

No. 702,757.

Patented June 17, 1902.

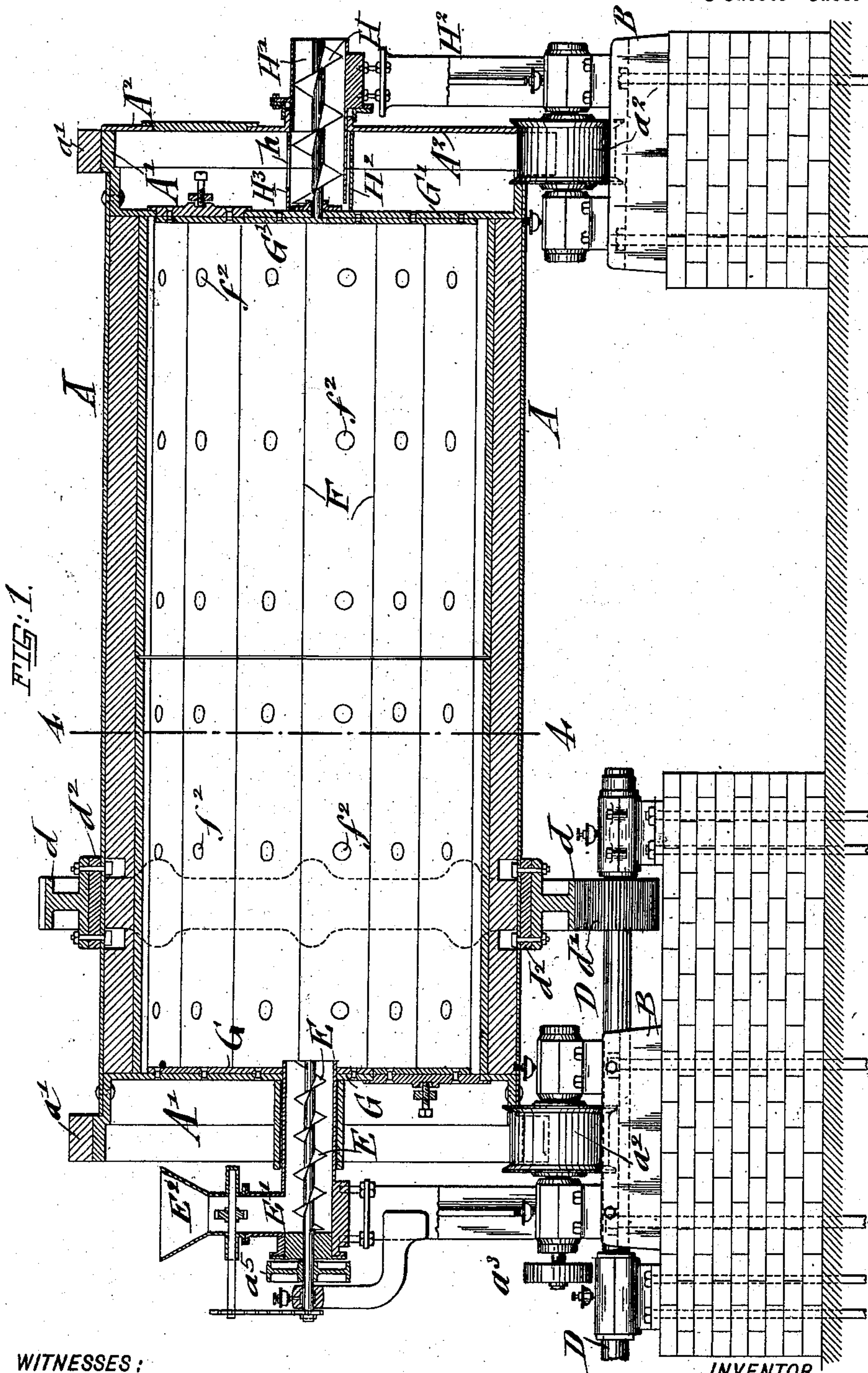
M. F. ABBÉ.

