(No Model.)

2 Sheets—Sheet 1.

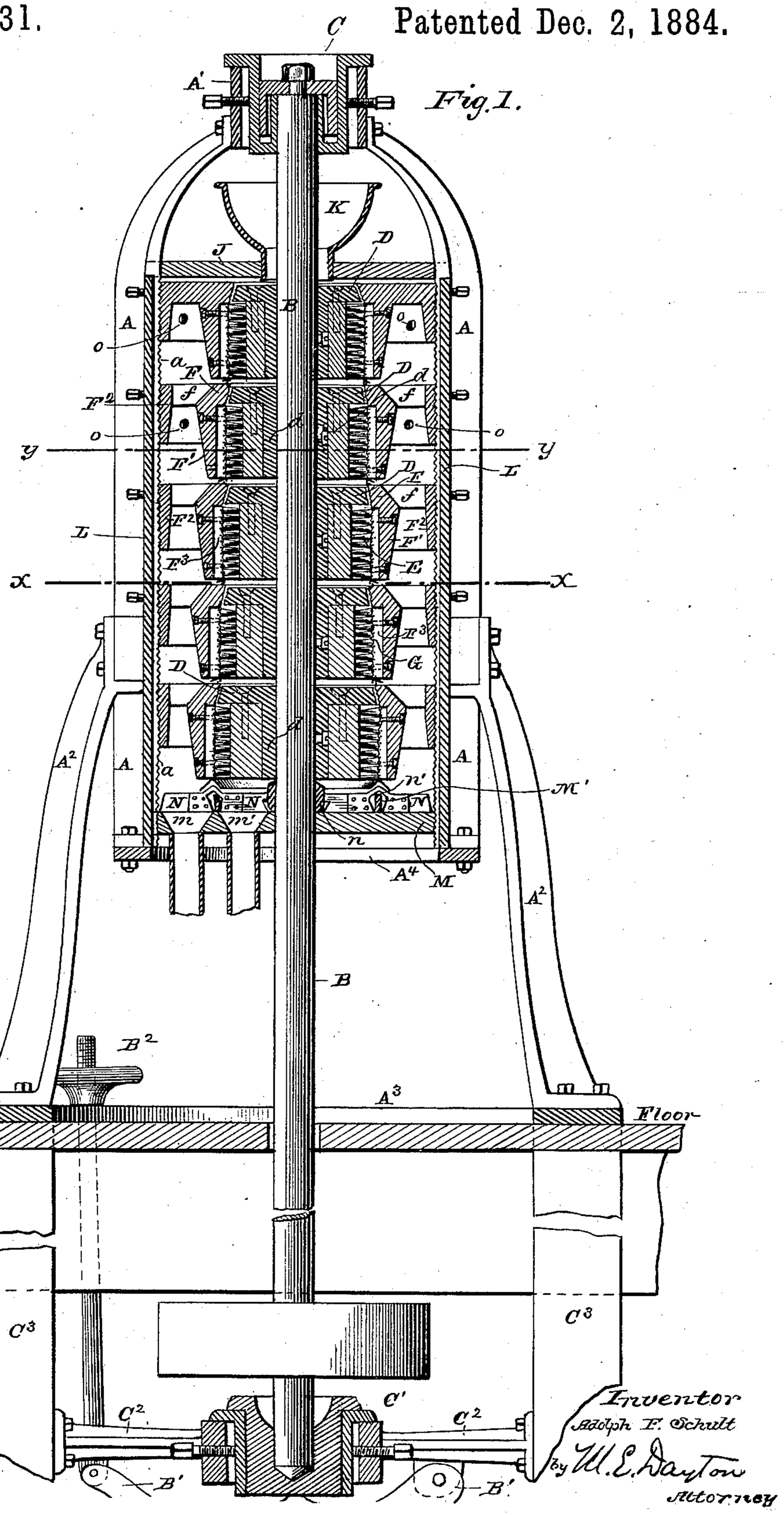
A. F. SCHULT.

GRINDING MILL.

No. 308,631.

Patented Dec. 2, 1884.

Fig. 1.



Witnesses
Jno. H. Pockett
W. J. Osgood

Inventor
Adolph F. Schult
by W. E. Dayton
Attorney

(No Model.)

