No. 720,946. PATENTED FEB. 17. 1903.

J. B. MICHAEL & T. P. ROBERTS.

GRINDING MACHINE.

APPLICATION FILED AUG. 25, 1902.

NO MODEL. 3 SHEETS—SHEET 1.

Fig. 1.

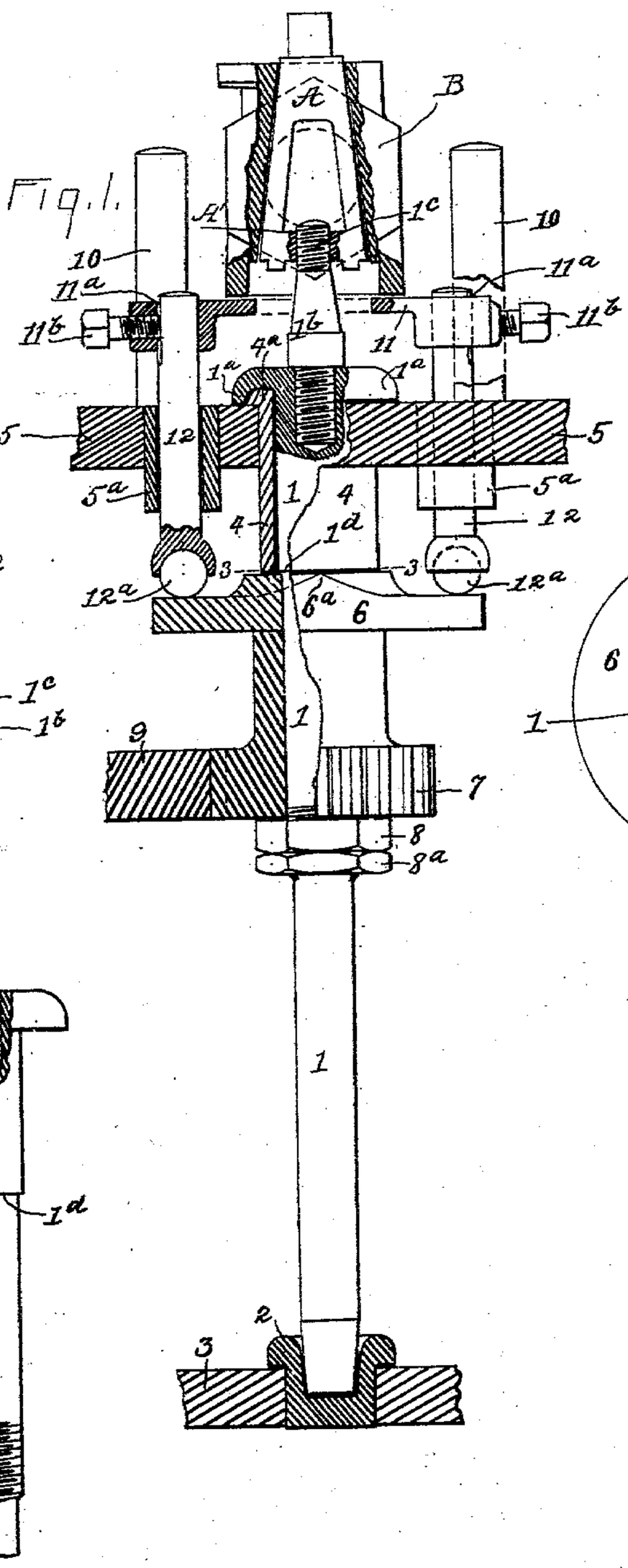


Fig. 4.

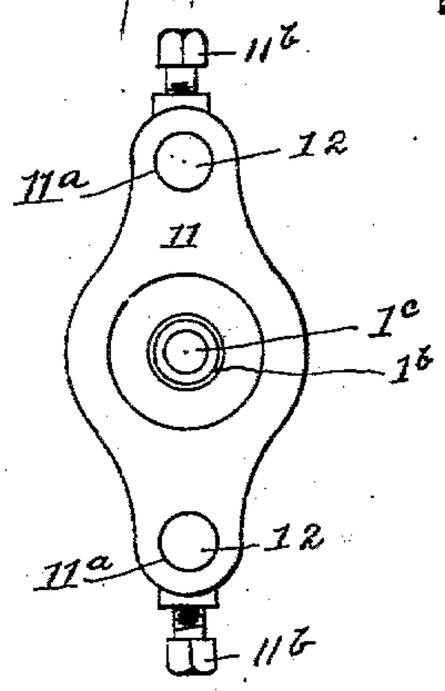


Fig. 3.

