

(No Model.)

2 Sheets—Sheet 1.

E. C. GRIFFIN.
PULVERIZING MILL.

No. 410,758.

Patented Sept. 10, 1889.

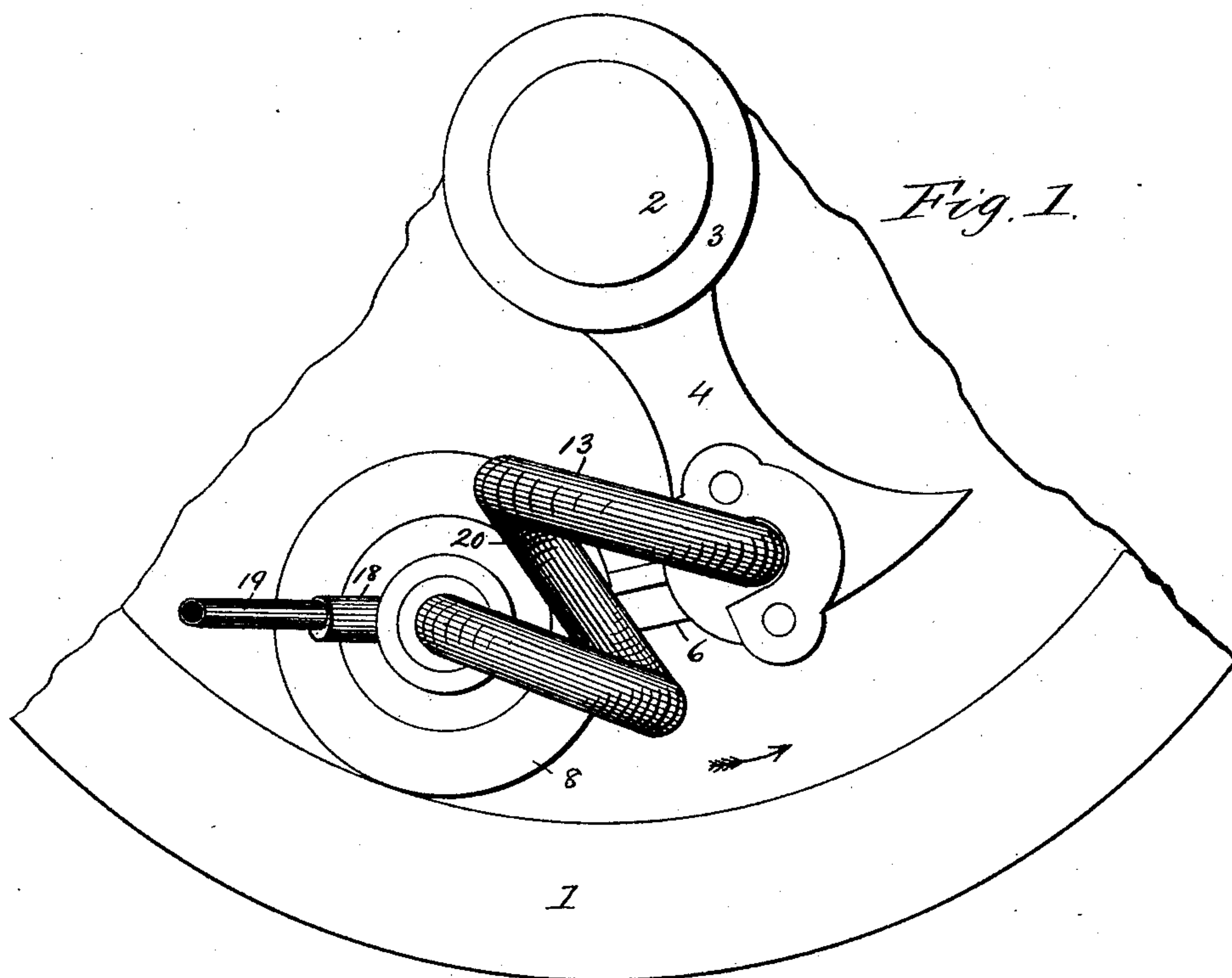


Fig. 1.