2 Sheets—Sheet 2.

A. F. SCHULT.

GRINDING MILL.

No. 308,631. Patented Dec. 2, 1884.

Fig. 2.

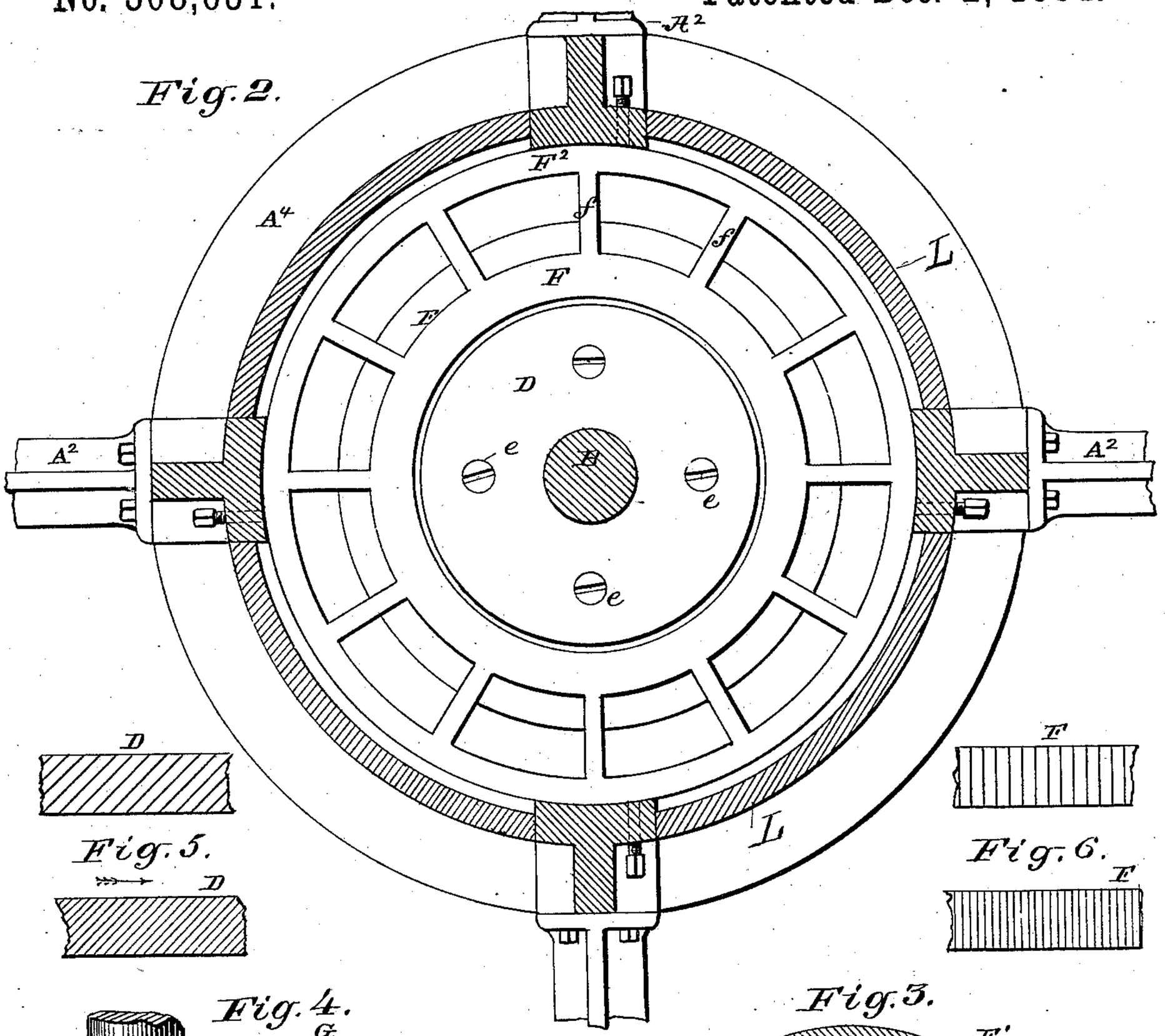


Fig. 5.

Fig. 6.

Fig. 4.