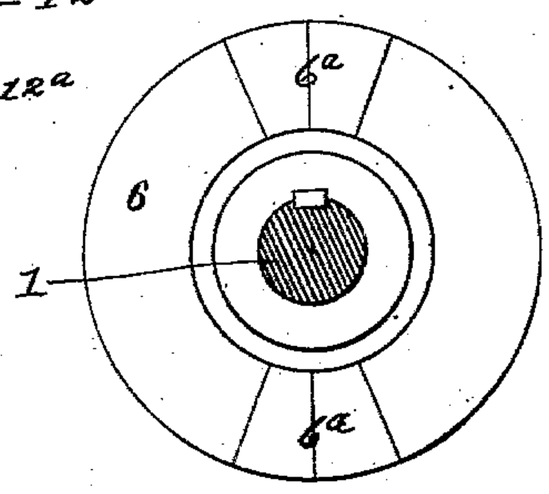
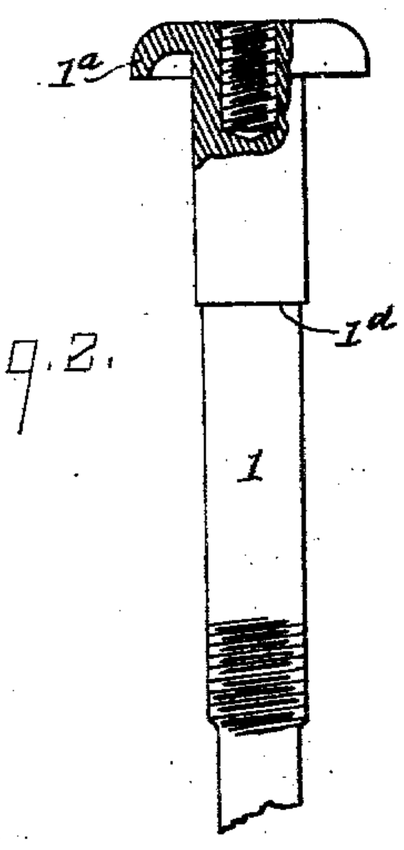


Fig. 2.



Witnesses—

Carrie R. Ivy.

James A. Fowler

Inventors—

John B. Michael

Thomas P. Roberts

By Cyrus Keller

Atty.

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NO MODEL. 3 SHEETS—SHEET 2.

