

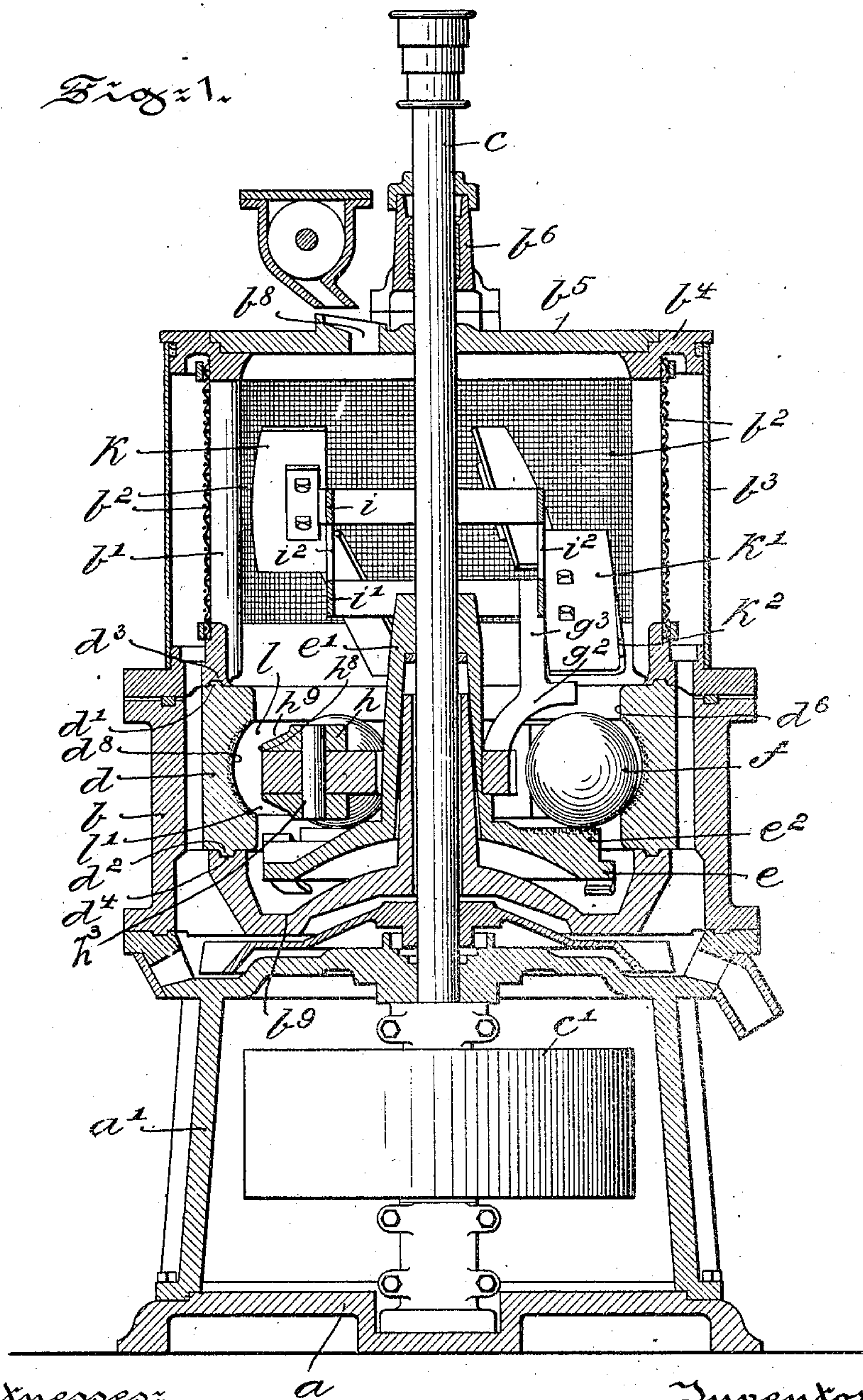
No. 849,780.