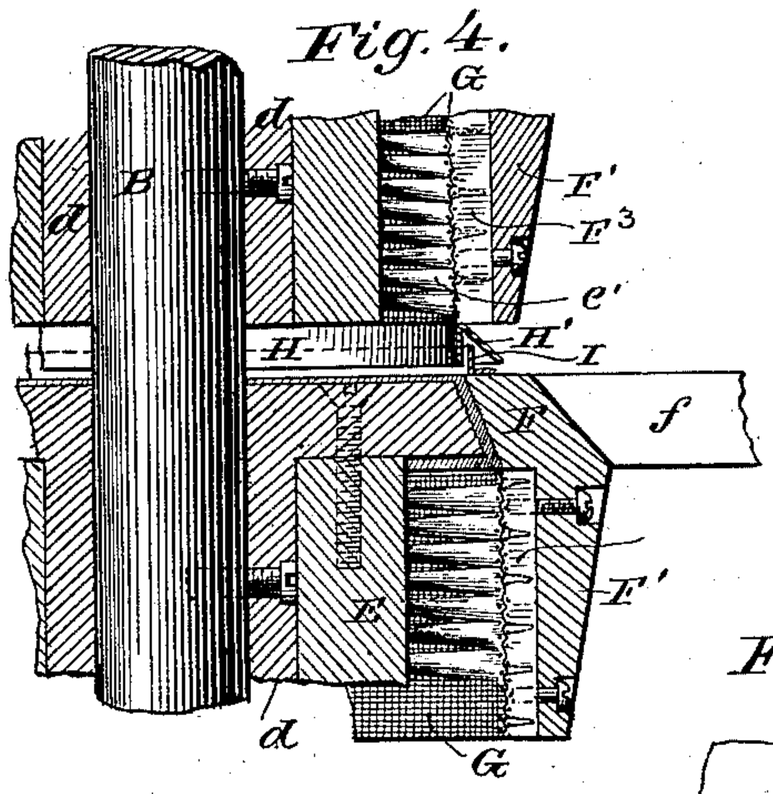


Fig. 3.

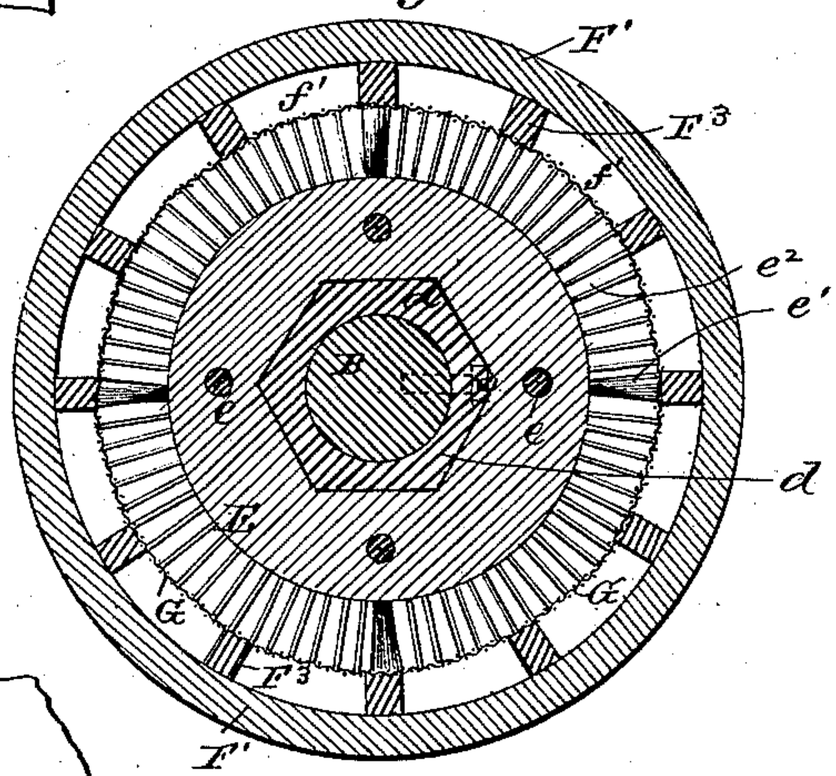
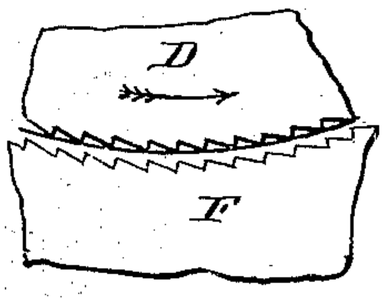


Fig. 7.