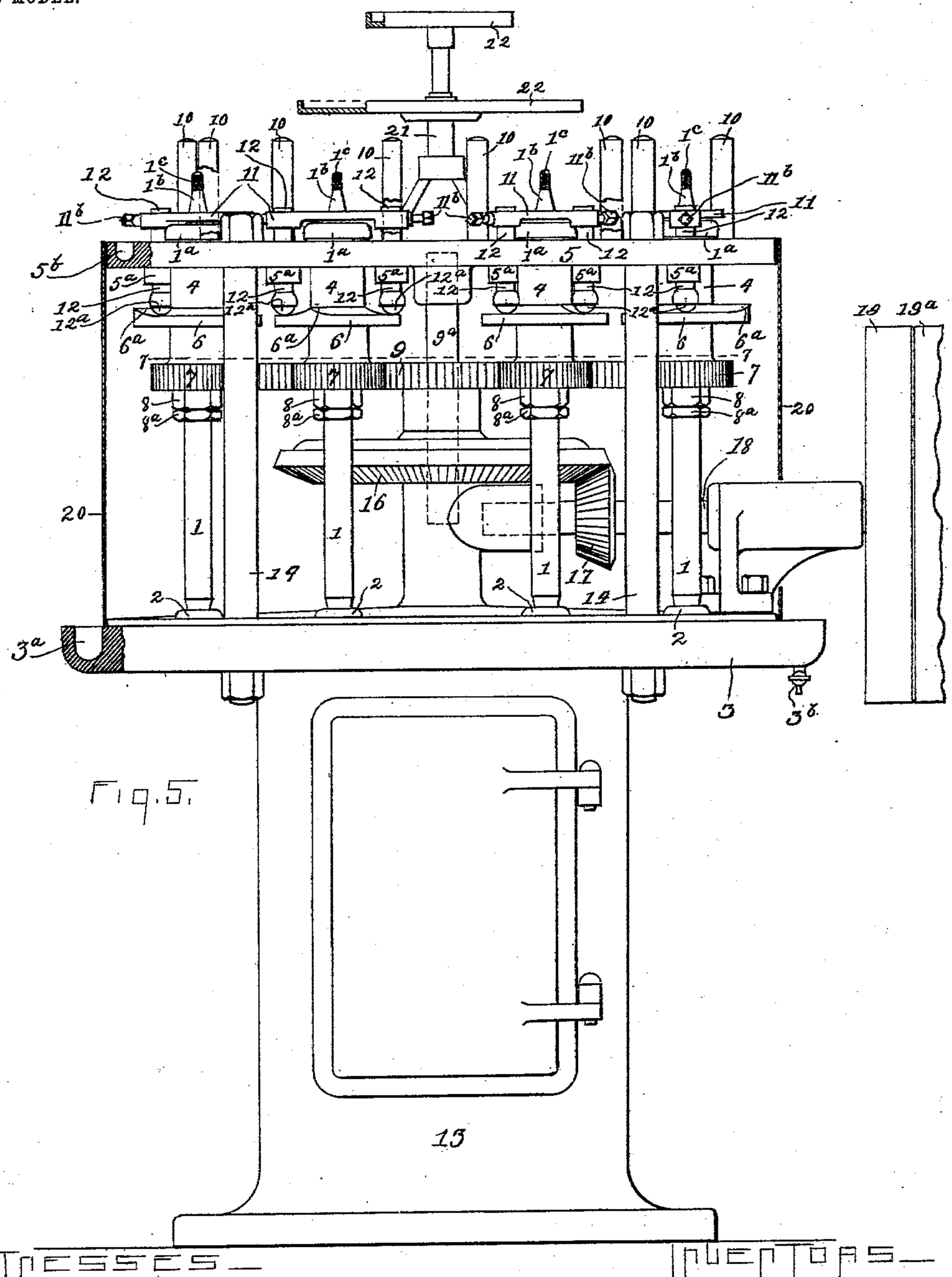

Fig. 5.

WITNESSES—

Carrie R. Ivy.

James A. Fowler

INVENTORS—

John B. Michael

Thomas P. Roberts

By Cyrus Keller

Atty.

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NO MODEL. 3 SHEETS—SHEET 3.

Fig. 6.

