(No Model.) 3 Sheets—Sheet 1.

A. W. STRAUB.

GRINDING MILL.

No. 512,846. Patented Jan. 16, 1894.

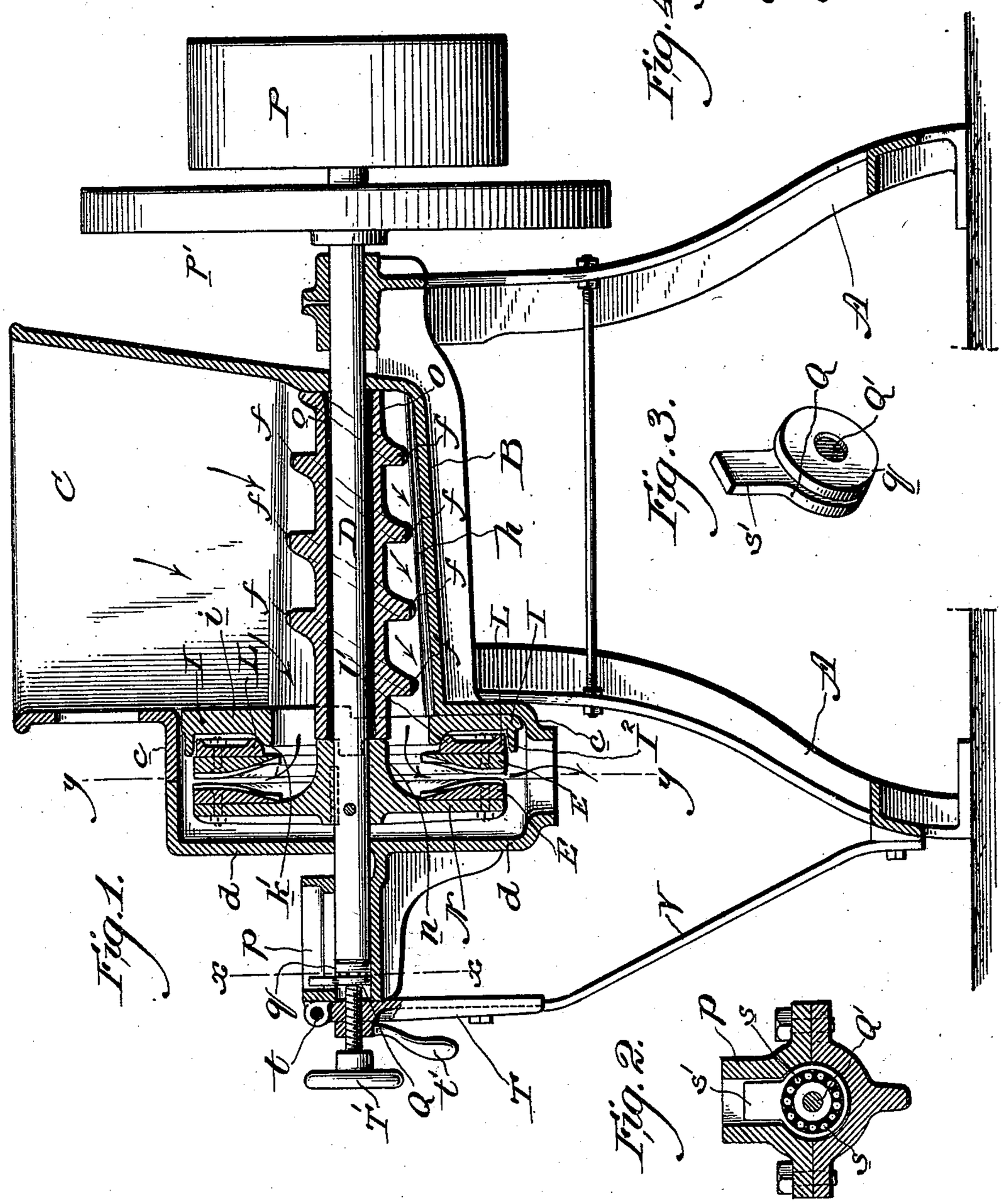

Fig. 1.