Witnesses:
Jno. W. Stockett
W. J. Osgood

Inventor:
Adolph F. Schult.
by W. E. Dayton
Attorney

UNITED STATES PATENT OFFICE.

ADOLPH F. SCHULT, OF LA CROSSE, WISCONSIN.

GRINDING-MILL.

SPECIFICATION forming part of Letters Patent No. 308,631, dated December 2, 1884.

Application filed June 2, 1884. (No model.)

To all whom it may concern:

Be it known that I, ADOLPH F. SCHULT, of La Crosse, in the county of La Crosse and State of Wisconsin, have invented certain new and useful Improvements in Grinding-Mills; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to mills for the gradual reduction of wheat or other grain, and it has for its object to provide a mill in which several steps in the reduction of the grain may be simultaneously performed upon different portions of a mass of grain and successively upon the same portion, and in which the flour, or flour and middlings, are separated from the coarser fragments and bran after each of the several breaks.

The invention consists in the several matters hereinafter set forth, and pointed out in the appended claims.

In the accompanying drawings, Figure 1 is a central vertical section of a machine embodying my invention. Fig. 2 is a horizontal section at *x x* of Fig. 1, enlarged. Fig. 3 is a horizontal section through Fig. 1 at *y y*. Fig. 4 is a fragmentary central vertical section of the reducing and separating devices of the machine, showing more plainly certain details of construction. Figs. 5 and 6 are fragmentary views of the grinding-faces having a differentiated dress thereon, whereby certain effects are sought to be obtained, as hereinafter more fully set forth. Fig. 7 shows a preferred arrangement of the dress on opposite working-faces.

A A are a series of uprights (preferably four in number) arranged equidistant from a vertical central line, and having their upper ends converged to support an annular head, A′. Said uprights may directly extend to the floor or other suitable base or support, but are herein shown as being sustained by spreading-legs A^2, resting upon a cast-iron base-ring, A^3. A central vertical rotating shaft, B, is arranged between the uprights A A, having its upper end supported by a suitable bearing-box, C, adjustably placed within the ring or head A′, said shaft resting upon and being laterally supported at its lower end by a suitable step, C′. In the present case said lower shaft-bearing and step, C′, is placed below the floor, and is sustained by the arms C^2, fastened to pendants, posts, or brackets C^3, depending from the base-ring A^3.

The object of locating the lower shaft-bearing below the floor is to give a greater length to said shaft B without elevating the working part of the machine unduly above the floor. The advantage of great length in such shaft between its bearings is plainly to lessen the disadjustment of the working parts attached to the shaft, which results from wear of the bearings, or from lack of accurate adjustment of said bearings. By constructing the pendants C^3 as a part of the ring or base A^3, to which the upper frame is secured, the frame as a whole has the same continuity and possesses the same permanent relation of its parts as though the entire frame were above the floor. These and other details of construction are, however, of course variable, and not essential to other and distinctive features of my invention.

To the shaft B are secured a series of horizontal circular disks, D D, preferably about an inch deep at their peripheries, and having each the form of a shaliow cone-frustum with slight inward inclination only of its periphery from bottom to top. Immediately beneath each disk D is also secured to the shaft a cylindric brush, E, extending downward into proximity to the next disk below, or, in the case of the lower brush, to the bottom of the chamber inclosing said disks and brushes. Said brushes are of substantially the same or preferably of a little greater diameter than the disks D. Surrounding the several disks are located rings F of about the same depth or vertical thickness as the disks, and having their inner faces conical in form to correspond with the adjacent peripheries of the said disks. Said rings F are supported from the uprights A by arms *f*. As shown in the drawings, and to give vertical adjustment to the said rings F, other and parallel rings, F^2, are provided on the outer ends of said arms *f*, and a screw-thread is cut upon the periphery of each of said outer rings to fit a corresponding thread provided at *a* on the inner surfaces of said up-

