces, as
 70 shown in Fig. 3, and mounted thereon is the screw-threaded band F⁴, which rests upon the shield or guard-plate G⁴, and said band F⁴ is operated by handles F⁵, connected therewith, and the vertical movement thereof is limited
 75 by stops F⁶, formed on or secured to the hopper E, and the downward movement thereof is limited by said top or guard plate G⁴. In this movement of the band F⁴ around the hopper the feed-regulating band F² will be carried
 80 therewith until one of the upwardly-directed projections or arms F³ strikes one of the stops F⁶ on the side of the hopper, when the continued circular movement of the ring or band F⁴ will result in the feed-regulating
 85 ring or band F² being raised or lowered, as will be readily understood, and it will be apparent that the stops F⁶ may be so arranged as to stop the circular movement of the ring or band F² within very narrow limits.

The blocks B, which are provided with vertical grooves or channels on their inner surfaces, constitute the outer grinding surface or wall and operate in connection with the inclined or spiral grooves or channels formed
 95 on the outer surface of the cylinder A, and these blocks are radially adjustable with reference to said cylinder, whereby the crushing area or distance between the grinding-surfaces of said blocks and the said cylinder
 100 can be either increased or diminished at will and during the processes of grinding without stopping the mill, all of said blocks being operated in a simultaneous and uniform manner by means of the large gear-ring D, which
 105 may be turned in either direction, as will be readily understood, the operation of turning said ring resulting in forcing the said blocks B inwardly or outwardly, according to the direction in which said ring is turned. The
 110 movable slides C are intended to overlap or close the space between said blocks occasioned by the operation of moving the latter outwardly, and the operation of the machine will be readily understood from the foregoing
 115 description when taken in connection with the accompanying drawings and the following statement thereof.

A rotary motion being imparted to the cylinder A by the gear J⁶ the wheat to be crushed
 120 is delivered into the hopper E through the openings E², and, falling on the guard-plate E⁴, said hopper holds the wheat, as shown in the drawings, and the latter passes down through the annular space E⁵ and through the
 125 annular opening or space E⁶ below the hopper onto the cylinder A, and by the centrifugal action of said cylinder the wheat is conveyed to its outer periphery in a uniform and regular manner and falls down into the grinding-
 130 space between said cylinder and the blocks B, being facilitated in its movement

by the lead-away formation B³ of the block B. The draft or current occasioned by the operation of the mill draws the grain down through the grooves B², in which it is crushed and ground into flour of the required fineness, and said flour falls on the tray G³ and is swept or conveyed outward by the collector G and is finally delivered through the discharge-opening G², and it will be understood that during the operation of the mill the operator can regulate the width of the grinding area or space between the cylinder and the blocks B by simply turning the gear-ring D by means of the shafts J⁴ or either or them.

The grain may be crushed to any fineness in one operation by closing the blocks B, or what is technically known in the milling trade as the "short system," while if the long system be adopted two or more of these machines may be employed in the ordinary manner as is the case with existing flour-mills.

The bearings A⁵ and A⁶ may be of any desired construction, and the upper bearing A⁵ is supported by an annular band K, which is connected with the outer wall of the hopper by radial arms K² and which forms the inner wall of the annular space E⁵, and said hopper E is supported by arms L, secured to the casing J², any desired number of which may be employed, and the annular band K is provided with inwardly-directed arms K³, which support the bearing proper.

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

1. A grinding-mill, comprising a casing, a vertical shaft mounted centrally thereof, a grinding-cylinder connected with said shaft, radially-adjustable grinding-blocks inclosing said cylinder and having circular inner faces, slides connected with the ends of said blocks for closing the spaces between the same when they are moved outwardly, a tray mounted below said cylinder, and adapted to receive the flour, and a hopper mounted above said cylinder and provided with means for feeding the grain therefrom, into the grinding-space between said cylinder and said grinding-blocks, and devices for regulating the flow of the grain into said grinding-space, substantially as shown and described.

2. A mill of the character herein described, comprising a casing, a vertical shaft mounted therein and provided with means for operating it, a grinding-cylinder mounted on said shaft and provided with inclined or spiral grooves in its outer face, a gear-ring mounted between said casing and said cylinder, devices for revolving said ring, radially-adjustable grinding-blocks mounted between said ring and said cylinder, the inner surfaces of which are curved to correspond with the perimeter of said cylinder, and means for feeding the material to be ground to the grinding space or interval between said blocks and said cylinder, substantially as described.