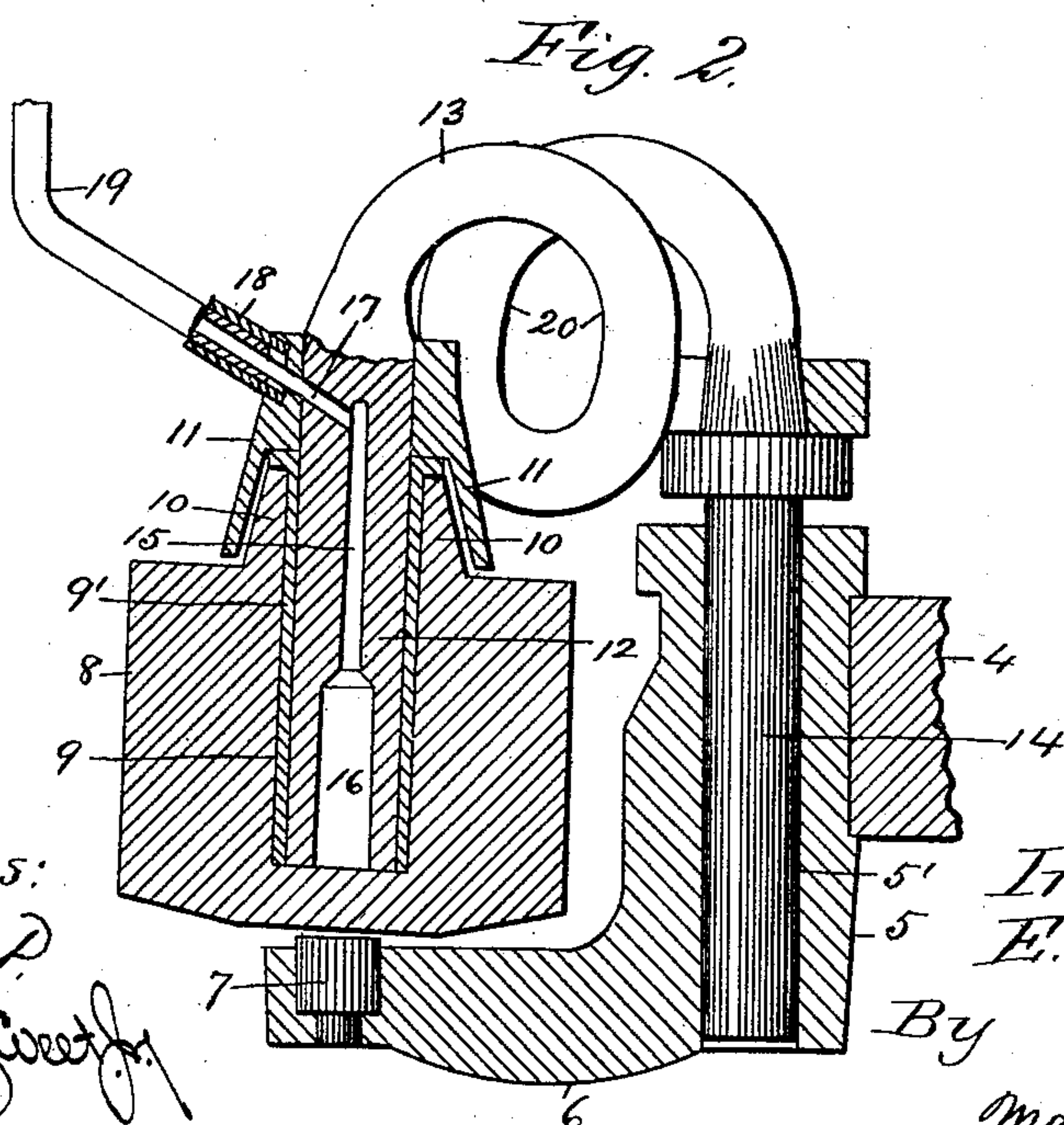


Fig. 2.

Witnesses:
J. R. Stuart
D. R. F. F. F.

Inventor:
E. C. Griffin.

By
Marblet Mason,
Attys.

(No Model.)

2 Sheets—Sheet 2.

E. C. GRIFFIN.
PULVERIZING MILL.

No. 410,758.

Patented Sept. 10, 1889.