rights. By means of such threaded construction of the parts mentioned the rings F may be raised and lowered to any desired extent and the conical space between such rings and several disks surrounded thereby narrowed or widened, as the case may require. Holes *o* in the outer rings, F, permit the insertion of a lever by which to turn the rings, and horizontal slots in the housing (not shown) give access to said holes. The adjacent faces of the disks D and surrounding rings F accomplish the reduction of the grain, and are dressed suitably for the purpose. Usually an upper disk and its surrounding ring will have a coarser dress and be more widely separated than the corresponding faces of the disk and ring next lower down, as indicated in Figs. 5 and 6, (which show upper and lower fragments of two disks and two rings, respectively,) because it is desired to effect the reduction of the grain by graded steps, first breaking the whole grain into coarse fragments by the uppermost grinding-faces, then breaking these fragments into smaller ones by the next grinding-faces, and so on until the last and lowermost of such faces are reached. The screens will also usually differ in fineness, the uppermost being the coarsest and each lower one being finer than the next one above.

Besides the separate adjustment provided for each of the rings F by the construction above pointed out, or by other construction adapted for the purpose, the shaft B is also desirably adjustable in a vertical direction by the usual means of a lever, B′, supporting the step C′, and a hand-screw, B², located in convenient position above the floor, sufficiently indicated in Fig. 1. By means of this double adjustment the several rings may be first set at the unequal distances from the several opposing rings desirable for giving the closer and closer reduction as the material descends, and thereafter all these distances may be simultaneously and equally varied by lowering or raising the shaft B, to adjust the mill to different qualities or conditions of material to be reduced.

From each of the rings F depends an annular flange, F′, of depth corresponding practically with the depth of the adjacent brush E. Said annular flange has its interior diameter greater than the diameter of the brush, and at suitable intervals vertical wooden ribs, F³, are secured to the inner face of the flange, as seen in Figs. 1, 3, and 4. To these ribs is fastened a cylindric screen or wire-cloth, G, exterior to the working-face of the ring F and extending the full depth of the brush. The working-face of the brush bears against the screen.

To the lower ends of the ribs F³ is secured an inner depending vertical annular flange, H, and an outer flaring annular flange, H′. (Best seen in Fig. 4.) Between these two flanges rises a vertical annular flange, I, located upon the ring F, adjacent to its inner margin.

Above the uppermost disk, D, is placed a cover, J, forming a support for the hopper K, which is arranged preferably around the shaft B, so as to deliver the grain centrally upon said disk. The support J is preferably continuous, but divided centrally into two parts in a familiar manner. Between adjacent uprights are placed parti-cylindric walls L, of wood or iron, still further inclosing said working parts. A bottom, M, is also provided, having a vertical annular flange, M′, arranged beneath and practically in line with the adjacent cylindric screen and dividing said bottom into two annular receptacles. Each of said receptacles has a delivering-spout, *m m′*. A two-part sweep, N, is secured to the shaft B by a hub, *n*, said sweep being cut away at *n′* to bridge the flange M′ and to operate in both receptacles. Depending annular flanges, like or similar to those (H H′) above referred to, are attached to the lowermost screen-supporting ribs, F³, spreading over the fixed flange M′.

In the operation of the machine, it is intended to rotate the shaft B with its rigidly-attached disks and brushes at a high speed. The action of the machine is manifest. The grain delivered upon the upper disk is broken in its passage between said disk and the surrounding ring, and the entire broken product falls between the brush and the screen opposed thereto. In the rotation of the brush the flour and middlings pass outward through the screen into the spaces *f′*, whence they fall upon the next ring F below outside the flange I, and further descend through the openings between the arms *f* to the outer receptacle of the bottom M, and are discharged through the outer spout, *m*. The coarser fragments and bran of the broken grain pass downward between the brush and screen upon the next disk below, whence they pass between the next grinding-faces, and are still further reduced. This operation is repeated until the bran, more or less completely stripped of the food substance, enters the inner receptacle at the bottom and is discharged at the inner spout, *m′*. The flanges H H′ and I, arranged as indicated, operate plainly to keep the flour and middlings separate from the coarser materials after they leave the screen and brush and insure their delivery to the several appropriate passages, as above indicated.