PATENTED APR. 9, 1907.

J. W. FULLER, JR.
PULVERIZING OR GRINDING MILL.

APPLICATION FILED JAN. 26, 1906.

3 SHEETS—SHEET 1.



Witnesses:
Wilhelm Vogt
Thomas M. Smith.

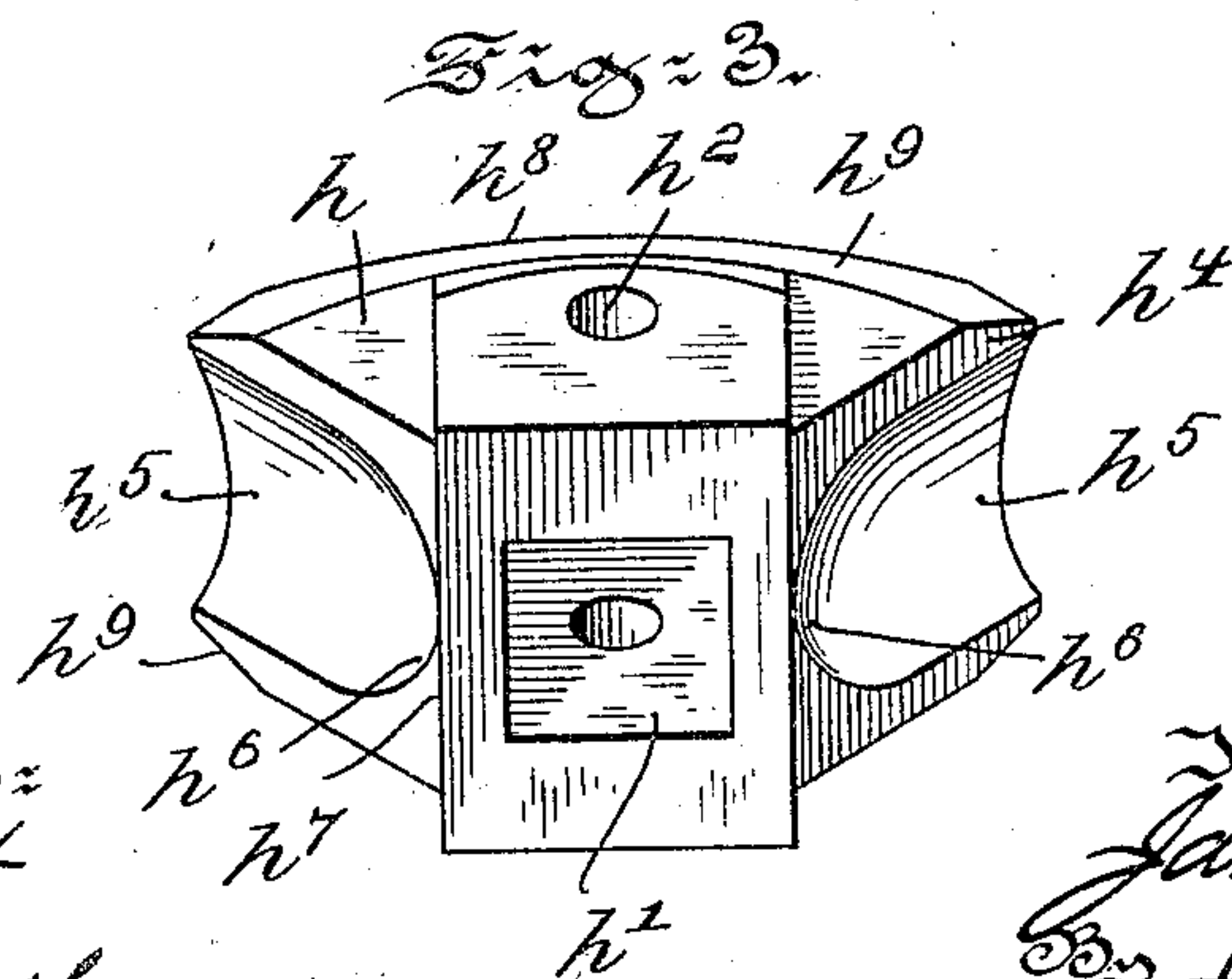