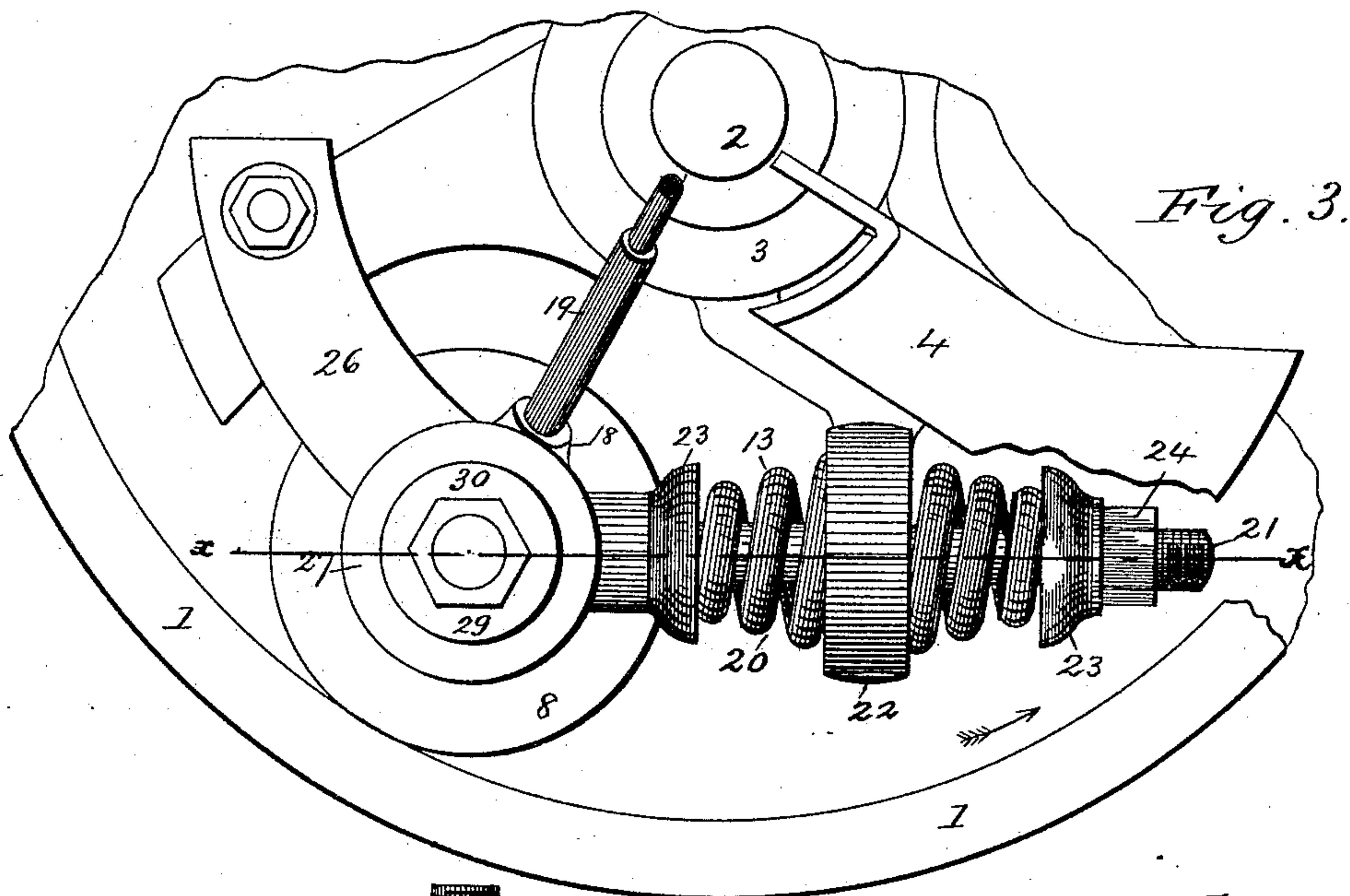


Fig. 3.