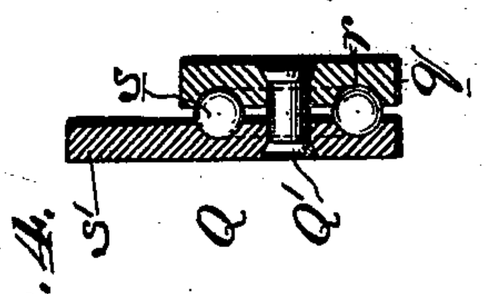

Fig. 4.

Fig. 3.

Fig. 2.

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Fig. 5.

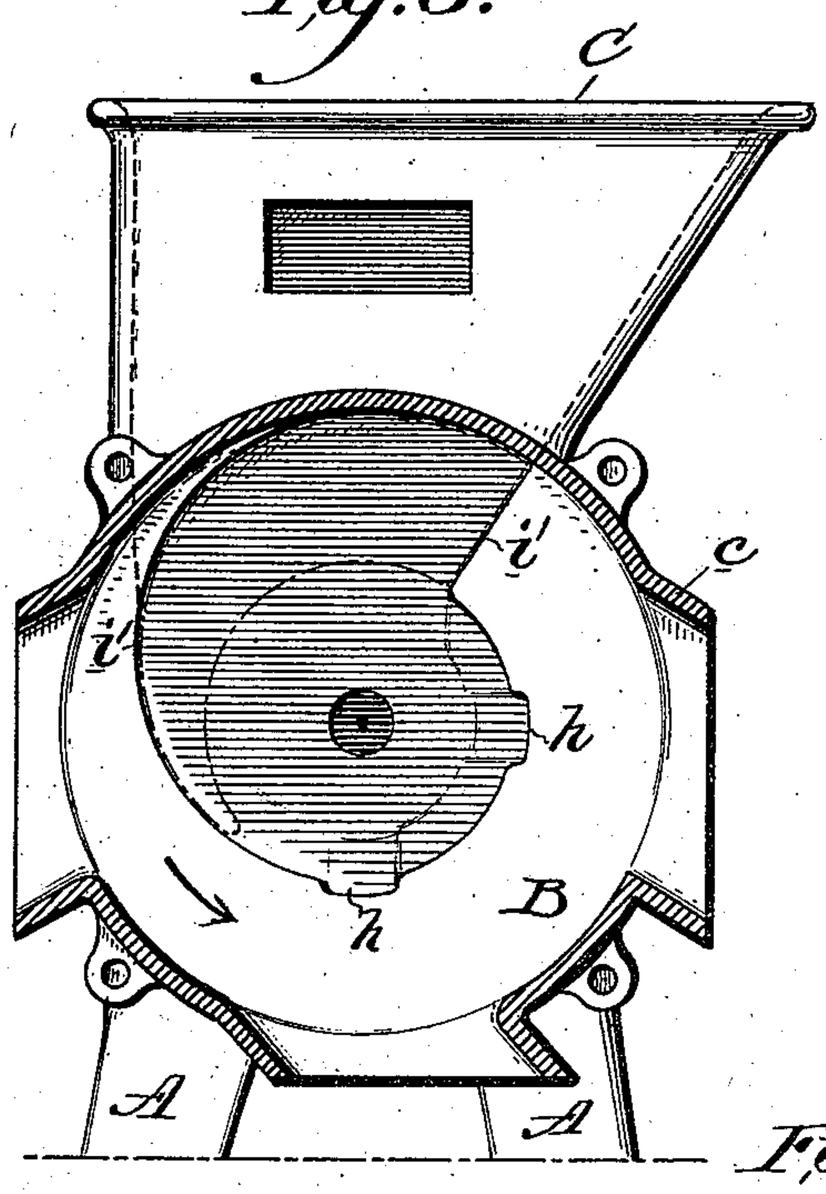

Fig. 6.