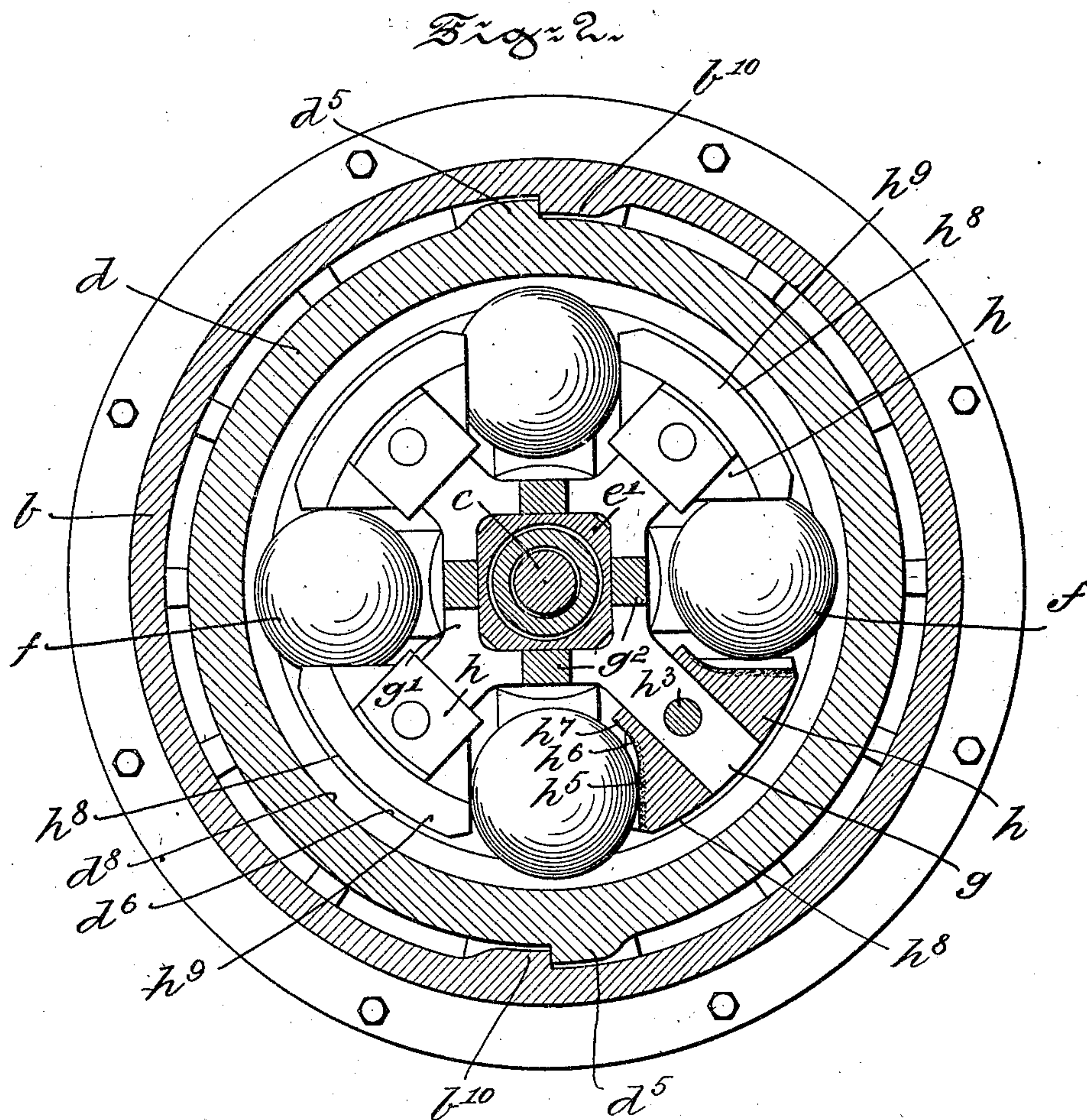
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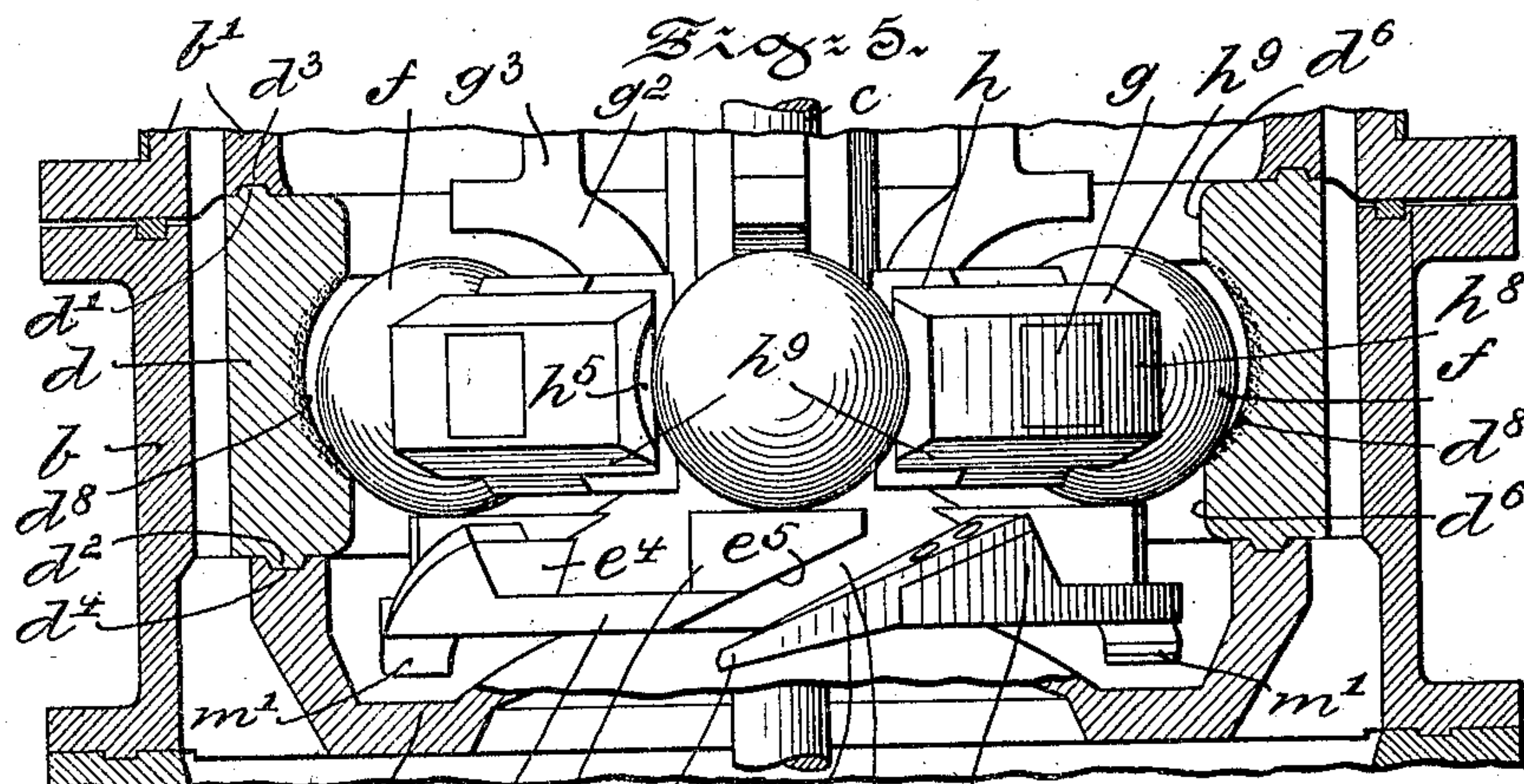
