(No Model.) 4 Sheets—Sheet 1.

H. F. STONE.

GRINDING MILL.

No. 397,445. Patented Feb. 5, 1889.

Fig. 1.

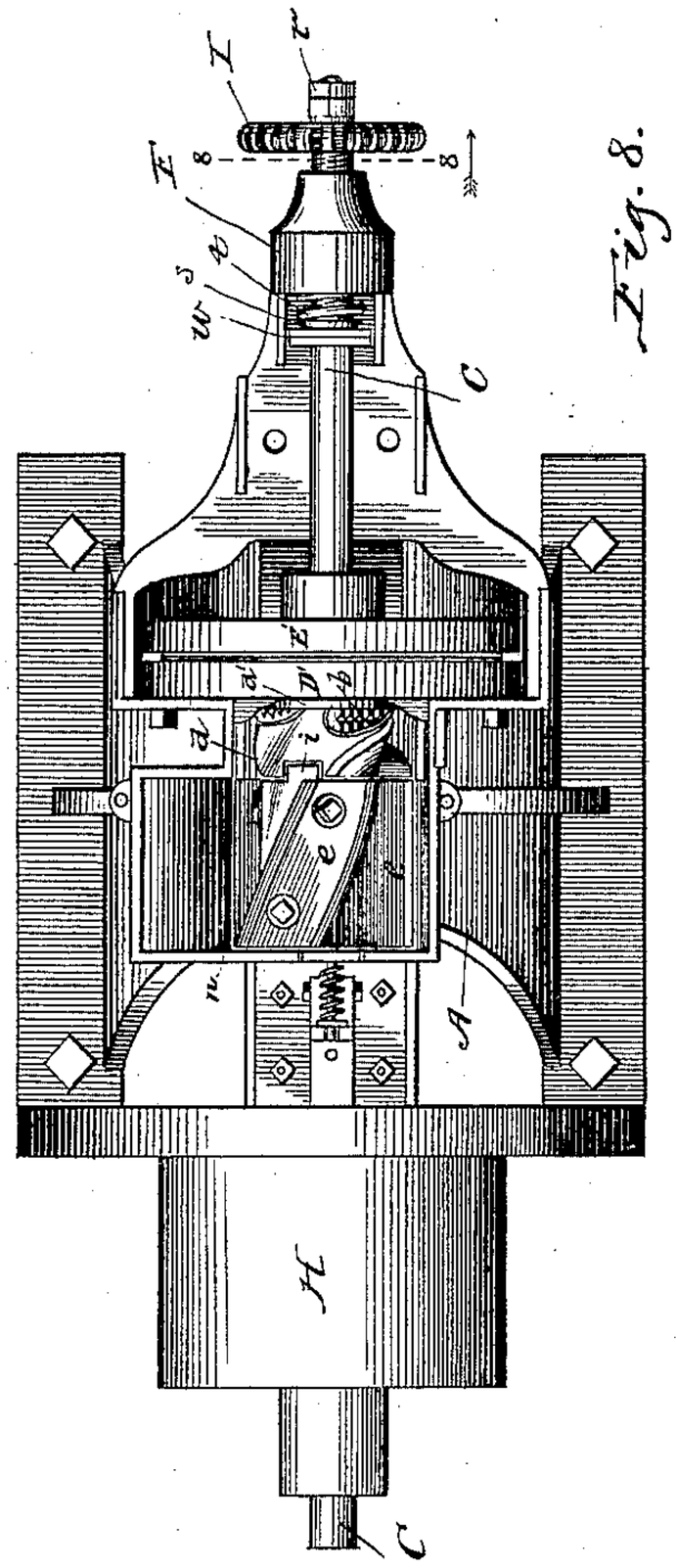


Fig. 8.