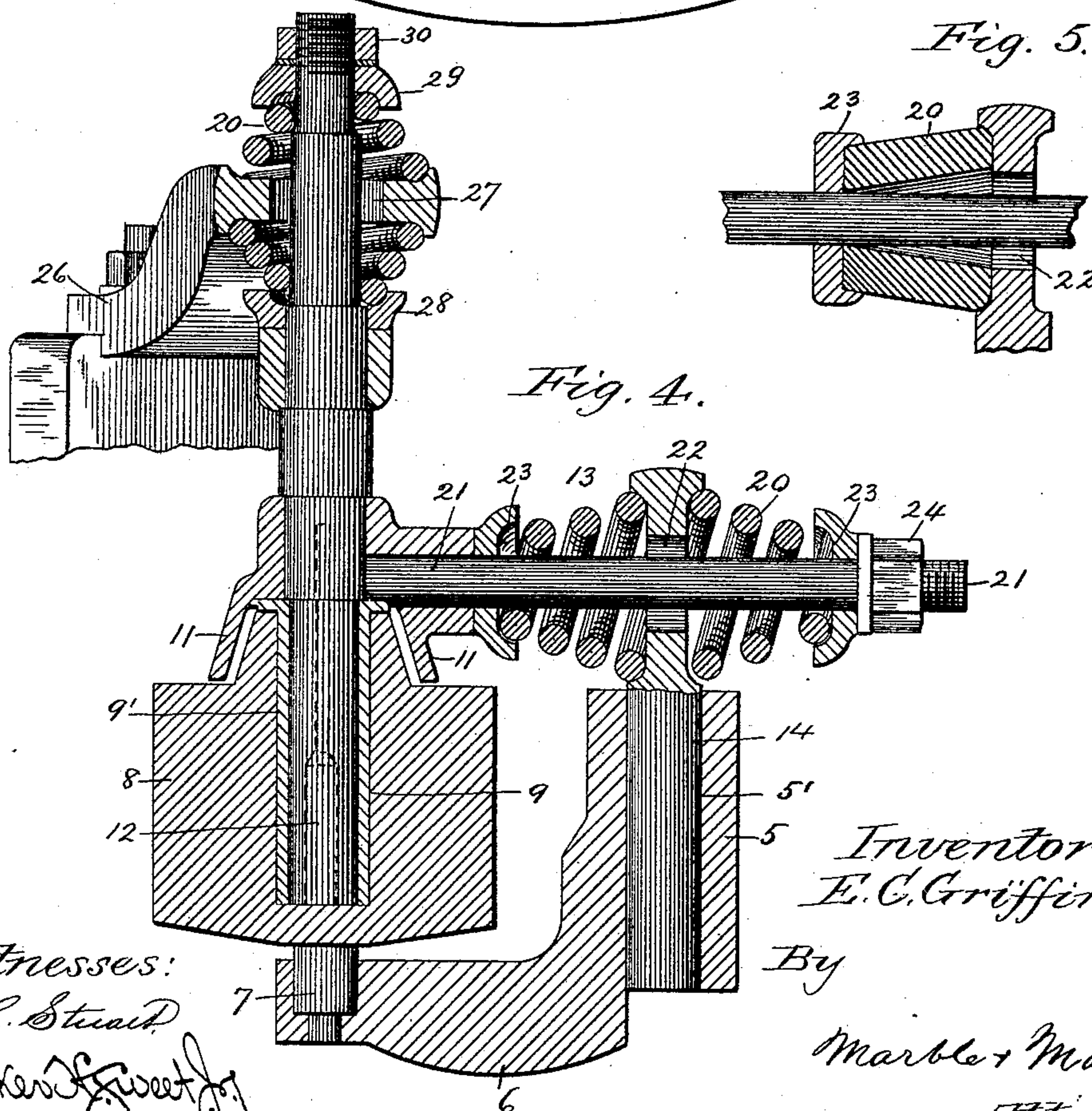


Fig. 4.