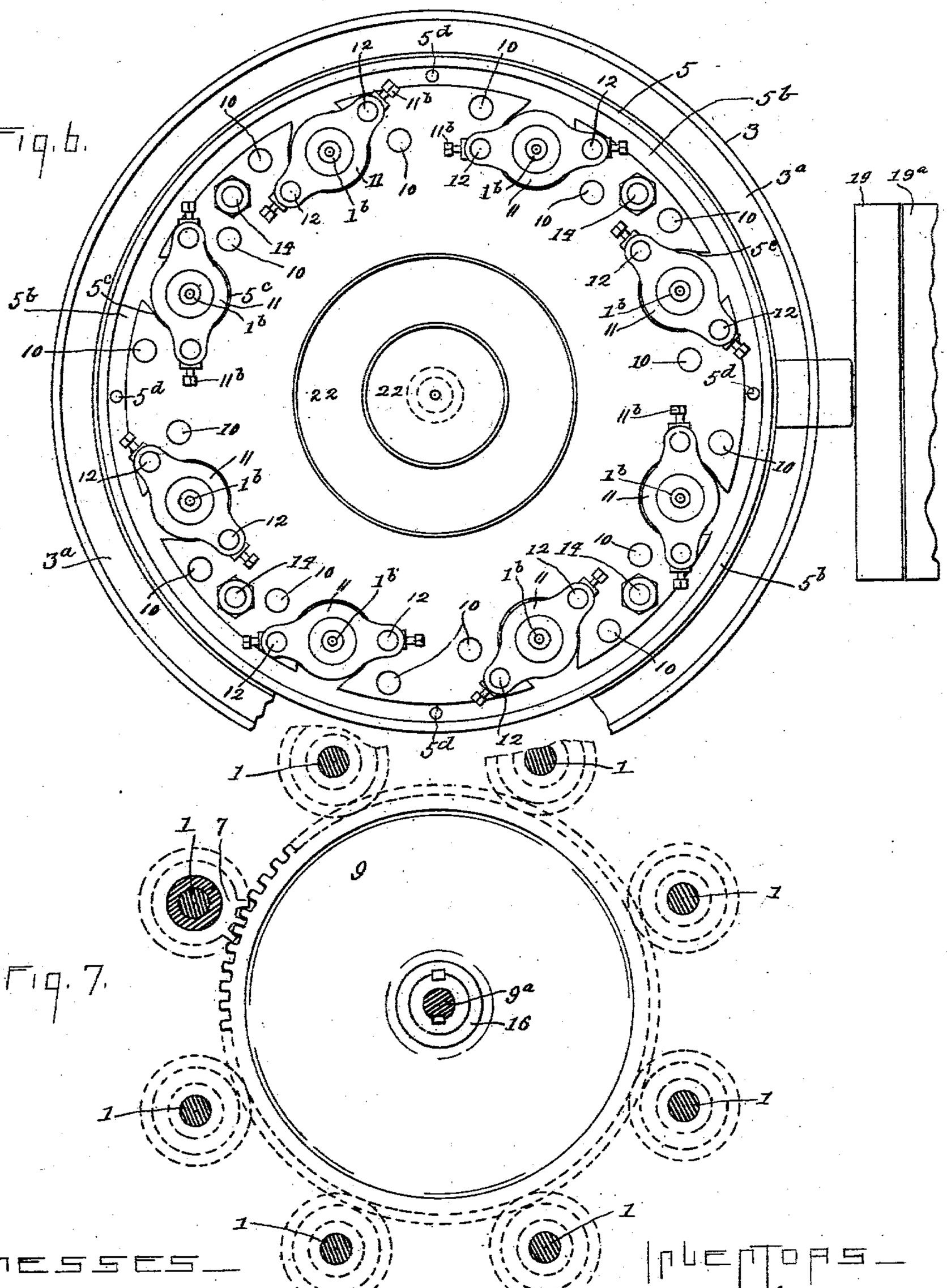

Fig. 7.

Witnesses—
Carrie R. Ivy.
James A. Fowler.

Inventors—
John B. Michael
Thomas P. Roberts
By Cyrus Kehr
Atty.

UNITED STATES PATENT OFFICE.

JOHN B. MICHAEL AND THOMAS P. ROBERTS, OF KNOXVILLE, TENNESSEE.

GRINDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 720,946, dated February 17, 1903.

Application filed August 25, 1902. Serial No. 120,876. (No model.)

To all whom it may concern:

Be it known that we, JOHN B. MICHAEL and THOMAS P. ROBERTS, citizens of the United States, residing at Knoxville, in the county of Knox and State of Tennessee, have invented a new and useful Improvement in Grinding-Machines, of which the following is a specification, reference being had to the accompanying drawings.

Our invention relates particularly to machines for grinding the meeting faces of the members of rotary valves or cocks—such, for example, as are used for cutting off the flow through air, steam, and water pipes. We have used said machine for grinding the cocks used in air-brake equipments. Such valves or cocks consist of a body or casing having a longitudinal passage, and also a transverse passage conforming to a truncated cone, and a key or plug in the form of a truncated cone and adapted to fit into said transverse passage. In the manufacture of such cocks or valves the transverse passage in the body or casing and the exterior of the key or plug are formed in a lathe or similar machine with such exactness as is practicable. Then for the purpose of securing a closer fit the key or plug is placed in the casing and these members relatively rotated, oil and emery powder or similar gritty material being placed between said plug and casing. By this means said members are made to conform closely to each other.