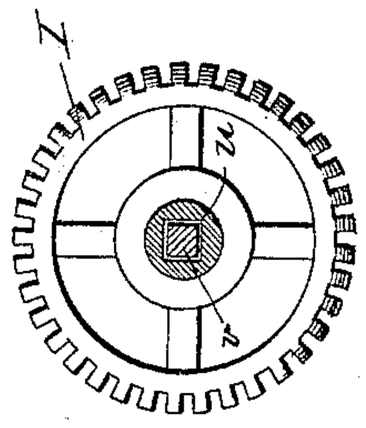
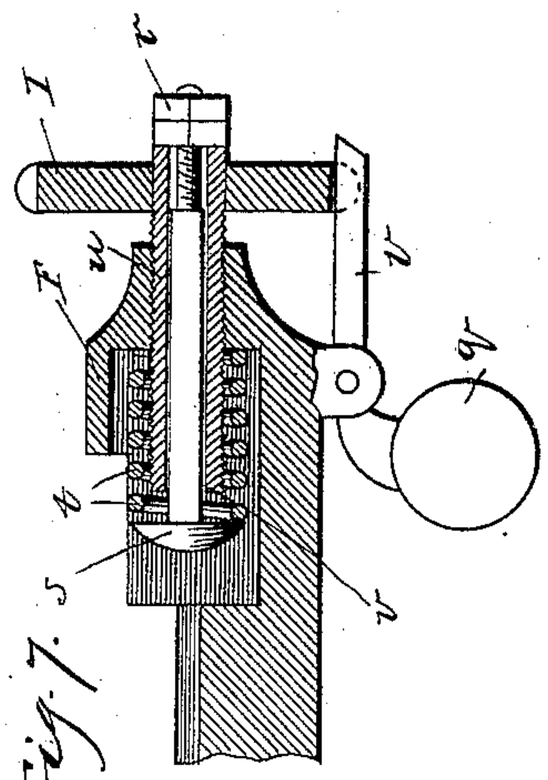


Fig. 7.



Witnesses,
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E. L. Huber

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Attys.

(No Model.)

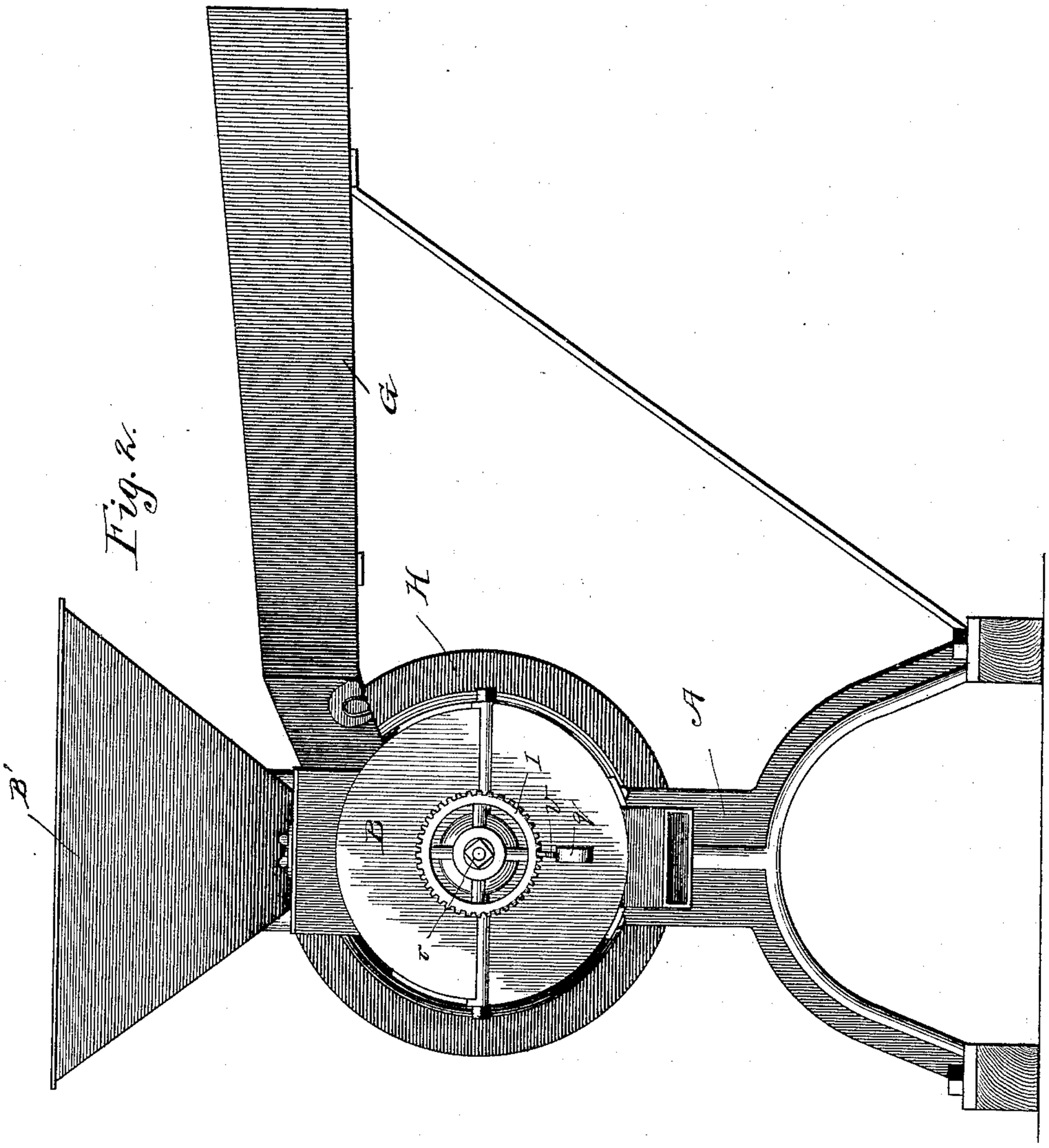
4 Sheets—Sheet 2.