The details of construction may manifestly be widely varied without departure from my invention.

As a desirable construction for the rigid attachment of the disks D and brushes E, I suggest that said disks be cast with hubs *d*, depending from their lower surfaces, and that said hubs be externally polygonal, as seen in Fig. 3. Screws may be employed to secure the disk-hubs to the shaft. The brushes will be held from turning on the shaft if fitted to the said hubs *d*, and they may be upheld permanently in place by screws *e*, inserted through the disks. The brushes may be of any preferred construc-

tion. As shown in Fig. 3, tufts or bristles e' alternate with groups of flexible metal pins or filaments e^2, but the entire working-surface of the brush may be composed of bristles or otherwise, as preferred. The dress upon the grinding-faces may also be variously constructed for the general purposes of my invention.

In order to give substantially the effect of the corrugations upon rollers having differentiated speed and spirally dressed, as is approved in that class of mills, and also to give a feeding effect greater than that due to gravity alone, I prefer to make the dress furrows or ribs or the corrugations upon the ring F vertical and those upon the disk D downwardly and rearwardly inclined, as indicated in Figs. 5 and 6. This gives a shear action of the corrugations essentially like that of the class of rolls mentioned. A ring, A^4, connecting the lower ends of the uprights A, will serve to hold the latter permanently and rigidly in place, and if without inner arms may be attached before the inner surfaces of said uprights are finished or threaded to receive the movable grinding-rings.

I claim as my invention—

1. The combination, with a central vertical rotating shaft, of a series of peripherally-dressed conical grinding-disks, and a series of circular brushes arranged in alternation with each other upon the shaft, a series of grinding-rings, and a series of screens arranged around and in opposition to said disks and brushes, respectively, means, substantially as described, for keeping apart the substances separated by the screens, and separate discharging-receptacles for the screened and unscreened products, substantially as described.

2. The combination, with a rotating vertical shaft, of a peripherally-dressed grinding-disk secured to the shaft, a grinding-ring opposed to the working-surfaces of the disk, a circular brush secured to the shaft below the disk, a screen surrounding the brush in position to receive the ground product between the brush and screen, an annular partition continuous with the lower margin of the screen for keeping apart the materials separated by the screen, and separate discharging-receptacles for the screened and unscreened products, substantially as described.

3. The combination, with the rotating disk and circular peripheral brush beneath the same, of a movable grinding-ring surrounding the disk, and a screen supported from the grinding-ring in opposition to the brush, substantially as described.

4. The combination, with a vertical rotating shaft, of a series of grinding-disks thereon having dress of unequal fineness, a series of brushes also secured to the shaft, one below each disk, a series of grinding-rings arranged in opposition to the several disks and correspondingly varying in dress, and a series of screens of unequal mesh arranged in opposition to the several brushes, substantially as described.

5. The combination, with the vertical shaft and a series of conical grinding-disks thereon, of a series of conically-apertured opposing rings equal in diameter and composed of parallel annular parts F and F^2, connected by suitable arms, a peripheral screw-thread upon each of said exterior rings, and an outer support or supports provided with an interior corresponding screw-thread to receive the rings, substantially as described.

6. A grinding-mill comprising a vertical rotating shaft, a series of grinding-disks, and a series of circular brushes secured upon said shaft in the relative positions shown, a series of grinding-rings, and a series of screens arranged in opposition to the disks and brushes, respectively, a housing, a bottom provided with a vertical annular flange and a discharge-opening at each side of the flange, a two-part sweep operating on both sides of the flange, and deflecting devices serving to direct the material from within the screen to the inner and the material passed through the screen to the outer space on the bottom, substantially as described.

7. The combination of the upper portion of the frame constructed to rest upon the floor and supporting a series of grinding-rings and screens, a central vertical rotating shaft carrying a series of grinding-disks and brushes and extended below the floor, a driving-pulley on said shaft beneath the floor, and a step constructed to give lateral bearing to the lower end of the shaft and supported by arms connected with the upper frame-work, substantially as described.

In testimony that I claim the foregoing as my own invention I affix my signature in presence of two witnesses.

ADOLPH F. SCHULT.

Witnesses:
W. E. HOWE,
W. F. SCHULT.