BALL GRINDING MILL.

(Application filed Sept. 20, 1900.)

(No Model.)

3 Sheets—Sheet 1.



WITNESSES:

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FIG. 3.

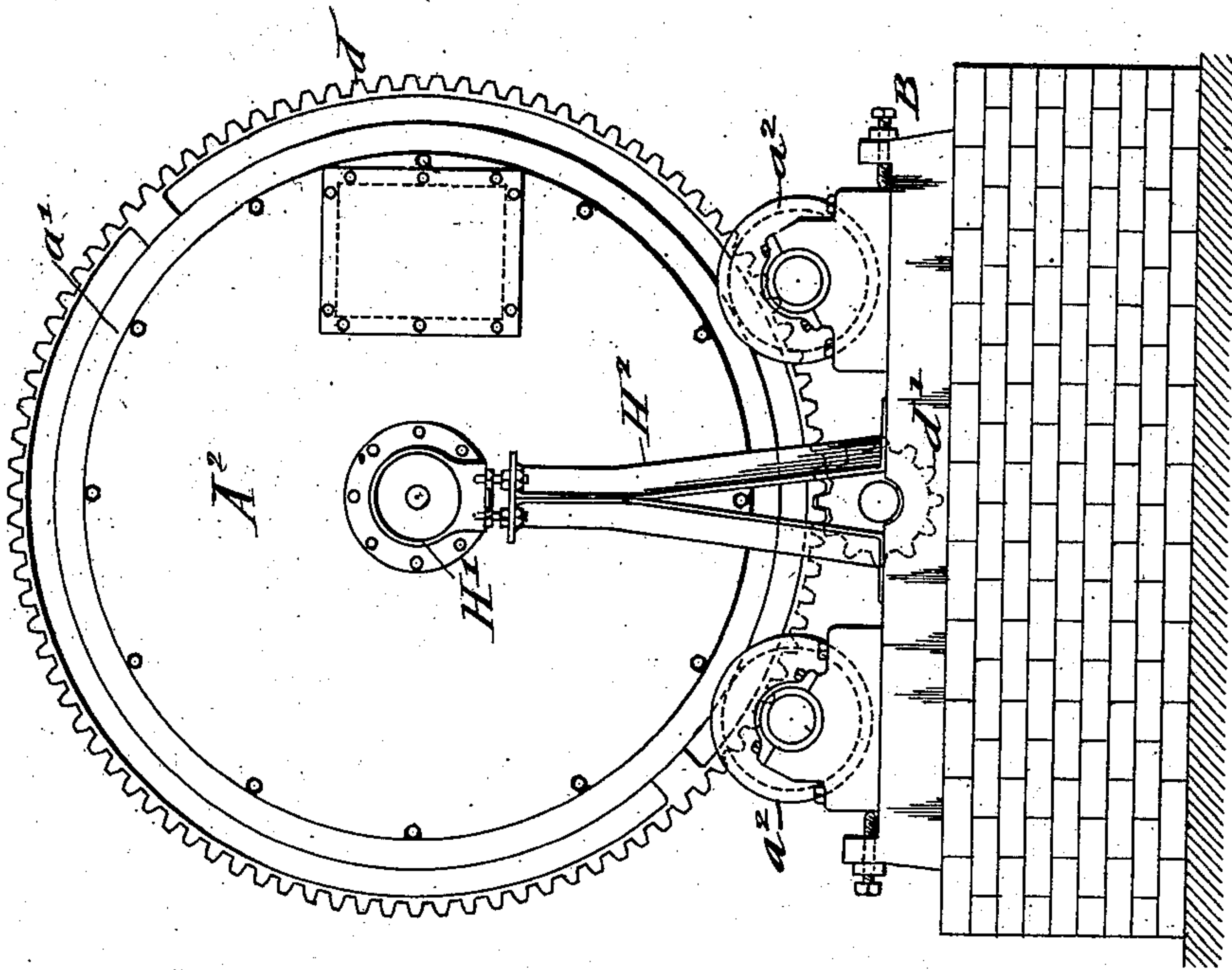
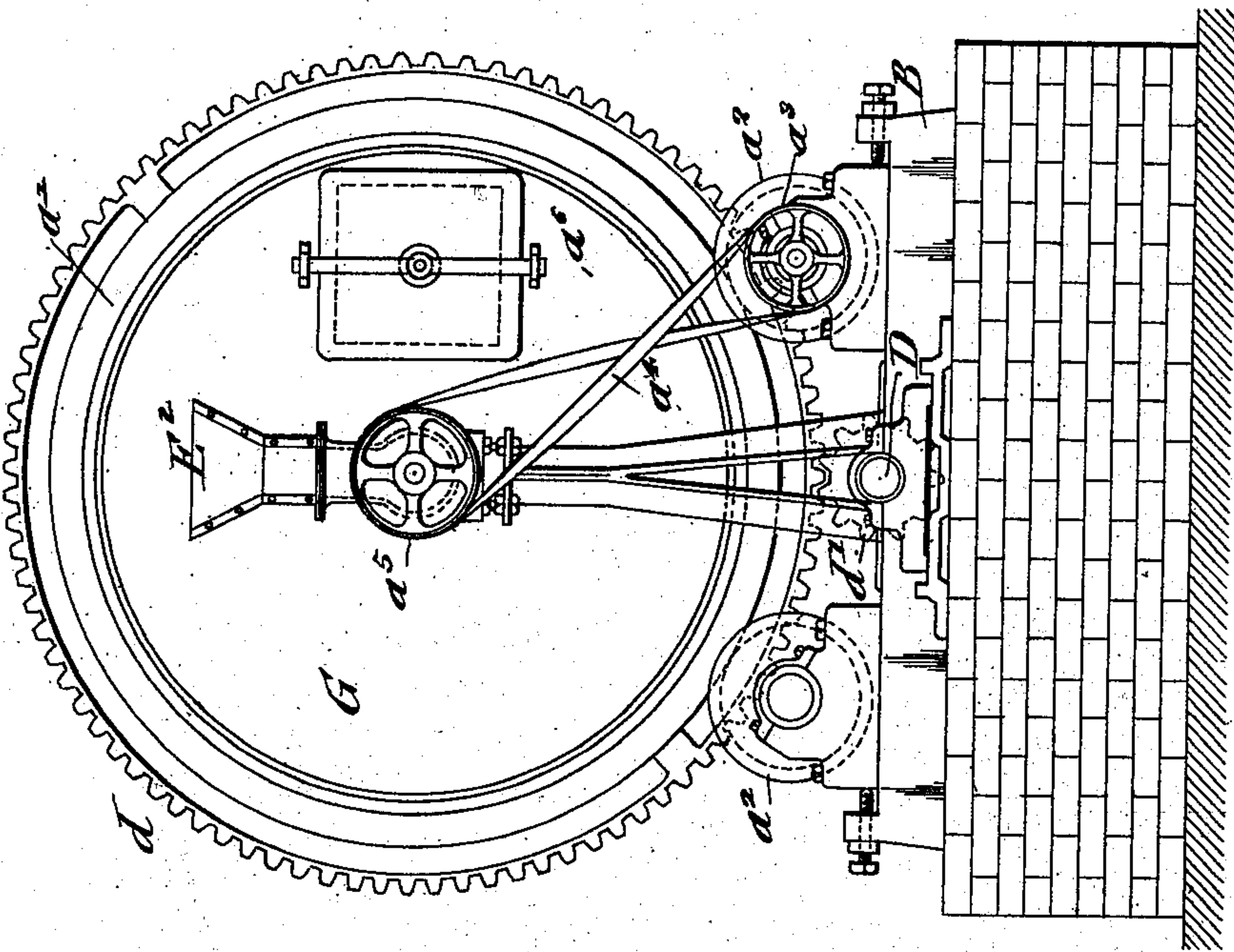


FIG. 2.