H. F. STONE.

GRINDING MILL.

No. 397,445. Patented Feb. 5, 1889.

Fig. 2.



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(No Model.) 4 Sheets—Sheet 3.

H. F. STONE.

GRINDING MILL.

No. 397,445. Patented Feb. 5, 1889.

Fig. 3.

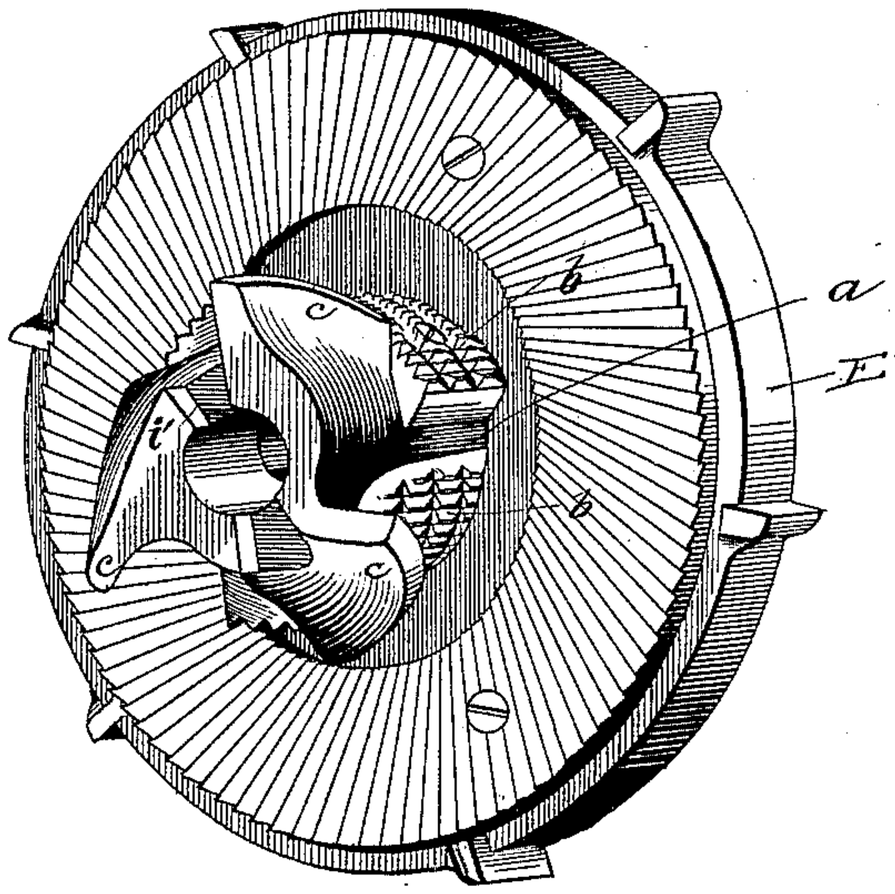
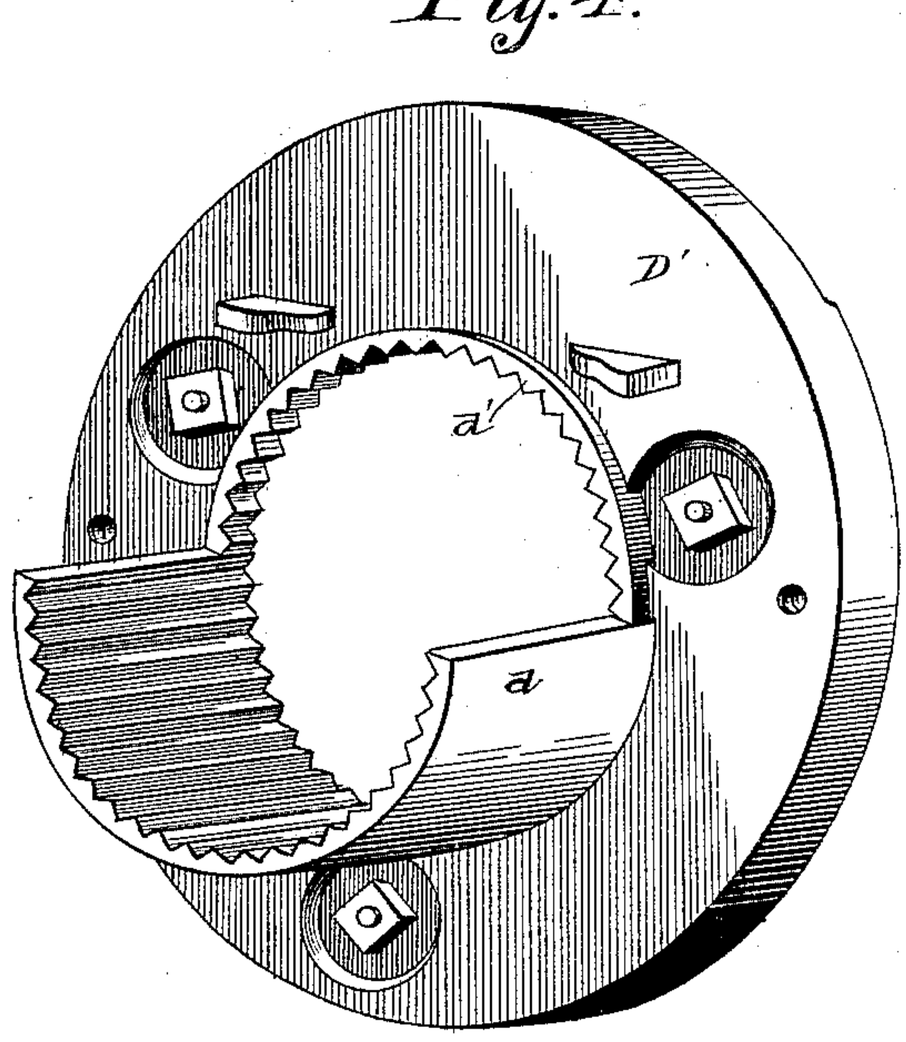