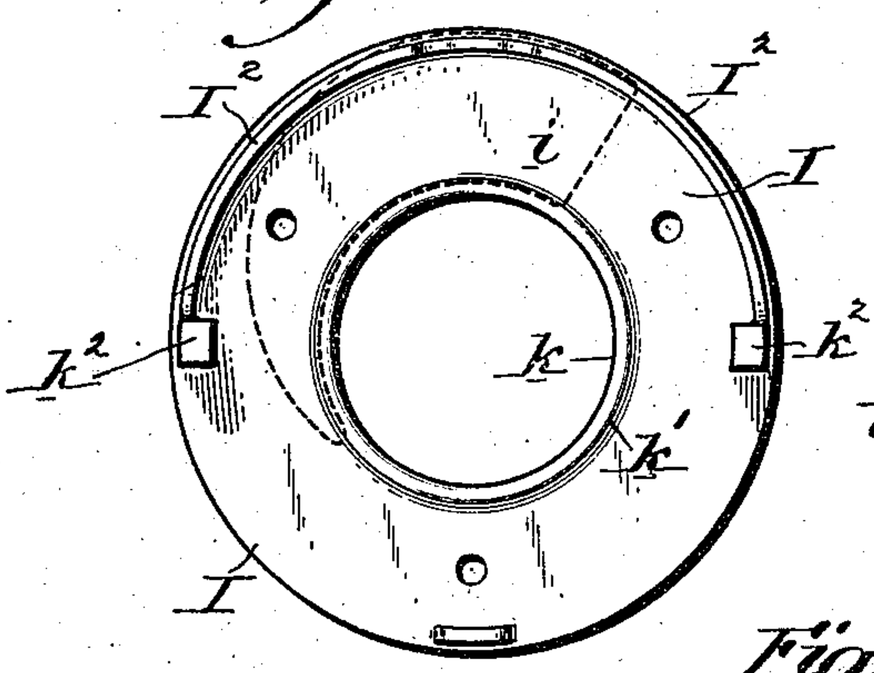

Fig. 7.

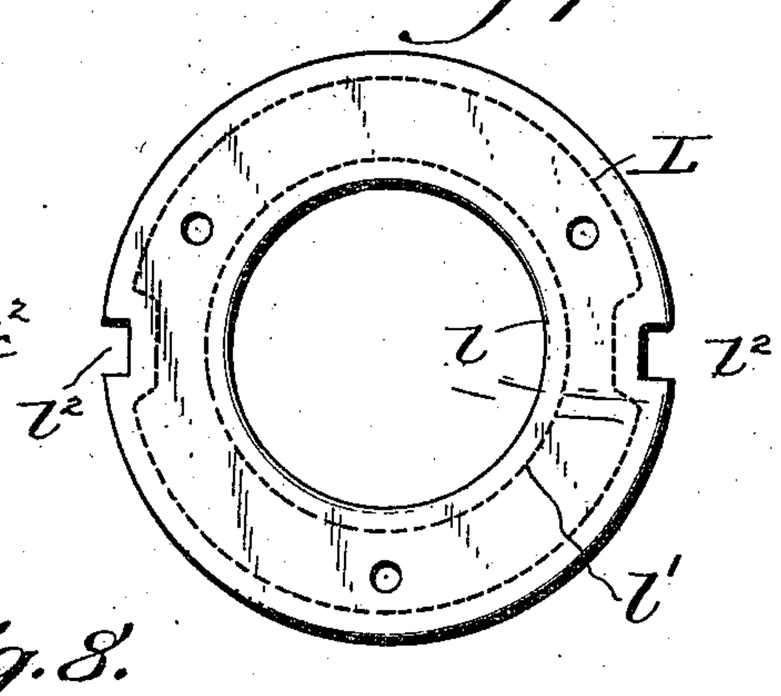

Fig. 8.