WITNESSES:

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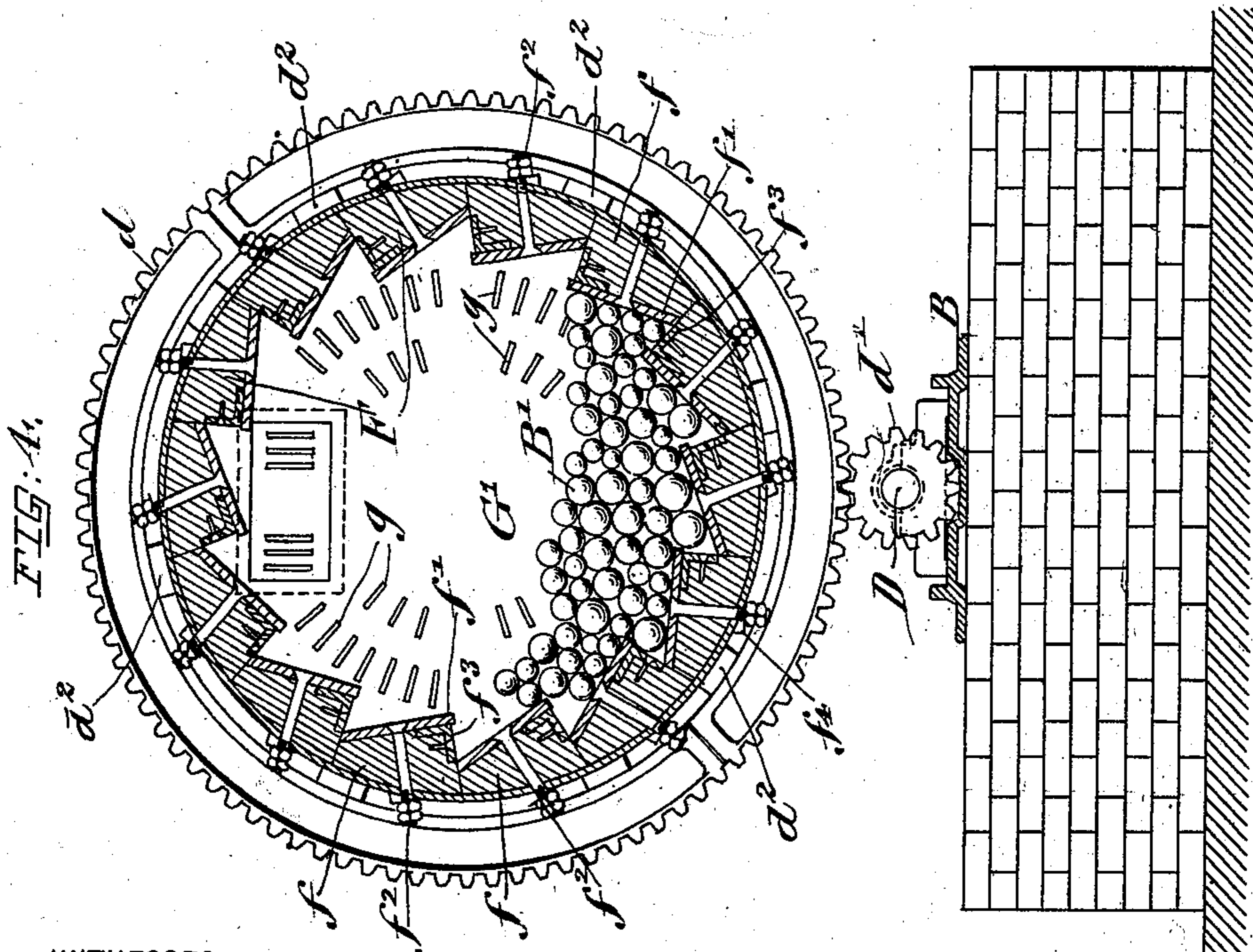
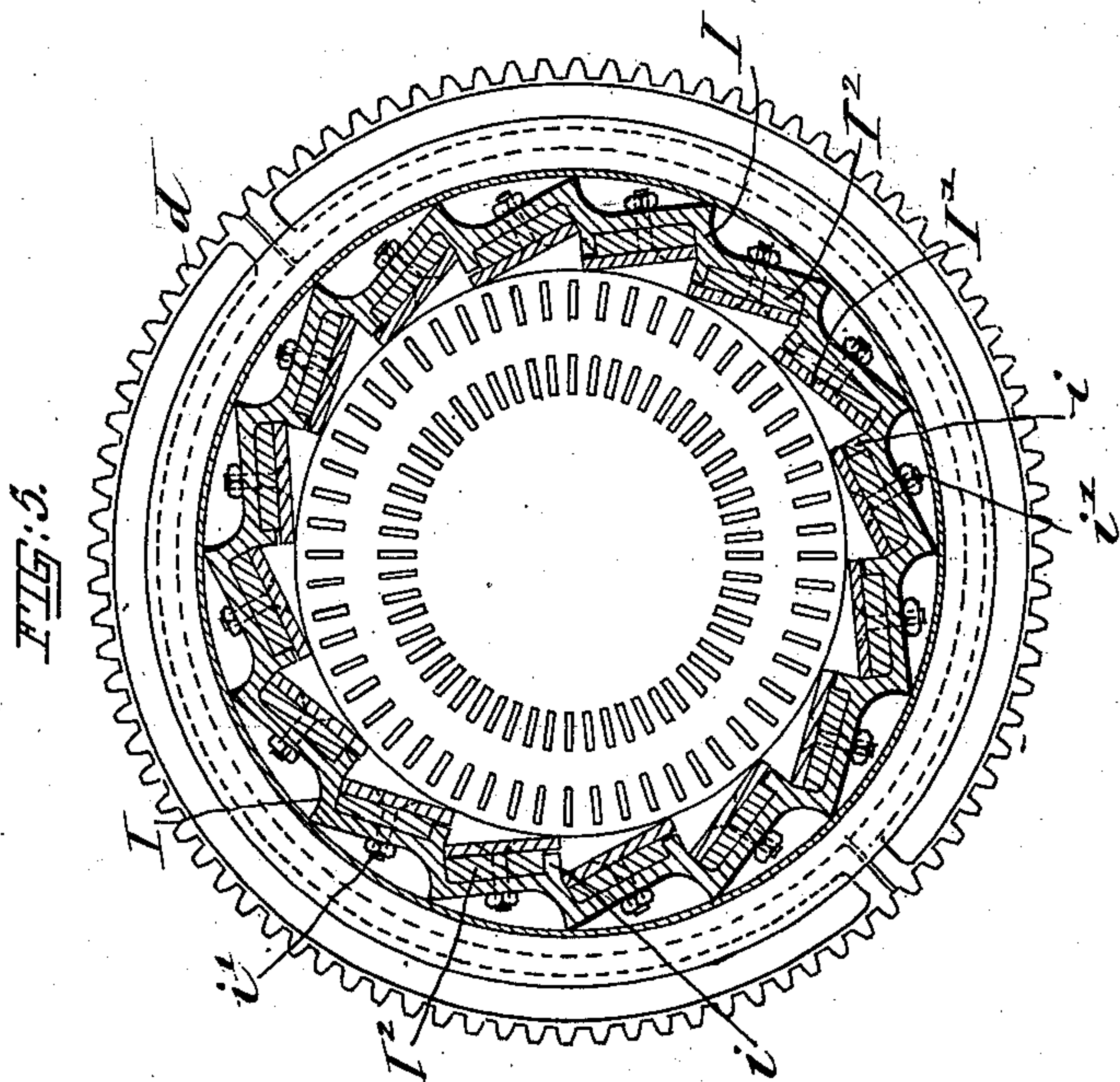
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WITNESSES:

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UNITED STATES PATENT OFFICE.