Our machine carries on the grinding process automatically, so that one operator may attend a plurality of machines, or the machine may be constructed in multiple form, so that on the same machine a plurality of cocks may be undergoing the grinding operation simultaneously, and the operation of the machine is such as to grind with accuracy.

In the accompanying drawings, Figure 1 is a sectional elevation of a group of devices constituting the mechanism for the grinding of one valve or cock. Fig. 2 is a detail view of the upper portion of the shaft forming a part of the structure illustrated by Fig. 1. Fig. 3 is a horizontal section on the line 3 3 of Fig. 1. Fig. 4 is a plan of Fig. 1, the valve being removed. Fig. 5 is an elevation of one of our machines constructed in multiple form. Fig. 6 is a plan of the upper portion of the machine illustrated by Fig. 5. Fig. 7 is a horizontal section on the line 7 7 of Fig. 5.

Referring to said drawings, 1 is a rotary shaft or mandrel journaled at its lower end in the cup-formed bearing or step-box 2 and at its upper end in the bushing 4. Said cup-formed bearing and said bushing are suitably supported, respectively, by plates 3 and 5. The upper end of said bushing 4 is preferably provided with a flange 4^a, and the upper end of the shaft 1 is provided with a corresponding flange 1^a, extending over and around the flange 4^a, whereby said bearing is protected against the entrance of particles of grit, metal, and similar matter falling from the valve supported above said bearing. Rising from the upper end of said shaft 1 is a spindle 1^b. Said spindle may be integral with the shaft; but it is in some cases preferable to make it a separate piece provided with a screw-threaded shank 1^c, tapped vertically and axially into the upper end of said shaft. The upper end of said spindle is screw-threaded, and the key or plug A of the valve which is to be ground has in its base an axial aperture A', similarly threaded, so that said plug can be screwed rigidly upon said spindle in the manner and position shown in Fig. 1.

B is the second member or casing of the valve. This rests normally upon the plug A by its weight. A stop-post 10 rises from the plate 5 near enough to the spindle 1^b to stand in the path of rotation of said body or casing B. The purpose of said stop-post is to prevent the rotation of said casing. The drawings show two such posts for each spindle 1^b. It is obvious that in many cases one such post will be sufficient and that other similar devices may be used for preventing the rotation of said casing. The shaft 1 is contracted from 1^d downward, so that an annular shoulder (with its face directed downward) is formed at 1^d. Immediately below said shoulder a cam-plate 6 surrounds said shaft and bears against said shoulder. Upon its upper face said cam-plate has one or more extensions 6^a, and immediately below said cam-plate is a spur gear-wheel 7, surrounding said shaft and bearing against said cam-plate. Below said spur gear-wheel are a pair of jam-nuts 8 8^a, surrounding said shaft and bearing upward against said spur gear-wheel, whereby said wheel and said cam-plate are bound against the shoulder 1^d, so that said cam-plate and said gear become fixed upon and rotate with the shaft 1. Said cam-plate