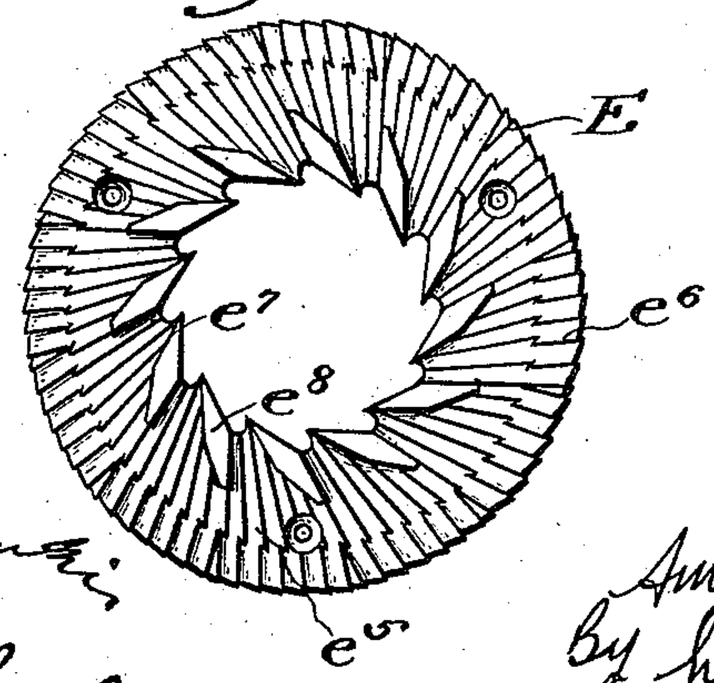

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Fig. 9.