Fig. 4.



Witnesses,
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(No Model.) 4 Sheets—Sheet 4.

H. F. STONE.

GRINDING MILL.

No. 397,445. Patented Feb. 5, 1889.

Fig. 5.

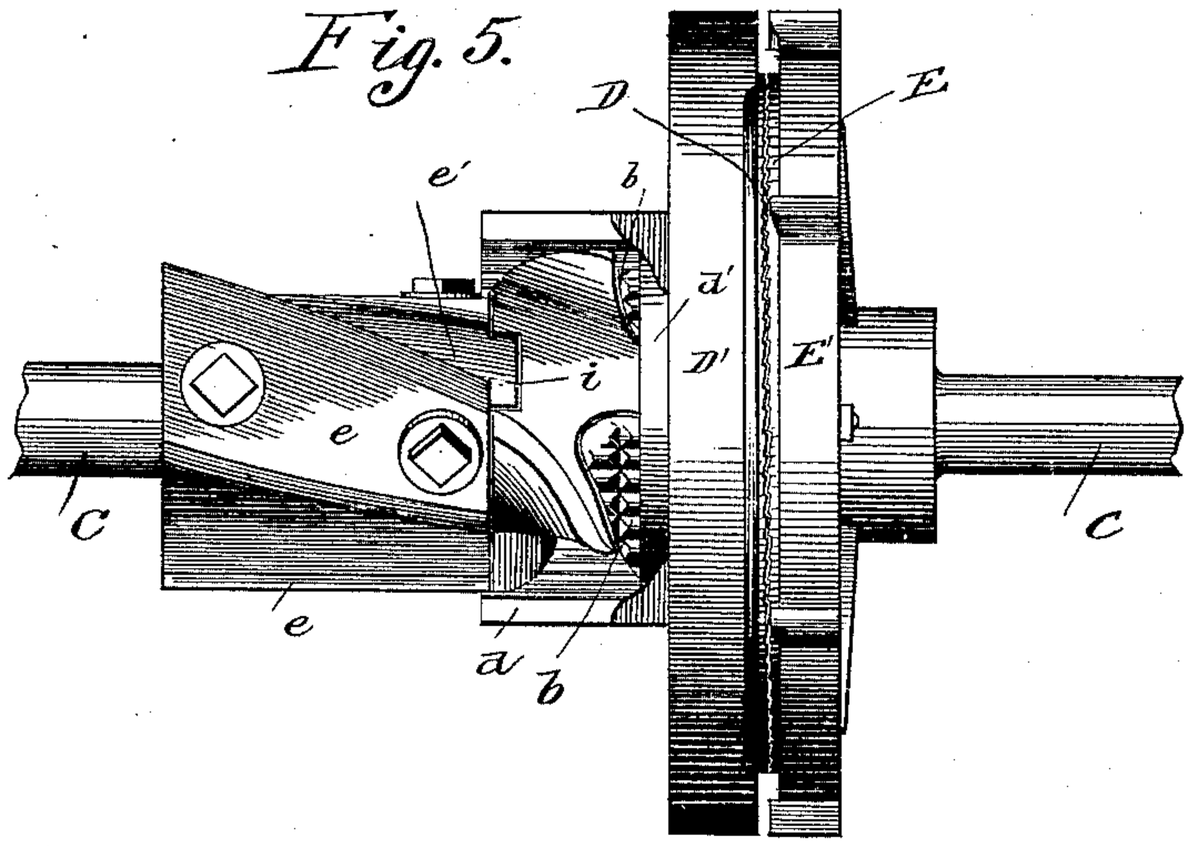
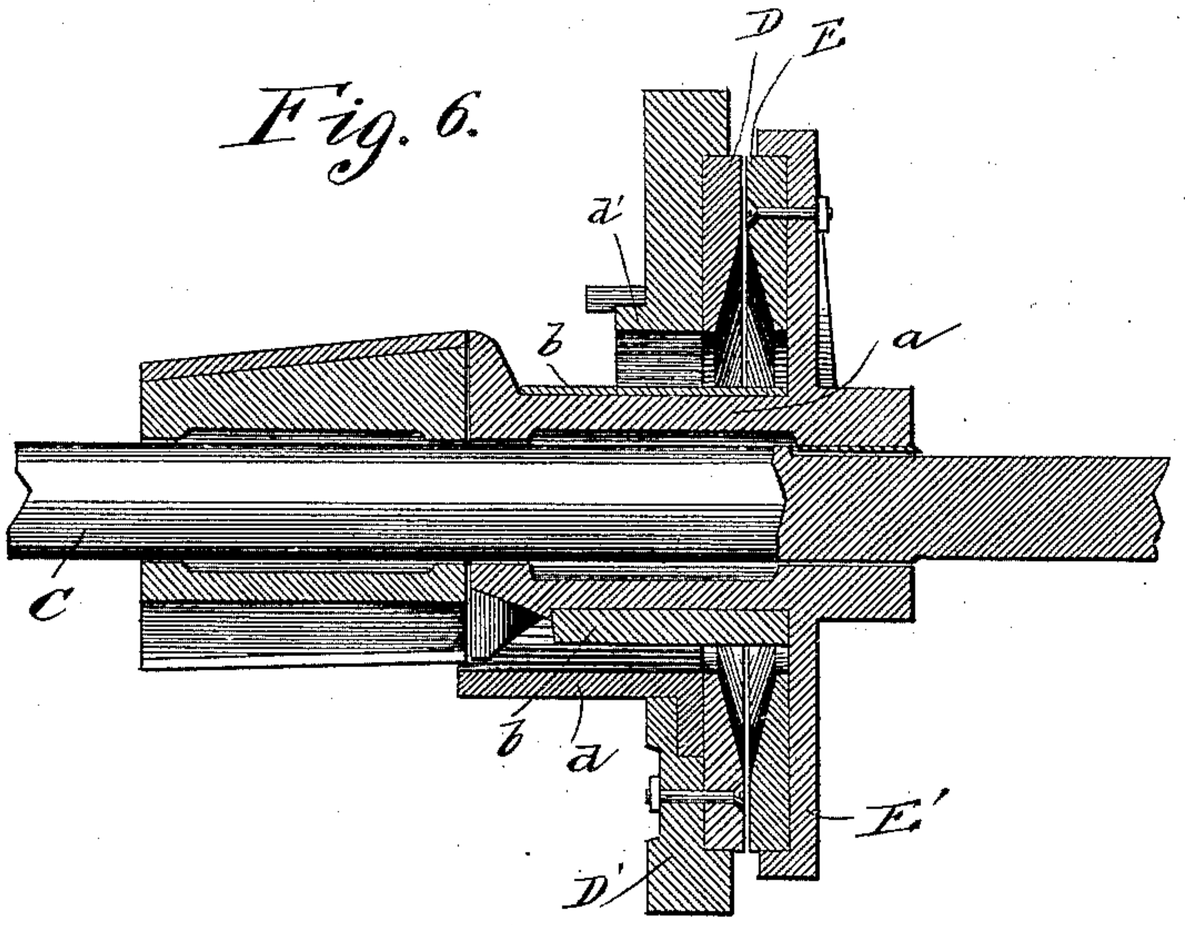