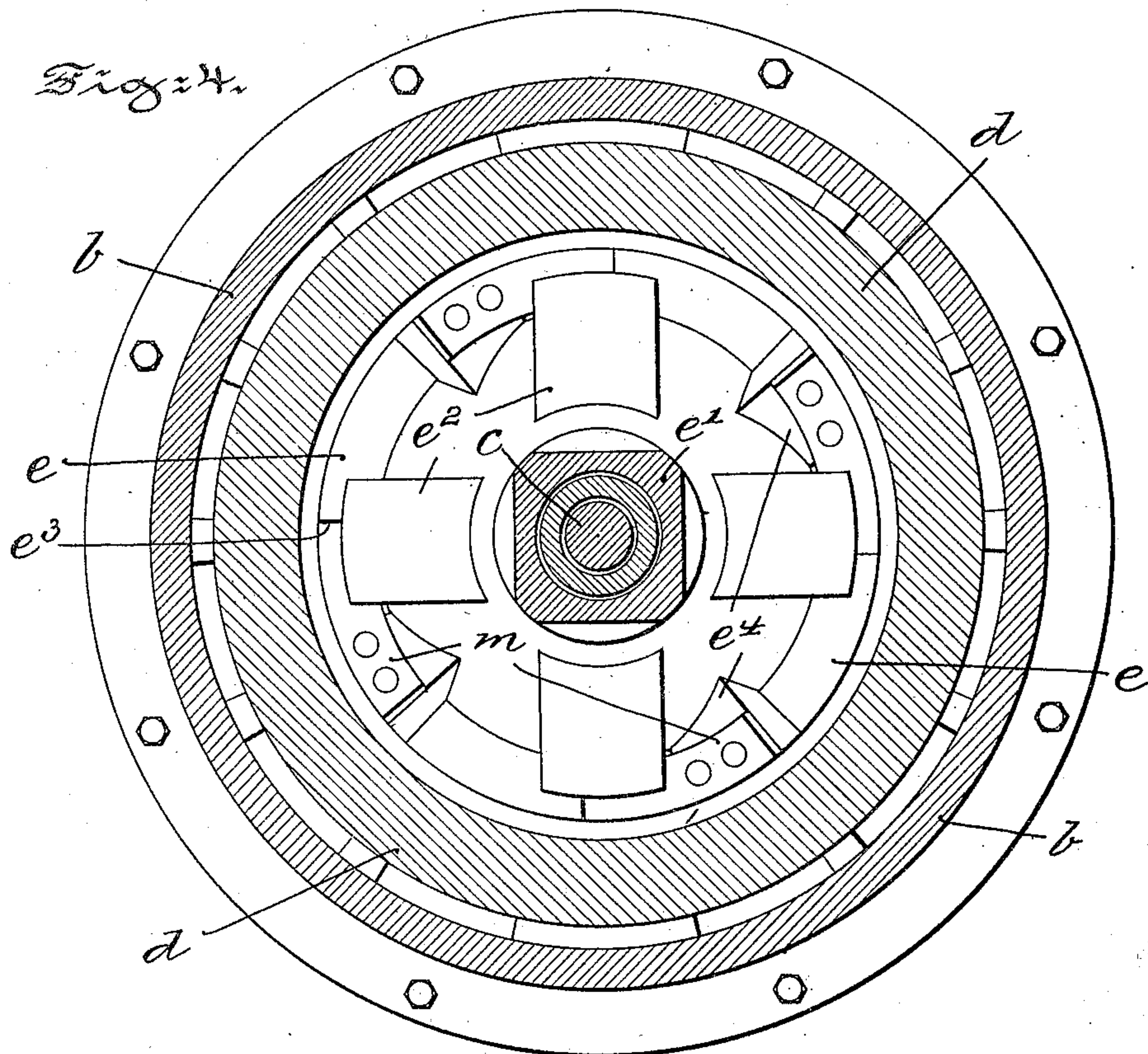
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3 SHEETS—SHEET 3.