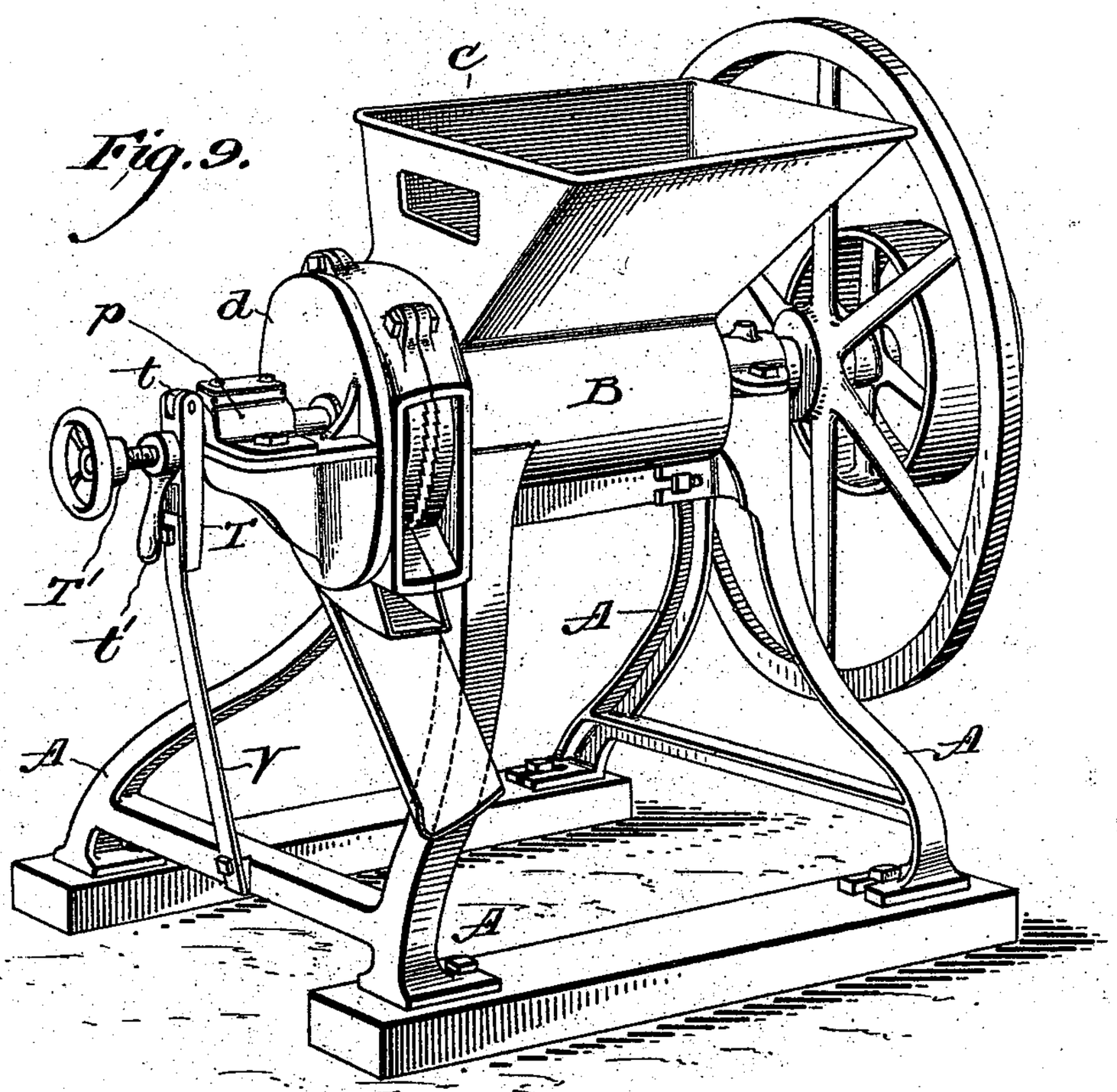


Fig. 10.

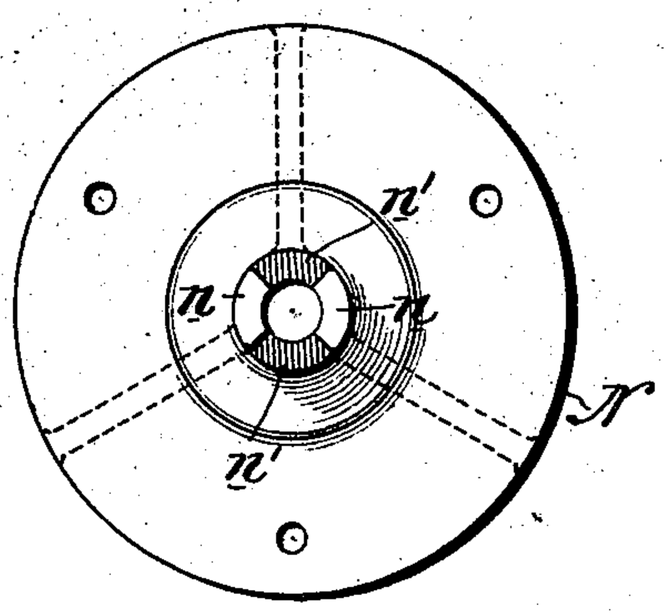


Fig. 11.