Fig. 6.



Witnesses,
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E. L. Huber.

Inventor,
Herbert H. Stone
By Offield and Soule,
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UNITED STATES PATENT OFFICE.

HERBERT F. STONE, OF APPLETON, WISCONSIN, ASSIGNOR TO THE APPLETON MANUFACTURING COMPANY, OF SAME PLACE.

GRINDING-MILL.

SPECIFICATION forming part of Letters Patent No. 397,445, dated February 5, 1889.

Application filed November 19, 1887. Serial No. 255,658. (No model.)

To all whom it may concern:

Be it known that I, HERBERT F. STONE, a citizen of the United States, residing at Appleton, in the county of Outagamie, in the State of Wisconsin, have invented a certain new and useful Improvement in Grinding-Mills, which I desire to protect by Letters Patent of the United States, and of which the following is a specification.

The object of my invention is to improve in grinding-mills in the first or preparatory reduction of the material before reaching the burrs or grinding-disks. It has been the custom, as a preparatory reduction of the material, (corn in the ear, for example,) to subject it to a cutting or breaking operation only before the final reduction by the burrs or disks. This proves unsatisfactory, as by such means the material is not sufficiently reduced to properly enter the disks.

I have as an important feature of my invention applied intermediate reducing mechanism that fully obviates the difficulty named.

Other features, hereinafter set forth, also enter into my improvements.

In the accompanying drawings, making a part of this specification, Figure 1 is a plan view with some of the upper portions of the mill removed. Fig. 2 is an end elevation. Fig. 3 is a perspective of the revolving grinding-disk. Fig. 4 is a perspective of the stationary grinding-disk. Fig. 5 shows the grinding mechanism in elevation. Fig. 6 is a vertical section centrally through the grinding mechanism with part of the shaft shown in elevation. Figs. 7 and 8 are details of disk-adjusting mechanism.

The general construction of the machine does not differ materially from prior mills. A supporting part, A, casing B for the grinding mechanism, a shaft, C, suitably supported to extend through the eye of the stationary disk D and serve as a bearing for the rotary disk E, may be of usual construction.

The more important improvements involved in this application have their foundation in a hub, *a*, cast in the present example integral with the disk E, or rather the supporting structure E′ of the revolving disk. The hub *a*, as shown in Fig. 6, when the disks or burrs are in position, extends through the eye of the stationary disk. Upon this hub, or this portion thereof, are secured, by screws or otherwise, corrugated or roughened plates *b*. The end of hub *a* has integral therewith flanges *c*, that bear a spiral relation as to position with the axial line of the hub.

A plate, *d*, is secured to the supporting-plate D′ of the stationary grinding-disk. Plate *d* is flanged, the flange being adapted to be secured in the inside of plate D′, against which flange disk D is bolted, whereby said plate is permanently secured. The semicircular plate *d* is designed in horizontal breadth to equal the width of plates *b*, and also to reach, or approximately so, the inner edges of the flanges *c*, and is corrugated or roughened to furnish proper grinding or reducing surface. The corrugated upper semicircular plate, *d′*, is integral with plate D′, and is designed as auxiliary to plate *d*. The proximity of plates *d d′* to plates *b* is such that they may operate conjointly for the reduction of the material. Plates *b*, to facilitate the ingress of feed, are made tapering—that is, they are increased in thickness in the direction opposite to rotation, as indicated in section, Fig. 6. The first stage in the reduction of the material is effected by means of the knives *e*. The latter are bolted or otherwise secured upon a hub portion, *e′*, that has tenon projections adapted to be seated in recesses *i* in the adjacent end of hub *a*, by which rotation of said knives is insured. The outer ends of knives *e* and hub *e′* are in proximity to a wall, *n*, of the mill structure, and thus uncoupling from the recesses *i* is prevented. Shaft C, and consequently the other rotatable parts, has motion imparted to it by means of the pulley H.