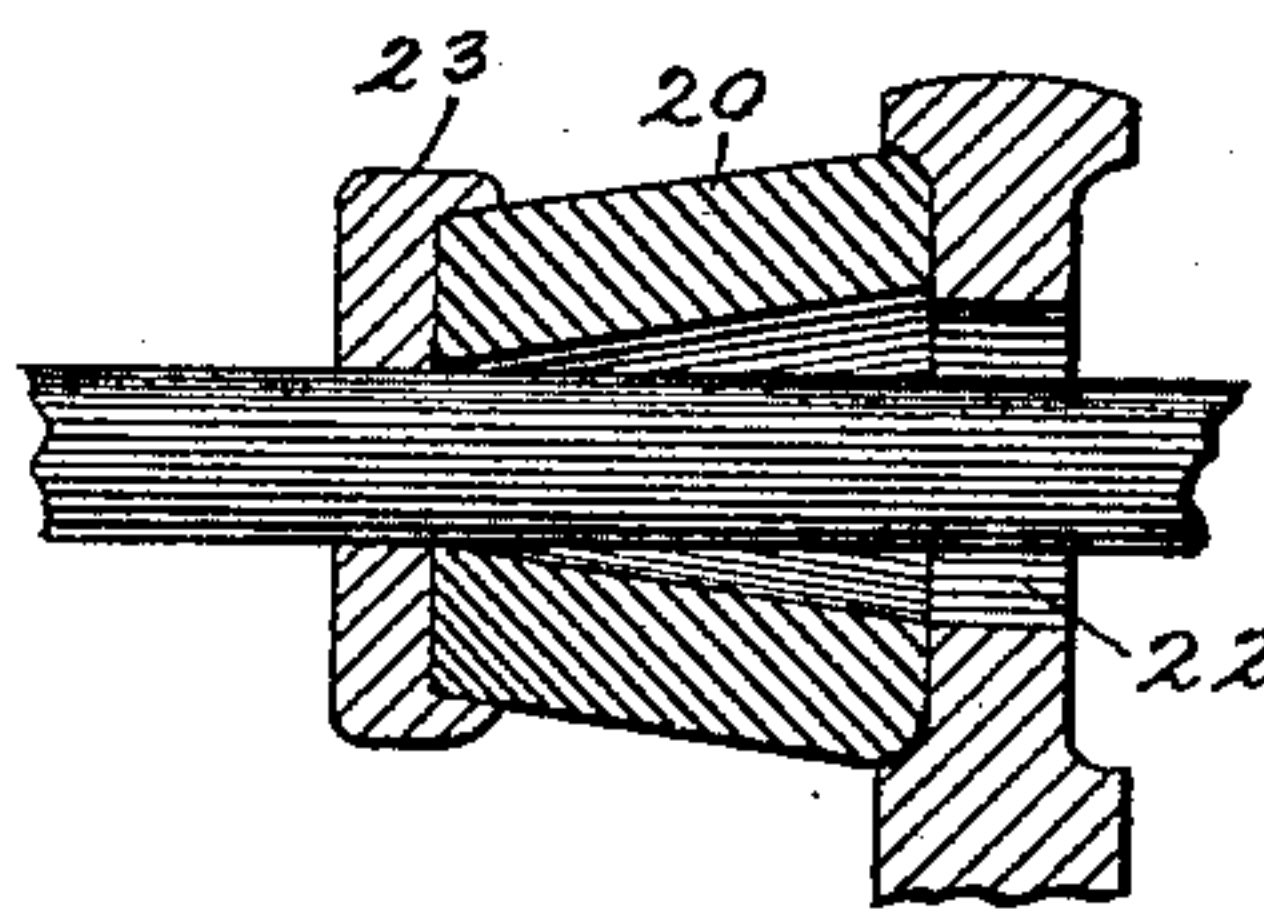


Fig. 5.

Witnesses:
J. R. Stuart
Zarker Sweet

Inventor:
E. C. Griffin.
By
Marble & Mason,
Attys.

UNITED STATES PATENT OFFICE.

EDWIN C. GRIFFIN, OF BROOKLYN, ASSIGNOR TO THE GRIFFIN MANUFACTURING COMPANY, OF NEW YORK, N. Y.

PULVERIZING-MILL.

SPECIFICATION forming part of Letters Patent No. 410,758, dated September 10, 1889.

Application filed July 17, 1888. Serial No. 280,158. (No model.)

To all whom it may concern:

Be it known that I, EDWIN COLVER GRIFFIN, a citizen of the Dominion of Canada, residing at the city of Brooklyn, in the county of Kings, State of New York, have invented certain new and useful Improvements in Pulverizing-Mills, of which the following is a specification, reference being had therein to the accompanying drawings.

10 My invention relates to that class of pulverizers or mills in which the reduction or pulverization of ores and other substances is accomplished by one or more rollers arranged to revolve against the inner wall of an annular die or ring, said roller or rollers, when in
15 operation, being forced against said die or ring by centrifugal force; and it consists in the improved construction and arrangement or combination of parts, hereinafter fully disclosed in the description, drawings, and
20 claims.