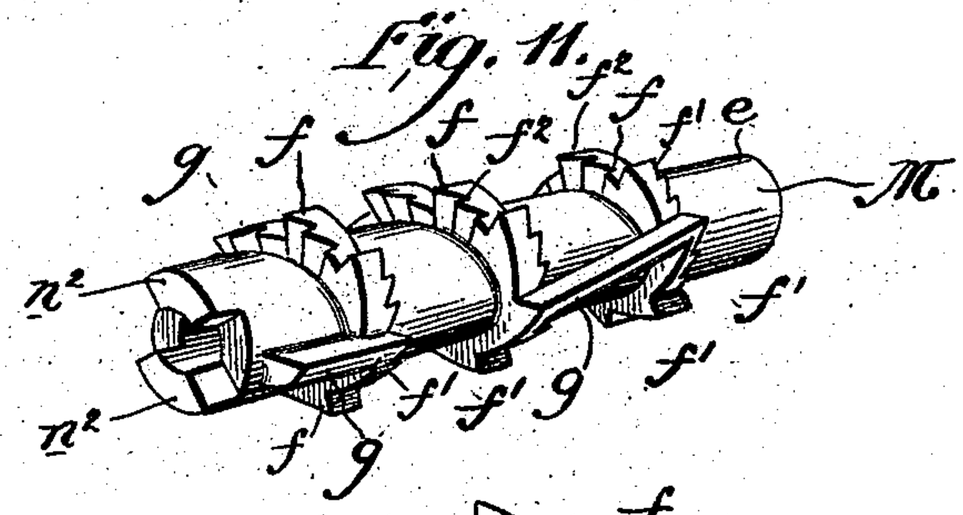
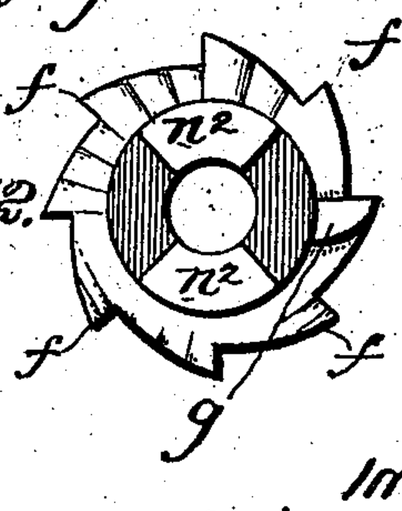


Fig. 12.



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UNITED STATES PATENT OFFICE.

AMBROSE W. STRAUB, OF PHILADELPHIA, PENNSYLVANIA.

GRINDING-MILL.

SPECIFICATION forming part of Letters Patent No. 512,846, dated January 16, 1894.

Application filed November 4, 1892. Serial No. 450,937. (No model.)

To all whom it may concern:

Be it known that I, AMBROSE W. STRAUB, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Grinding-Mills, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention has particular reference to grinding mills of the type shown in the Letters Patent which were granted to me on June 27, 1882, No. 260,062, and July 14, 1885, No. 322,400, and has for its objects the improvement of the construction of various parts of the machine with a view to simplicity and economy and the production of a mill which will act more efficiently in the reduction of the various substances upon which it is required to operate. These objects I accomplish by the use of the mechanism illustrated in the accompanying drawings and the invention consists in certain novel features of the same which will be hereinafter described and claimed.

In the drawings referred to, Figure 1 is a longitudinal section of a mill constructed in accordance with my invention. Fig. 2 is a transverse section on the line *x*—*x* of Fig. 1. Figs. 3 and 4 are detail views of the bearing for the end of the shaft showing the same in perspective and vertical section respectively. Fig. 5 is a transverse section on the line *y*—*y* of Fig. 1. Fig. 6 is an elevation of the tramming ring seat. Fig. 7 is an elevation of the rocker disk or tramming ring. Fig. 8 is an elevation of the grinding disk. Fig. 9 is a perspective view of the mill. Fig. 10 is an elevation of the disk which carries the rotating grinding ring and Figs. 11 and 12 are detail views of the breaking drum with the drunken saws thereon.

Referring particularly to the drawings by letter, A designates the supporting legs, forming a frame which may, if desired, be cast integral with a casing B and the hopper C. At one end of the casing and hopper is an annular flange *c* which together with a covering cap *d* forms a circular chamber in which the grinding disks or rings are arranged.