It is obvious that the form of the knives may be varied, or other devices may be substituted for the knives in the preliminary operation, the purpose of which is to break, cut, or otherwise reduce the material to fit it for the first grinding.

In Fig. 2 is shown a chute, G, through which the ear-corn or the material unfit for immediate reception by the grinding-disks is introduced to the knives, which, after undergoing reduction by the latter, is, owing to their spiral relation to the axis of motion, carried to the

spiral flanges *c*, and by the latter fed to the grinders *b* and *d d'* as the next stage in the process.

It will be noted that the plates *b* are broader at one end than at the other, their sides being curved or cut to follow the spiral configuration of the curved conveyer-flanges *c;* and hence said plates *b* form a part of the conveyer, and the grinding operation takes place at the same time that the material is being urged forward by the conveyer-flanges. As soon as the material reaches the grinding-plates *b* the reduction commences, and the material is so far reduced before it leaves the plates *b* as to pass readily through the eye of the stationary disk without clogging or choking. This intermediate grinding is essential to the successful operation of this class of machines, as without it the material will choke or clog the eye of the disk and will not pass to the grinding-space between the disks. The material is then in position to be operated upon by the grinding-disks and the operation of reduction thus completed.

I do not claim the knife accessories, as such appliances are not new in connection with feed-mills.

The shaft C, upon which all the rotatable parts are supported, is adjusted longitudinally by means of a hand-wheel, I, the auxiliary mechanism being shown in Figs. 7 and 8. A suitable box, F, is formed at the end or extension of the structure contiguous to the end of shaft C, having a screw-threaded bore at its outer end into which is inserted a threaded sleeve, *u*, upon the end of which the hand-wheel I is mounted. Within box F, surrounding sleeve *u*, is placed a spiral spring, *t*. Sleeve *u* has an angular bore, as shown in Fig. 8, into which extends a shaft, *v*, corresponding in cross-section to the bore of the sleeve to insure turning of the latter, but sufficiently loose to admit of longitudinal movement.

On the projecting end of shaft *v* is a head, *s*, that bears against a follower, *w*, which in turn has a bearing against the end of shaft C. The inner end of spring *t* bears against head *s*, and its outer end against the end wall of the recess of box F. The immediate force or pressure against shaft C is derived from the interposed spring *t*.

Sleeve *u*, by means of hand-wheel I, may be adjusted so that any desired distance between head *s* and the adjacent end of the sleeve may be obtained. This distance is the amount of longitudinal play allowed to shaft C under the yielding pressure of spring *t*, and consequently limits the distance through which the grinding-disks may separate. The spring-pressure is designed to be sufficient to keep the disks in proper relation to each other under normal conditions of grinding; but in the event of accidental admission of refractory material a yielding is admitted between the head *s* and end of the sleeve aforesaid. To prevent shaft *v* from being forced out of its seat in the sleeve by the action of the spring in the event of detaching the parts, said shaft is reduced and screw-threaded at its outer end and nuts *r* applied, which latter abut against the end of the sleeve.

The periphery of wheel I is notched, as a part of the provision for preventing its accidental movement, and beneath to the structure is pivoted a lever, V, adapted to engage with the notches at one end, and so weighted at its opposite end, *q*, that gravitation will serve to hold the other end in contact with the wheel.

Hopper B over the grinding-disks is designed for use when preparatory reduction of the material is unnecessary.

I do not design that my improvement with relation to grinding shall be limited to the specific devices shown for the intermediate part of the operation, as modifications may be substituted without departing from the invention.

Having described my invention, what I claim, and desire to protect by Letters Patent, is—

In grinding-mills, the combination of disks D and E, rotatable hub *a*, provided with plates *b*, stationary plates *d d'*, conveyer-flanges *c*, and knives *e*, all arranged to operate substantially in the manner set forth.

HERBERT F. STONE. [L. S.]

In presence of—
A. B. WHITMAN,
W. W. BRIGGS.