The objects of my invention are, first, to provide a mill or pulverizer of the character named, with elastic or spring connections between the rollers or their spindles and the revolving center or driver to which they are attached, whereby the strain upon said spindles and their connections and the wear upon
25 the same and their bearings will be less severe than usual; second, to provide roller-supports which are so constructed and attached to the revolving center or driver as to permit the rollers to have freedom of movement in all directions; third, to provide said
35 revolving center or driver with brackets, which may be either integral with or attached thereto, and which are formed with sockets arranged parallel with the axis thereof; fourth, to form the roller-supports with journal-spindles and pivotal spindles, the latter
40 being loosely fitted in the sockets of said brackets and the former serving as journals upon which the rollers revolve; fifth, to form said roller-supports with journal-spindles
45 and pivotal spindles and with spring-coils arranged intermediate of said spindles and adapted to move universally or like ball-and-socket joints, and, sixth, to provide improved means for lubricating the rollers and journal-
50 spindles and for preventing the access thereto

of dirt and water. These objects I accomplish by the mechanism illustrated in the accompanying drawings, forming part of this specification, in which the same reference-numerals indicate the same parts.

55 Figure 1 represents a top plan view of a sufficient portion of my improved mill or pulverizer to illustrate my invention; Fig. 2, a vertical part section of the same, the ring or annular die being omitted; Fig. 3, another
60 top plan view of a portion of a mill or pulverizer provided with a modified construction of my improvement; Fig. 4, a vertical part section of the same on the line xx of Fig. 3, and Fig. 5 a sectional detail view of a modified form of spring for the improvement illustrated in Figs. 3 and 4.

In the drawings, the numeral 1 indicates the annular die or ring, which is made of steel and supported in the casing of the machine in the usual or any suitable manner.

2 indicates the central vertical drive-shaft, upon which is mounted and rigidly secured the revolving center or driver 3, which is provided with equidistant arms 4, having
75 castings or brackets 5, which may be formed integral therewith or attached thereto and formed with vertical sockets 5'. Projecting at right angles from the lower portions of these castings or brackets are extensions 6, which are formed or provided with supports
80 7, upon which the rollers rest when not in operation.

The crushing or pulverizing rollers 8 are preferably cylindrical in form, but they may
85 be of other shape, according to the desired configuration or angle of the inner wall of the die against which they work, and they are formed with axial bores 9, which terminate slightly above their lower ends, and within
90 which are inserted linings or bushings 9', which extend from the upper to near the lower ends of said rollers. The upper ends of the rollers are formed with central projections or necks 10, which are of the form of
95 truncated cones and surround the upper ends of the axial bores and bushings. Fitted over these necks and securely fastened to the journal-spindles of the rollers are hoods 11, which form shoulders against which the rollers work
100

when in operation and steady the same, and also they serve to protect the spindles and journal-bearings from dirt and water. The rollers are mounted with their axial bores 9 upon the downwardly-projecting journal-spindles 12 of the roller-supports 13, which are formed at their inner ends with similar downwardly-projecting pivotal spindles 14, which are journaled in the sockets 5' in the brackets 5 of the revolving center or driver 3.

The journal-spindles 12 are each formed with an axial channel 15, which is enlarged at its lower end to form a chamber 16, and with a lateral duct 17 at its upper end, which extends out through the circumference of the spindle and connects with a metal tube 18, which is secured in an opening in the hood 11. To this tube is removably attached an elastic pipe 19, which leads outside of the shell or casing and is adapted to receive a lubricant and properly deliver the same through the channel 15 into the chamber 16, for lubricating the bore of the roller, the journal-spindle, and the lining or bushing; or, if preferred, the elastic pipe 19 may be omitted or removed and the lubricant supplied directly through the tube 18 from an oil can or reservoir attached to the hood 11 or other suitable support.

The roller-supports 13 are preferably made of rods of spring steel, which are bent along their middle portions into coils 20, their ends being formed, respectively, into the journal and pivotal spindles 12 and 14. This is the preferred form of my invention, and is illustrated in Figs. 1 and 2 of the drawings; but it is evident, however, that modifications may be made in the construction and arrangement of the parts thereof without departing from the principle of my invention, as will be observed on reference to the other figures of the drawings and the description of the modification therein shown.