Upon reference to Fig. 5 it will be noticed that the casing B is partly circular in form so as to partially surround the breaking drum which is indicated in dotted lines and is expanded on one side to merge into the vertical rear face of the hopper, thus leaving a gradually narrowing space between the drum and side of the casing in which the material is crowded and reduced. The front side of the hopper is inclined as shown in said figure so as to throw the material over toward the gradually narrowing space and prevent it from being lifted by the teeth of the drum saws on their upward movement. The rear side of the hopper is perpendicular to prevent cob bridging.

The driving shaft D extends longitudinally through the casing and is mounted in a suitable bearing upon one of the legs A and in a journal-box *p* formed on the outer face of the cap *d*, the free end of the driving shaft being provided with a band-pulley P by which motion is imparted to said shaft and a fly-wheel P′ to cause said motion to be steady and even. Within the casing the driving shaft carries a breaking drum M which is provided with a series of saws *f* which extend the entire length of the drum and have the teeth f' f^2 formed in alternate series on their front and rear faces, thereby providing a series of drunken saws the entire length of said drum. At various points of the drum the drunken saws are connected by longitudinally disposed ribs *g* which coact with longitudinal recesses or grooves *h* in the casing to break the material fed into the machine into fine pieces which may be more conveniently acted upon by the grinding disks or rings. It will be noticed that the drunken saws make a shear cut on the material as it lodges in the space between the drum and the side of the casing and thus break the same into small pieces while the teeth on the front and rear faces of the saws will further act on the same to break it into fine particles, the ribs *g* completing the work thus inaugurated by the said teeth.

In order to reduce the shocks on the breaking drum and to deaden the noise of the breaking action between the same and the interior of the casing, I arrange between the said drum and the driving shaft a collar *o* of lead or other similar material which also aids in holding the said drum to the driving shaft.

At the end of the casing and within the flange *c*, I arrange a tramming ring seat or disk I which is provided on its rear face with a projection *i* adapted to fit within a similarly shaped opening *i'* so that the disk or ring is prevented from turning. The central opening or eye of the tramming ring seat or disk is equal in diameter to the outlet opening in the casing B so that the broken material may readily pass through the said ring to the grinding disks, and the said eye or central opening *k* is surrounded by an annular convex rib *k'* as shown most clearly in Fig. 1. A rocker or tramming disk L fits within the recessed face of the tramming ring seat and is provided with a central opening or eye *l* and an annular rib *l'* which has a circular face resting against the rib *k'* to permit the disk L to rock when necessary so as to tram to the running disk and allow a foreign substance to pass out. The rocker disk is prevented from rotating by means of the recesses l^2 in its periphery which engage the lugs k^2 on the tramming ring seat or disk while the said tramming ring seat or disk is provided with a flange I^2 to prevent the entrance behind the tramming or rocker disks of any of the material upon which the mill may be acting.

The stationary grinding disk or ring E is secured to the rocker disk or ring, as clearly shown in Fig. 1, and its face presents the peculiar dress illustrated in Fig. 8. The disks are provided with a central opening or eye to permit the passage of the material to be ground and around said eye are provided with a series of teeth e^7 to cut up the severed parts of cobs of corn into still finer particles, and a series of conveyer-flights e^8 placed tangentially to the eye of the disk so that the material fed to the disk is conveyed or caused to move across the face of the disk. The disk is further provided with a series of furrows e^5 which are arranged somewhat tangentially to the eye and have their cutting edges in front while beyond the said furrows e^5 are arranged the more nearly radial furrows e^6 which have their sharp edges in the rear so that their front faces are inclined and form crushing sides. The two grinding disks are of the same construction and the result of this peculiar dress is that when the disks are in operation the material is first cut up by the teeth e^7 and then moved over the faces of the disks by the flights e^8. The material is thus forced over the furrows e^5 by which it is cut into finer particles and afterward moved over the furrows e^6 where it is crushed, rolled or mashed so as to be reduced to flour that is not standard to the touch but is soft and mellow.