and gear-wheel may be suitably keyed to secure them more firmly to the shaft 1. Power may be applied in any suitable manner to the gear-wheel 7, as by means of a gear-wheel 9. (See Figs. 1, 5, and 7.) For the greater portion of the grinding operation the mere rotation of the plug within the casing by the rotation of the shaft 1 is sufficient, and this portion of the operation can be carried on by merely rotating the spindle 1^b and the plug mounted upon said spindle and holding said casing against rotation while it rests by gravity or with only slight pressure upon said plug; but to cause a shifting of the grinding material between the meeting faces of said plug and the casing we provide for the periodical vertical reciprocation of said casing. It is obvious that the same result could be attained by the vertical reciprocation of said plug, and if the axial line of said members is not vertical then said reciprocation is not vertical, but on said axial line. For convenience, the movement in the direction whereby the members are brought into engagement with each other is herein termed the movement "over each other," while the movement in the opposite direction is termed the "separating" of the members. By shifting the position of said grinding material the forming of horizontal channels or grooves around said plugs and around the interior of said casing is prevented and the meeting faces of said plug and casing are made to conform to each other so closely as to prevent the passage of air, steam, or water under pressure. For the reciprocation of said body or casing B we provide a yoke or table 11, which loosely surrounds the spindle 1^b, immediately below said casing. Said table is supported by standards 12, extending from said table downward through the plate 5 to the upper face of the cam-plate 6. In order that the table may be vertically adjustable, said standards pass through vertical apertures 11^a and are bound at any chosen elevation by set-bolts 11^b. Suitable bushings 5^a may surround said standards in the plate 5. The lower portion of each standard 12 may be suitably expanded and recessed to receive an antifriction-ball 12^a. Since the standards 12 are in the vertical position and seated in the vertical bushings, they are limited to a vertical movement. Said standards are located at opposite sides of the shaft 1, as are also the cam extensions 6^a. Hence with each half-rotation of the shaft 1 said cam extensions will pass beneath and lift said standards and again allow them to fall. Thus with each half-rotation of the shaft 1 and the plug A said standards and the table 11 are lifted and again permitted to fall. Each time said table is lifted it bears against and lifts the body or casing B of the valve, whereby the grinding material located between said plug and said casing is permitted or compelled to shift position vertically. Thus said grinding material is not allowed to move in the same horizontal line more than a portion of a half-rotation. Hence the forming of horizontal grooves or the grinding to undue depth is entirely avoided. The table 11 may be so set as to almost touch the lower face of the casing when the grinding operation begins. Then the grinding stops as soon as the members have been cut enough to allow the casing to descend and rest upon the table. If it is then found that the parts need further grinding, the table may be adjusted a little lower. Thus said table constitutes a means for limiting the movement of the members of the valve over each other.

The foregoing is a description of a machine constructed for the grinding of one pair of members constituting a rotary valve or cock. The forming of a multiple machine embodying groups of such mechanism will be next described.

Upon a suitable base 13 is mounted the circular plate 3. From said plate rise four distance-posts 14, which support by their upper ends the circular plate 5. In the frame thus formed are mounted eight shafts 1 and the parts thereto belonging, as shown in Fig. 1, said shafts being equidistant from a line passing vertically and centrally through said plates 5 and 3, so that said shafts stand in a circle. The circular space between the spur gear-wheels 7 is occupied by a larger spur gear-wheel 9, into which all of said spur gear-wheels 7 mesh. Said spur gear-wheel 9 is mounted on a shaft 9^a and suitably joined, as by telescoping hubs and keys, (see Fig. 7,) to a bevel-gear 16, axially in line with said gear-wheel 9, so that when said bevel-gear is rotated said spur gear-wheel 9 and the similar spur gear-wheels 7 and the shafts 1 and spindles 1^b are rotated. A small bevel-gear 17, mounted upon a horizontal power-shaft 18, meshes with the bevel-gear 16. Band-pulleys 19 19^a transmit power to the shaft 18. Into the upper face and along the edge of the plate 5 the groove 5^b is formed, and around each flange 1^a of the shafts 1 the upper face of said plate is provided with a groove 5^c, leading into the groove 5^b. At one or more points oil-holes 5^d extend vertically through the plate 5 from the bottom of the groove 5^b. Oil drained from the valves which are being ground collects in these grooves and descends through the oil-holes 5^d and falls upon the plate 3, whence it falls into a groove 3^a, formed in the upper surface and along the edge of the plate 3. From said groove 3^a the oil may be removed in any suitable manner, as by the cock 3^b.

A sheet-metal casing 20 may extend horizontally around the machine, with its lower edge resting upon the plate 3 and with its upper edge surrounding the plate 5. Said casing is shown in section in Fig. 5.

A standard 21 (see Figs. 5 and 6) rises centrally from the upper face of the plate 5 and

supports one or more shelves 22. Said shelves are used for holding parts of valves before and after grinding.