3. A mill of the character herein described, comprising a casing, a vertical shaft mounted therein and provided with means for operating it, a grinding-cylinder mounted on said shaft and provided with inclined or spiral grooves in its outer face, a gear-ring mounted between said casing and said cylinder, devices for revolving said ring, radially-adjustable grinding-blocks mounted between said ring and said cylinder, the inner surfaces of which are curved to correspond with the perimeter of said cylinder, and means for feeding the material to be ground to the grinding space or interval between said blocks and said cylinder, said mill being also provided with a tray beneath said cylinder provided with a passage for the flour, and the cylinder being provided with means for collecting and passing the ground product therethrough, substantially as described.

4. In a mill of the character herein described, a casing, a vertical shaft mounted therein centrally thereof, means for operating said shaft, a grinding-cylinder mounted thereon, a revoluble ring mounted between said casing and said cylinder, radially-adjustable grinding-blocks mounted between said ring and said cylinder and adapted to be operated by said ring, adjustable slides connected with the ends of said blocks and adapted to close the space between the same when the latter are moved outwardly, and means for feeding the material to be ground between said blocks and said cylinder, substantially as described.

5. In a mill of the character herein described, a casing, a vertical shaft mounted therein, a cylinder mounted on said shaft, a revoluble ring mounted between said casing and said cylinder, radially-adjustable grinding-blocks mounted between said ring and said cylinder and adapted to be operated by said ring, said cylinder being provided in its outer surface with inclined or spiral grooves, and said blocks with vertical grooves, and means for feeding the material to be ground between said blocks and said cylinder, substantially as described.

6. A grinding-mill, comprising a casing, a revoluble cylinder mounted therein, a tray supported below said cylinder, radially-adjustable grinding-blocks inclosing said cylinder and provided with circular inner faces, said tray being also provided with an opening, and said cylinder with a collector which is secured to the bottom thereof, and a hopper mounted above said cylinder, the bottom portion of which comprises two concentric casings between which is an annular space, through which the grain passes, a top or guard plate mounted above said cylinder and inclosing said hopper, and between which plate and said cylinder is an annular space, which is in communication with the grinding-space between the said radially-adjustable grinding-blocks and said cylinder, and also in com-

munication with the annular space of the hopper, and means for regulating the flow of the grain through the annular space between the top or guard plate and the cylinder, substantially as shown and described.

7. A grinding-mill, comprising a casing, a revoluble cylinder mounted therein, a tray supported below said cylinder, radially-adjustable grinding-blocks inclosing said cylinder and provided with circular inner faces, said tray being also provided with an opening, and said cylinder with a collector which is secured to the bottom thereof, and a hopper mounted above said cylinder, the bottom portion of which comprises two concentric casings between which is an annular space, through which the grain passes, a top or guard plate mounted above said cylinder and inclosing said hopper, and between which plate and said cylinder is an annular space, which is in communication with the grinding-space between the said radially-adjustable grinding-blocks and said cylinder, and also in communication with the annular space of the hopper, and means for regulating the flow of the grain through the annular space between the top or guard plate and the cylinder, consisting of a vertically-movable ring or band mounted between said top or guard plate, and the hopper, and means for raising

and lowering the same, substantially as shown and described.

8. A mill, comprising a casing, a vertical shaft mounted therein, a grinding-cylinder mounted on said shaft, short shafts journaled in said casing and provided with pinions, a gear-ring mounted on said pinions, screw-threaded bearings mounted in said casing above said last-named shafts, shafts mounted in said bearings and provided with screw-threaded heads which operate in said bearings, said shafts being provided inside of said casing with pinions which operate in connection with said gear-ring, grinding-blocks connected with the inner ends of said last-named shafts and inclosing said cylinder, the inner faces of said blocks being circular in form, and a hopper mounted above said cylinder, and means for feeding the grain therefrom into the space between said cylinder and said blocks, substantially as shown and described.

In witness whereof I have hereunto set my hand, in presence of two witnesses, this 23d day of April, 1896.

JOSEPH WILLIAM CUNNINGHAM.

Witnesses:

E. H. D. SMITH,
RICH'D. SPARROW.