The running grinding disk is secured to a disk N which is mounted on the driving shaft and is secured thereto so as to be rotated by means of a suitable key. The hub *n* of said disk is provided with recesses *n'* which are engaged by projections n^2 which are formed on the end of the breaking drum so that the said drum will be rotated with the said disk N.

The grinding disks employed by me have been found to produce the best possible grinding action but also create considerable friction and thus give a very strong end thrust to the driving shaft and in order to overcome, as far as possible, the said end thrust I provide an anti-friction bearing at the end of the shaft which is fully shown in Figs. 1, 2, 3 and 4. It will be noticed that the end of the driving shaft enters a journal-box *p* which is formed on the cap *d* and there bears against a disk *q*, the rear face of which is provided with an annular groove *r*. In rear of the disk *q* is a disk Q which also has an annular groove registering with the annular groove *r* and is further provided with a projection *s'* which enters the narrow, upper portion of the journal-box *p*, as shown in Fig. 2. The two disks are held together by a central pivot pin Q' and are separated by the series of balls *s* arranged within the annular grooves in the adjacent faces thereof which form an anti-friction bearing to reduce and relieve the friction due to the end thrust of the driving shaft. The said balls are preferably of alternately large and small diameters so that the intermediate balls may reverse and turn in opposite directions. The upper portion of the journal box *p* is sufficiently long to permit the longitudinal adjustment of the driving shaft which adjustment is provided for by means of a lever or arm T which is pivoted to a lug *t* on the end of the journal-box and through which passes a set screw T' which bears against the disk Q and is provided with a lock-nut *t'*. In order that the driving shaft may have a longitudinal movement when any hard substance finds its way to the grinding rings I provide the spring V one end of which is secured to the lower end of the arm or lever T and the opposite end of which is secured to the base or some other fixed portion of the machine.

No provision for keeping the disks separate when the mill is running empty is necessary, as the furrows and ridges at the outer edges of the disks are flat so as to pass each other without clashing or becoming dull.

In practice, the material to be acted on which is usually corn-cobs and shell corn is placed in the hopper and motion imparted to the driving shaft. The material in the hopper will rest upon the breaking drum and in the space between the same and the side of the casing so that as the said drum revolves the material will be broken up and cut into fine particles and fed toward the grinding rings or disks. The material is then thoroughly reduced by the grinding rings or disks and then passes through any of the discharge openings into suitable receptacles. It will be noticed that by the peculiar formation of the casing and hopper clogging of the breaking drum is prevented as the inclined side of the hopper causes the material to slide over the

drum and into the space between the same and the casing so that it is impossible for the corn-cobs to become lodged over the drum and form a bridge to prevent the material in the hopper passing to the drum owing to the opposite side of the hopper being perpendicular.

By providing the teeth f' f^2 alternately on opposite sides of the saw f, I insure the cutting away of both ends of the small sections into which the corn cobs are cut by the outer edge teeth of the saw and at the same time I do not unnecessarily reduce the material in the saw and impair the strength of the same.

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

1. A breaking drum for grinding mills consisting of a central sleeve having a helical saw provided on its opposite faces with alternating series of teeth.

2. In a grinding mill, the combination of the casing having longitudinal grooves, a drum arranged in said casing and provided with a helical saw having alternate series of teeth on its opposite facings, and longitudinal breaking ribs connecting adjacent coils of said saw.

3. The combination of the casing having an annular flange and a recess in its end, a tramming ring seat fitting within the flange and having a projection on its rear side engaging the recess, a tramming ring fitted on said seat, a grinding disk secured to said ring, a running grinding disk, and a driving shaft.

4. The combination of the casing, the tramming ring seat secured to the end of the same and having the annular shield I^2 and the annular convex rib k', and the tramming ring seat fitting within the shield I^2 and having a convex rib l' engaging the rib k'.

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

AMBROSE W. STRAUB.

Witnesses:
ALEX. D. LAUER,
WALTER W. CALMORE.