It will be understood that the engagement between the two members of the valve may be effected in part or entirely by mechanical pressure instead of by the weight of one of the members of the valve. It is also to be understood that the use of our invention is not limited to valves or cocks. It is adapted for the grinding of other mechanical devices in which two members are similarly fitted together.

We claim as our invention—

1. In a grinding-machine, a rotary support adapted to sustain the two members of a cock, the upper of said members resting by its weight in engagement with the lower, means for preventing the rotation of the upper member with the lower member, and automatic means for periodically separating said members in a direction parallel to the axis of said support.

2. In a grinding-machine, a rotary support adapted to sustain the two members of a cock by engaging the plug while the casing rests by its weight upon said plug, means for preventing the rotation of the casing with the plug, and automatic means for periodically separating said members in a direction parallel to the axis of said support.

3. In a grinding-machine, a rotary support adapted to sustain the two members of a cock by engaging the plug while the casing rests by its weight upon said plug, means for preventing the rotation of the casing with the plug, and automatic means for periodically lifting the casing.

4. In a grinding-machine, mechanism for supporting the two members of a cock or valve axially in line when in engagement with each other by the weight of one of said members and relatively rotating said members and mechanism for limiting the movement of said members over each other and periodically separating said members, substantially as described.

5. In a grinding-machine, mechanism for supporting and rotating one member of a cock or valve and mechanism for holding the other member relatively non-rotatably upon the first-mentioned member, and means for limiting the movement of said members over each other in one direction and for periodically moving said members from each other on their axial line, substantially as described.

6. In a grinding-machine, mechanism for supporting and rotating one member of a cock or valve, and mechanism for holding said second member against rotation but leaving it free for parallel movement on its axial line in one direction, and means for periodically moving said second member in one direction and limiting its movement in the opposite direction on the axial line of said members, substantially as described.

7. In a grinding-machine, mechanism for supporting the two members of a cock or valve axially in line and in engagement with each other and relatively rotating said members, and adjustable means for limiting the movement of said members over each other and periodically separating them on their axial line, substantially as described.

8. In a grinding-machine, a vertical rotary spindle for supporting the key or plug of a rotary valve or cock, a periodically-reciprocating, horizontal yoke or table adjacent to said spindle, and a stop for preventing the rotation of the casing of the valve, substantially as described.

9. In a grinding-machine, a vertical rotary spindle for supporting the key or plug of a rotary valve or cock, a periodically-reciprocating, adjustable horizontal yoke or table adjacent to said spindle, and a stop for preventing the rotation of the casing of the valve, substantially as described.

10. In a grinding-machine, the rotary shaft, 1, the table, 11, standards, 12, and mechanism for supporting and periodically lifting said standards, and mechanism for holding the valve-casing against rotation, substantially as described.

11. In a grinding-machine, the rotary shaft, 1, the table, 11, adjustable standards, 12, and mechanism for supporting and periodically lifting said standards, and mechanism for holding the valve-casing against rotation, substantially as described.

12. In a grinding-machine, the rotary shaft, 1, the table, 11, standards, 12, and a cam-plate secured to said shaft for supporting and periodically lifting said standards, and mechanism for holding the valve-casing against rotation, substantially as described.

13. In a grinding-machine, the combination of a rotary shaft, 1, bearing the cam-plate, 6, the table, 11, the standards, 12, extending through said table and through suitable guides to the cam-plate, set-bolts securing said standards to said table, and a stop for preventing the rotation of the valve-casing, substantially as described.

14. In a grinding-machine, a vertical rotary shaft for supporting the article to be ground, an annular flange extending upward from the upper bearing of said shaft, and a depending annular flange extending from said shaft outward over said first-mentioned annular flange, whereby dust and grit are excluded from said bearing, substantially as described.

15. In a grinding-machine, a plurality of groups of mechanism, each adapted for supporting the two members of a cock or valve axially in line and in engagement with each other and relatively rotating and periodically separating said members, and mechanism for simultaneously transmitting power to said groups of mechanism, substantially as described.