Witnesses:
Wilhelm Vogt
Thomas M. Smith.

Inventor:
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Attorney.

UNITED STATES PATENT OFFICE.

JAMES W. FULLER, JR., OF CATASAUQUA, PENNSYLVANIA.

PULVERIZING OR GRINDING MILL.

No. 849,780.

Specification of Letters Patent.

Patented April 9, 1907.

Application filed January 26, 1906. Serial No. 297,929.

To all whom it may concern:

Be it known that I, JAMES W. FULLER, Jr., a citizen of the United States, residing at Catasauqua, in the county of Lehigh and State of Pennsylvania, have invented certain new and useful Improvements in Pulverizing or Grinding Mills, of which the following is a specification.

My invention has relation to a pulverizing or grinding mill of the type wherein the materials are ground by balls or rolls traveling within an annulus or ring; and in such connection it relates more particularly to means for holding the ring in proper position and for revolving the balls within the ring and to means connected with the ball-carrier to elevate and conduct material into the path of the ring and balls.

The principal objects of my invention are, first, to provide a ring or annulus of a pulverizing or grinding mill at its upper and lower surfaces with a rib or tongue and at its outer surface or rim with projections to hold the ring in proper position within the casing of the mill and to prevent turning of the same therein; second, to provide such a mill with reversible segmental pushers or blocks having tapering ends and indented and rearwardly-tapering bearing-faces for the balls to revolve within the ring and to form with their tapering end portions, in conjunction with the ring, passage-ways for material which permit of ready entrance of the same between the pushers and the ring; third, to provide the carrier for the balls at the outer periphery with inclined passage-ways and with projecting sweepers or scoops forming one of the surfaces of the passage-ways to elevate material accumulating in the bottom of the casing and to elevate and conduct the same into the path of the balls and interior or wearing surface of the ring, and, fourth, to chill or harden the portions of the carrier supporting the balls, as well as the faces of the pushers engaging the same and the portion of the ring engaged by the balls, to materially prolong the usefulness of the same and to economize greatly as to repairs of such parts of the mill subject to constant wear.

The nature and scope of my present invention will be more fully understood from the following description, taken in connection with the accompanying drawings, forming part hereof, in which—

Figure 1 is a view illustrating, partly in

vertical central section and partly in elevation, a pulverizing or grinding mill and also showing the manner of centering the ring in the mill, the tapering of the pushers to permit of the unobstructed entrance of material between the pushers and ring, and the carrier for the balls having passage-ways, and scoops or sweepers arranged therein for raising material and conducting the same into the path of the balls and wearing-surface of the ring, all embodying characteristic main features of my present invention. Fig. 2 is a view, partly in horizontal section and partly in top or plan, illustrating the ring and the means for preventing rotation thereof, the carrier for the balls, the means for supporting the reversible pushers and the particular outline or shape of the same at their free ends to facilitate the entrance of material to the ring, and the rearwardly-inclined bearing-surfaces for the balls to hold the same in a certain defined position with respect to the ring. Fig. 3 is a detail view, enlarged, illustrating in perspective a pusher detached from the holder thereof. Fig. 4 is a view, partly in horizontal section and partly in top or plan, illustrating the carrier for the balls, the passage-ways arranged in the perimeter of the carrier, and the scoops or sweepers arranged in the passage-ways; and Fig. 5 illustrates, partly in vertical section and partly in elevation, the central portion of the mill.