When the center or driver is revolved in the direction of the arrow shown in Fig. 1 of the drawings, the rollers will be swung outward by centrifugal force against the inner wall of the annular die and crush or pulverize whatever material may be fed between them; also, while the pivotal spindles of the roller-supports will be firmly held in proper position in the socketed brackets, the journal-spindles, by permission of the spring-coils, will be free to move or yield in all directions and admit of the rollers assuming varying positions with respect to the inner face of the ring or die, thereby not only causing proper operation of said rollers in crushing or grinding, but preventing the breakage of said roller-supports or the spindles, the rollers, the socketed brackets, or the arms of the revolving center or driver, in the event of the rollers coming into contact with any foreign or irreducible substance. The coil-springs are not employed for the mere purpose of forcing the rollers against the annular die or ring, as the centrifugal force of the rollers, as they are

thrown outwardly by the revolving center or driver, is sufficient for this purpose; but they serve to cushion said rollers to prevent all jarring of the working parts of the machine and consequent breakage, to prevent uneven wear upon the main or drive shaft and the journal and pivotal spindles, and also to provide a universally movable or flexible connection between said spindles which will admit of the same and the rollers assuming various angles with respect to each other, and this without causing uneven wear upon the bushings of the rollers, the spindles; or the sockets of the brackets upon the revolving center or driver. During the operation of the rollers, or while they are moved around by the revolving center or driver, they will rise slightly upward upon their journal-spindles from the fact that the lower ends of said spindles are slightly in advance of their upper ends, and when said center or driver and rollers are not in operation the latter will descend and rest upon the supports 7 of the horizontal extensions 6 of the brackets 5.

In the modified construction of my improvement, as illustrated in Figs. 3, 4, and 5 of the drawings, the rollers 8, sockets 5', brackets 5, extensions 6, and supports 7 are substantially the same as those already described; but the roller-supports 13 are differently constructed, as will appear from the following: The horizontal rods 21, to the outer ends of which the journal-spindles 12 and the hoods 11 are firmly secured, extend loosely through eyes 22, formed upon the upper ends of the pivotal spindles 14, which are tightly secured in the sockets 5'. Mounted upon the inner and outer ends of these rods are concaved washers 23, which are respectively held in place by being forced against the hoods 11 at their outer ends and against nuts 24 at their inner ends by the spring-coils 20, which are securely confined between said washers and the concaved sides of the eyes 22. The tension of these spring-coils is adjusted or regulated by means of the nuts 24 upon the outer ends of the rods 21; also by means of these nuts and the intermediate connections the journal-spindles and the rollers can either be fixed in perpendicular position or inclined in either direction, as may be necessary or desired.

Secured to and projecting outwardly from the revolving center or driver are the arms 26, which are arranged in a higher plane than the rods 21 and provided with concaved eyes 27 upon their outer ends, through which project the journal-spindles 12 of the rollers. Concaved washers 28 are rigidly secured upon these spindles below said eyes, and similar washers 29 are movably secured above said eyes by means of nuts 30 upon the upper ends of said spindles; also spring-coils 20 are confined between said washers and eyes and are capable of having their tension regulated by adjusting the upper washers and nuts; also, by means of these upper nuts the journal-spindles and the rollers can be vertically ad-

justed. In place of these coils truncated conical rubber springs, of the form illustrated in Fig. 5 of the drawings, may be used. It will be obvious from the foregoing that this modified construction of the roller-supports will permit of the same general play or universal movement of the rollers that is incident to the first-described form of said roller-supports, the spring-connection of the journal-spindles and their rollers with the revolving center or driver permitting the same movement of said rollers in both forms of the invention.

An advantage is incident to these constructions of roller-supports which is not possessed by mills or pulverizers of this class in which the roller-spindles are suspended from their upper ends. With my roller-supports the rollers will at all times present their peripheries parallel to the inner wall of the ring or die, this being due to their capability of movement to and from said die in the plane of their revolution, whereby they crush or grind evenly along their entire lengths, whereas in some mills or pulverizers in which the roller-spindles are suspended from their upper ends the lower ends of the rollers are swung farther outward than their upper ends, forming increasing angles with the inner wall of the ring or die, and thereby will crush or grind more finely with their lower than with their upper portions.

I am aware that it is not new in this class of mills or pulverizers to hold spindles and their rollers against dies by springs, so as to secure a yielding pressure; but I am not aware that a roller-support, provided with a universally springy or yielding journal-spindle has been attached to a revolving center or driver for the purpose of securing an elastic connection between the latter and the roller and its spindle, so that the strain upon said spindle may be lessened and the wear upon the same and the bushing of the roller reduced.