MAX F. ABBÉ, OF NEW YORK, N. Y.

BALL GRINDING-MILL.

SPECIFICATION forming part of Letters Patent No. 702,757, dated June 17, 1902.

Application filed September 20, 1900. Serial No. 30,555. (No model.)

To all whom it may concern:

Be it known that I, MAX F. ABBÉ, a citizen of the United States, residing in the city of New York, borough of Manhattan, in the State of New York, have invented certain new and useful Improvements in Ball Grinding-Mills, of which the following is a specification.

This invention relates to certain improvements in ball grinding-mills of that class in which longitudinal steps are arranged at the inner circumference of the drum, so as to rotate the balls with the material to be ground; and the invention consists in the combination, in a ball grinding-mill, of a cylindrical drum, a head at the ingoing end of the same, a perforated head at the outgoing end of the same, annular extensions, one at each end of the drum, extending beyond the heads of the same, tires applied one to each of said extensions, a screw conveyer passing through the ingoing head, a closing-plate closing the extension at the outgoing end of the drum, a screw conveyer passing through said closing-plate, a plurality of cushioning-blocks in step arrangement longitudinally at the interior circumference of the drum, reversible face-plates secured to said cushioning-blocks, and angular flanges secured one to the projecting edge of each of said cushioning-blocks, each flange extending beneath the face-plate and downwardly over the exposed front of its block and being attached at its downwardly-extending front portion thereto.

The invention consists, further, in certain other combinations of operative parts, which will be fully described hereinafter and finally claimed.

In the accompanying drawings, Figure 1 is a vertical longitudinal section through my improved ball grinding-mill. Figs. 2 and 3 are respectively an elevation of the ingoing and of the outgoing end of the mill. Fig. 4 is a vertical transverse section on line 4 4, Fig. 1; and Fig. 5 is a vertical transverse section of a modified construction of the ball grinding-mill.

Similar letters of reference indicate corresponding parts.

Referring to the drawings, A represents the drum of my improved ball grinding-mill, which is made of considerable length and provided at its ends with tubular extensions A',

that are attached to the heads of the drum, said extensions being provided with shoulders carrying the circumferential steel tires a' , which are supported each on a pair of rollers a^2 , arranged at each side of the longitudinal plane of the mill in bearings of suitable bed-plates B, as shown in Figs. 1 and 2. Rotary motion is imparted to the drum by means of exterior gearing d , which meshes with a pinion d' on the shaft D, to which rotary motion is imparted by a belt-and-pulley transmission, as shown in Fig. 1. On the shaft of one of the rollers a^2 of the drum is arranged a pulley a^3 , which transmits motion by a cross-belt a^4 to a pulley a^5 on the shaft of the conveyer E, that is arranged in the longer horizontal leg of an L-shaped tube E', the vertical leg of which is provided with a hopper E² for the material to be ground. The annular extensions A' of the drum are riveted to the shell of the same, and thereby support the drum. They have the great advantage of being easily replaced from time to time when worn out by use. In this respect they are a valuable improvement over the circular bands heretofore in use, which were applied upon the body of the drum and which could only be repaired with considerable difficulty. The extensions can be readily detached and replaced by new ones when worn out, so that the mill may again be set in operation with but little delay.

The drum is provided at its interior with a number of longitudinal steps F, which are constructed each of an intermediate cushioning-block, of wood or other suitable material, of tapering, oblong, or other shape, and metallic face-plates f' , which are attached to the blocks f by means of fastening-bolts f^2 , having heads that are countersunk into recesses in the face-plates. The face-plates are made alike on both sides, so that they can be reversed when desired. The fastening-bolts f^2 pass through the drum to the outside and are secured, as shown, by means of nuts and jam-nuts.