Referring to the drawings, with reference to Fig. 1, *a* represents the bed-plate of the pulverizing or grinding mill, to which is secured a standard *a'*, supporting the bottom *b* of a sectional casing *b*. Upon the casing *b* is arranged a frame or basket *b'*, adapted to support screens *b²*, and a casing or shell *b³*. The frame or basket *b'* is closed at its upper end by a ring *b⁴* and a plate *b⁵*, removably secured thereto, and upon this plate is arranged a bearing *b⁶* for the driving-shaft *c*, arranged vertically in the mill. The shaft *c* passes through the casing *b*, and between the same and bed-plate *a* is arranged a pulley *c'*, by means of which the shaft *c* is driven from any suitable source of power. (Not shown.) Within the casing *b*, traversed by the shaft *c*, is arranged an annulus or grinding-ring *d*, and the preferred manner of holding and centering the same to the casing *b*, as well as to the basket *b'*, consists of annular ribs or tongues *d'* and *d²*, respectively, projecting from the upper and lower surfaces thereof

and engaging grooves or depressions d^4 and d^3 , arranged, respectively, in the casing b and base of the basket b' , as shown in Figs. 1 and 5. In addition thereto the ring d at its outer surface or rim is provided with lugs d^5 , engaging lugs b^{10} of the casing b , which lugs serve to prevent turning of the ring d in the casing b .

To the shaft c by means of an extension e' is suitably secured a platform or carrier e , having projections e^2 , serving as supports for grinding-balls f . As shown in Fig. 2, the extension e' of the carrier e is preferably square in cross-section, and to the same is removably secured a spider or radiating arms g for the reception and support of pushers h , between which the grinding-balls f are arranged and are revolved and held by the same in position on the projections e^2 of the carrier e . The sleeve g' of the radial arms g , surrounding the extensions e' of the carrier e , is provided with outwardly and upwardly flaring arms g^2 , serving to hold and to retain the balls f in position upon the projections e^2 of the carrier e . Each of the retainer-arms g^2 is provided with an extension g^3 , to which is secured an annular body consisting of superposed rings i and i' , connected with each other by strips i^2 . To each of the rings i and i' are suitably secured a series of obliquely-arranged wings or blades k and k' , which when rotated tend to force material of a sufficient degree of fineness entering the mill through the opening b^8 in the plate b^5 directly through the screens b^2 and at the same time elevates finely-ground material and also discharges the same through the screens b^2 . Coarse and lumpy material, however, is permitted to descend in the mill and to be conducted either by the lower series of wings k' and their flanges k^2 directly into the path of the balls f or to be drawn toward the same by the action of the wings k and k' revolving rapidly in proximity to the screens b^2 . The central portion of the basket b' is left free and is defined by the rings i and i' , leaving the material to freely descend therein and to be distributed therefrom by the wings k and k' , the finer material through the screens b^2 and the coarser and lumpy material to the ring d and balls f . In order to permit of the free and unobstructed entrance of the material to be ground between the pushers h and the ring d , which pushers occupy a comparatively large space in the casing b , the same are shaped or constructed in preferably the following manner:

As shown in Figs. 2 and 3, each of the pushers h consists of a segmental body having an opening h' , through which one of the radial arms g passes, and is also provided with an opening h^2 for the reception of a locking-pin h^3 , by means of which the pusher is removably secured to the arm g . Each of the radial faces h^4 of the pusher h is provided

with a depression h^5 , concave in cross-section and extending to a rearwardly-tapering portion h^6 , terminating in a straight contracted portion h^7 . The depressions h^5 serve as contacting or bearing surfaces for the grinding-balls f , and the tapering portion h^6 as well as the contracted portion h^7 serve to limit the movement of the balls f toward the shaft c when the mill is brought to a standstill. The outer vertical face h^8 of each of the pushers h is curved in a radius determined from the central axis of the shaft c and is held by a pin h^3 at all points an equal or defined distance from the interior surface of the ring d , at which distance the outer face h^8 is held substantially in alignment with the portions d^6 of the inner surface of the ring d , as will be readily understood from Figs. 1 and 2. In addition thereto each of the pushers h at their upper and lower horizontal sides is provided with inclined portions h^9 , which inclined portions, in conjunction with the respective ends of the curved portion d^8 of the ring d , form inclined passage-ways l and l' , through which the material can readily pass and is directly conducted to the curved wearing portion of the ring d , which is the portion against which the balls f abut. All the coarse and lumpy material descending in the mill and striking the upper inclined portions h^9 of the pushers h will thus be permitted to freely enter the space between the ring d and pushers through the passage l , while the portions thereof reaching the bottom b^9 of the casing b , which are raised from the same, are permitted to freely pass through the passage l' to the ring and pushers h and balls f , as shown in Fig. 1. The preferred means for raising or elevating the material from the bottom b^9 of the casing b and for conducting the same in an oblique direction into the path of the balls f and the inner surface d^8 of the grinding-ring d are as follows:

As shown in Figs. 4 and 5, the carrier e for the balls f is provided at its perimeter with inclined cuts or passage-ways e^3 , which are arranged, preferably, directly below the supports e^2 for the balls f and extend through the lower portion of the same to form long guiding-surfaces e^5 . To a projection e^4 of the carrier e , arranged adjacent to each of the passage-ways e^3 , is removably secured and held in an oblique position by the same a scoop or sweeper m , projecting with its free end m' below the carrier e and terminating a certain distance above the bottom b^9 of the casing b . During the rapid rotation of the carrier e the scoops or sweepers m will continually raise the material accumulated on the bottom b^9 and, in conjunction with the inclined surface e^5 of the passage-way e^3 , acting as a ball-plate, will force the material in an oblique direction upward and through the passage-way l' , formed by the lower inclined portion h^9 of the pushers h and the lower projecting

portion d^6 of the ring d and the end of the curved portion d^8 directly into the path of the grinding-balls f and the interior or grinding-surface d^8 of the ring d , as will be readily understood from Fig. 5 of the drawings.

In order to prolong the use of the ring d , pushers h , and carrier e , made of cast-iron, the grinding or curved interior surface d^8 of the ring d , as well as the bearing-surfaces h^5 and h^6 of the pushers h and the upper surface of the supports e^2 of the carrier e , are chilled or case-hardened in any preferred manner.

Having thus described the nature and objects of my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a mill of the character described, a grinding-ring having a curved grinding-surface arranged between straight portions thereof, means for supporting said ring, pushers, each having an inclined surface extending over the upper and lower faces to permit of free entrance of matter between said pushers and ring, means for supporting said pushers and actuating the same within said ring, grinding-balls arranged between said pushers and a carrier having projections supporting said balls and provided with slots in the periphery extending through said projections to permit of the formation of long guiding-surfaces therein.

2. In a mill of the character described, a grinding-ring, a casing for supporting said ring, pushers each having an inclined surface extending over the entire upper and lower faces thereof to permit of the free entrance of matter between said pushers and ring, means for supporting said pushers and for actuating the same within said ring, grinding-balls ar-

ranged between said pushers, a carrier having projections supporting said balls and provided with slots in the outer periphery extending through said projections to permit of the formation of long guiding-surfaces therein, means connected with said carrier and located in the slotted portions thereof and projecting below the carrier, said means adapted when actuated by said carrier to elevate matter resting on the bottom of said casing and conduct the same against the inclined surface of the lower faces of said pushers and by the same to said ring.

3. In a mill of the character described; a casing, a grinding-ring supported thereby, pushers arranged within said ring, each having inclined surfaces at their outer ends and forming in conjunction with said ring passage-ways for matter adapted to enter the ring from opposite sides thereof, grinding-balls arranged between said pushers and adapted to be rotated by the same within said ring, a carrier adapted to support said balls having slots in the outer periphery, scoops connected with said carrier and projecting below the same, said scoops when actuated by said carrier adapted to elevate matter resting on the bottom of said casing and conduct the same through said slots to the grinding-ring.

In testimony whereof I have hereunto set my signature in the presence of two subscribing witnesses.

JAMES W. FULLER, JR.

Witnesses:

ALEX. N. ULRICH,
BESSIE McMAHON.