Under the construction of the invention as shown in Figs. 3 and 4 of the drawings it is possible to so adjust the journal-spindle with respect to the revolving center or driver as to hold the roller away from the die for a distance about sufficient to counteract the amount of centrifugal force that will be developed in the journal-spindle and its connections when in action, and thus said roller, its spindle and bushing will be relieved from the detrimental action or wear that is incident to such force. In this manner the roller will only press against the die with the pressure which is due to its own centrifugal force, which is a very desirable result to be obtained, as then the only strain upon the roller-support and its spindles and bearings will be due to the force necessary to propel the same, which is less than that due to the centrifugal force developed by and passed outward from the journal-spindle and its attachments.

The herein-described construction of mill

or pulverizer is principally intended for pulverizing ores and similar materials, but it is obvious that the same may be employed for crushing or grinding other substances.

The usual inclines for elevating the material, and also any suitable feeding, distributing, and discharging mechanism may be employed in connection with the improvements herein shown and described; hence they require no illustration or description herein.

Having thus fully described the construction and arrangement or combination of parts of my improved mill or pulverizer, its operation and advantages, what I claim as new, is—

1. In a pulverizer, the combination, with an annular die and a revolving center or driver, of a roller-support secured to said revolving center or driver and provided with a universally-yielding journal-spindle, and a roller mounted upon said spindle, substantially as described.

2. In a pulverizer, the combination, with an annular die and a revolving center or driver, of a roller-support provided with a universally-yielding journal-spindle, and also with a pivotal spindle arranged parallel to the axis of said revolving center or driver, the pivotal spindle being pivoted to said center or driver and the journal-spindle having a roller mounted thereon, substantially as described.

3. In a pulverizer, the combination, with an annular die and a vertical revolving center or driver provided with brackets having vertical sockets formed therein, of roller-supports provided with vertically-arranged spindles at their inner and outer ends, the inner spindles being mounted in said sockets and the outer spindles provided with rollers and means for permitting a universal yield of said outer spindles, substantially as described.

4. In a pulverizer, the combination, with the annular die 1, the drive-shaft 2, the revolving center 3, the brackets 5, formed with vertical sockets 5' and extensions 6, having the supports 7, of the roller-supports 13, provided with the universally-yielding springs 20, and with the pivotal spindles 14 and journal-spindles 12, and the rollers 8, which are formed with the central bores 9, closed at the lower ends, and which are mounted upon said journal-spindles, substantially as described.

5. In a pulverizer, the combination of the annular die 1, the revolving center or driver 3, provided with the brackets 5, having the sockets 5' and supports 7, the roller-supports 13, provided with the pivotal spindles 14, which are mounted in said sockets, and with the universally-yielding journal-spindles 12, provided with the hoods 14, and the rollers 8, mounted upon said journal-spindles and formed with the conical necks 10, substantially as described.

6. In a pulverizer, a roller-support provided with a pivotal spindle, a journal-spindle, and intermediate spring-coils, substantially as described.

7. In a pulverizer, the combination of an

annular die 1, a revolving center or driver 3, provided with vertical sockets 5', roller-supports 13, provided with spring-coils 20, pivotal spindles 14 and journal-spindles 12, said pivotal spindles being mounted in said sockets, and rollers 8, mounted upon said journal-spindles, substantially as described.

8. In a pulverizer, the combination of the annular die 1, the revolving center or driver 3, provided with the brackets 5, having the vertical sockets 5' and the supports 7, the roller-supports 13, provided with the spring-coils 20, the pivotal spindles 14 and the journal-spindles 12, and the rollers 8, having the central bores 9, closed at the lower ends and mounted upon said journal-spindles, substantially as described.

9. In a pulverizer, the combination of the annular die 1, the revolving center or driver 3, provided with the brackets 5, having sockets 5' and supports 7, the roller-supports 13, formed with the spring-coils 20, the pivotal

spindles 14, mounted in said sockets, and the journal-spindles 12, provided with the hoods 14, and the rollers 8, mounted upon said journal-spindles and formed with the conical necks 10 at their upper ends and with closed lower ends, substantially as described.

10. In a pulverizer, the combination of the roller-support 13, provided with the journal-spindle 12, which is formed with the axial channel 15, the enlarged chamber 16, and the lateral duct 17, the apertured hood 11, the metal pipe 18, the flexible pipe 19, and the roller 8, formed with a central closed bore 9 and a conical neck 10, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

EDWIN C. GRIFFIN.

Witnesses:

J. K. GRIFFIN,

E. E. GRIFFIN.