16. In a grinding-machine, a plurality of groups of mechanism, each adapted for sup-

porting the two members of a cock or valve axially in line and in engagement with each other by the weight of one of said members and relatively rotating and periodically separating said members, and mechanism for simultaneously transmitting power to said groups of mechanism, substantially as described.

17. In a grinding-machine, a plurality of groups of mechanism, each adapted for supporting and rotating one member of a cock or valve and holding the other member relatively non-rotatably upon the first-mentioned member and periodically moving said members from each other on their axial line, and mechanism for simultaneously transmitting power to said groups of mechanism, substantially as described.

18. In a grinding-machine, a plurality of groups of mechanism, each adapted for supporting the two members of a cock or valve axially in line and in engagement with each other and relatively rotating and periodically separating said members, said groups of mechanism being arranged in a circle and connected with suitable power-transmitting mechanism, substantially as described.

19. In a grinding-machine, a plurality of groups of mechanism, each comprising a rotary shaft for supporting and rotating one member of a cock or valve, mechanism for holding the other member of such cock or valve against rotation when in engagement with the first member, and mechanism for periodically separating said members on their axial line, and mechanism for simultaneously transmitting power to said groups of mechanism, substantially as described.

20. In a grinding-machine, a plurality of groups of mechanism, each comprising a rotary shaft for supporting and rotating one member of a cock or valve, mechanism for holding the other member of such cock or valve against rotation when in engagement with the first member, and mechanism for periodically moving said second member away from the first member on their axial line, and mechanism for transmitting power to each of said groups, substantially as described.

21. In a grinding-machine, a plurality of groups of mechanism, each group comprising a vertical rotary shaft for supporting and rotating one member of a cock or valve, mechanism for holding the other member of such cock or valve against rotation when in engagement with the first member and mechanism for periodically separating said members on their axial line, and mechanism for transmitting power to each of said groups, substantially as described.

22. In a grinding-machine, a plurality of groups of mechanism, each comprising a rotary spindle having a screw-threaded end adapted to receive the tapped key or plug of a rotary valve or cock, a stop for preventing the rotation of the casing or body surrounding said plug, and mechanism for periodically moving said casing or body away from said plug, and mechanism for transmitting power to each of said groups, substantially as described.

23. In a grinding-machine, a plurality of groups of mechanism, each comprising means for supporting and relatively rotating the two members of a rotary valve or cock, and mechanism for limiting the movement of said members over each other, and mechanism for transmitting power to each of said groups, substantially as described.

24. In a grinding-machine, a plurality of groups of mechanism comprising means for supporting the two members of a cock or valve axially in line and in engagement with each other and relatively rotating said members, and mechanism for limiting the movement of said members over each other and periodically separating said members, and mechanism for transmitting power to each of said groups, substantially as described.

25. In a grinding-machine, a plurality of groups of mechanism, each comprising a shaft for supporting and rotating one member of a cock or valve, mechanism for holding the other member of said cock or valve against rotation when in engagement with the first member, said shafts being arranged in a circle, a gear upon each of said shafts, and a gear located between and engaging with all the gears on said shafts, substantially as described.

26. In a grinding-machine, horizontal plates, 3 and 5, distance-posts uniting said plates, and a plurality of rotary shafts journaled in said plates and each adapted for supporting and rotating one member of a cock or valve, mechanism adjacent to each such shaft for holding the other member of said cock or valve against rotation when in engagement with the first member, and mechanism for periodically separating said members on their axial line, substantially as described.

27. In a grinding-machine, the combination of the horizontal plates, 3 and 5, distance-posts uniting said plates, and rotary shafts for separating the members of valves or cocks, said plates, 3 and 5, having circumferential grooves for collecting oil, substantially as described.

28. In a grinding-machine, the combination of a plurality of vertical rotary shafts, each adapted to support the two members of a valve or cock, and a shelf supported within the circle formed by said shafts, substantially as described.

In testimony whereof we have signed our names, in presence of two witnesses, this 13th day of August, 1902.

JOHN B. MICHAEL.
THOMAS P. ROBERTS.

Witnesses:
JNO. B. GUINN,
WILLIAM C. SHEEN.