The edges of the blocks are provided with angular metal corner-pieces f^3 or flanges extending upon the upper surface and over the exposed front of the blocks, so as to protect the blocks against wear. These flanges serve also to render the forward portion of the face-

plate more rigid than otherwise would be the case. They give the forward edge of the plate a firmer support. This is caused by the fact that each flange extends beneath the forward edge of the plate, between the same and the block, so as to rest upon the latter and support the forward part of the plate, and also by the fact that the plate is connected at its downwardly-extending front portion with the block, as shown in Fig. 4. The flanges thereby impart increased rigidity to the face-plate and prolong the life of the cushion and constitute a valuable feature of my invention. The balls B' are rotated with the material to be ground in the drum and drop from step to step, producing thereby the regrouping of the particles and the quick and effective comminuting of the same. The material moves gradually from the ingoing head G of the drum to the outgoing head G' , which latter is provided with radial slots g , arranged in circular concentric rows, through which the ground material passes into the chamber formed by the outgoing head G' , extension A' , and closing-plate A^2 , closing the extension. The closing-plate A^2 and the heads of the drum are provided with suitable man-holes and covers for inserting the grinding-balls and removing the same. To the outgoing head G' is attached a conveyer-screw H , which turns in a stationary discharge-tube H' , supported on a suitable standard H^2 . A short tube H^3 connects the head G' with the closing-plate. The ground material is carried up the sides of the extension-chamber by the rotation of the drum and drops through the opening h in the tube H^3 and is conveyed off through the discharge-tube by the conveyer H .

The drum is preferably made of boiler-iron, in which case the fastening-bolts of the steps are supported on suitable bosses f^4 , interposed between the nuts and the exterior surface of the drum, as shown in Fig. 4.

Between the gear-ring d' , by which motion is imparted to the drum, and the latter are interposed cushioning-blocks d^2 , which serve to cushion the gear, so as to take up the hammering vibration of the concussions received by the same during the passing of the balls from one step to another. The introduction of these cushioning-blocks prevents breakage and rapid wear of the teeth.

Instead of making the drum of boiler-iron it can be made of cast-iron, in which case the

circumference is provided with a cast-metal cylinder I , having longitudinal depressions, forming inclined seats for the face-plates I' , and intermediate wooden cushioning-blocks I^2 applied thereto. The inclined steps thus formed are provided at their inner edge with projecting retaining flanges or shoulders i . The face-plates are attached, by means of bolts i' , to the cylinder I . In other respects the construction of this drum is practically the same as that shown in Fig. 4, it being constructed throughout on cheaper lines, so as to reduce the expense of the same. The face-plates of the steps are alike on both sides, so as to permit reversal, so that they can be used until entirely worn out.

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

1. In a ball grinding-mill, the combination of a cylindrical drum, a head at the ingoing end of the same, a perforated head at the outgoing end of the same, annular extensions, one at each end of the drum extending beyond the heads of the same, tires applied one to each of said extensions, a screw conveyer passing through the ingoing head, a closing-plate closing the extension of the outgoing end of the drum, a screw conveyer passing through said closing-plate, a plurality of cushioning-blocks in step arrangement longitudinally at the interior circumference of the drum, reversible face-plates secured to said cushioning-blocks, and angular flanges secured, one to the projecting edge of each of said cushioning-blocks, each flange extending upon its block beneath the face-plate and downwardly over the exposed front of the block, and being attached at its front portion thereto, substantially as set forth.

2. In a ball grinding-mill, the combination, with a rotary drum and grinding-balls within the same, of a gear-ring applied to said drum, and a cushioning-ring interposed between the gear-ring and drum for taking up the concussions within the latter, substantially as set forth.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

MAX F. ABBÉ.

Witnesses:

PAUL GOEPEL,
J. H. NILES.