(No Model.)

4 Sheets—Sheet 1.

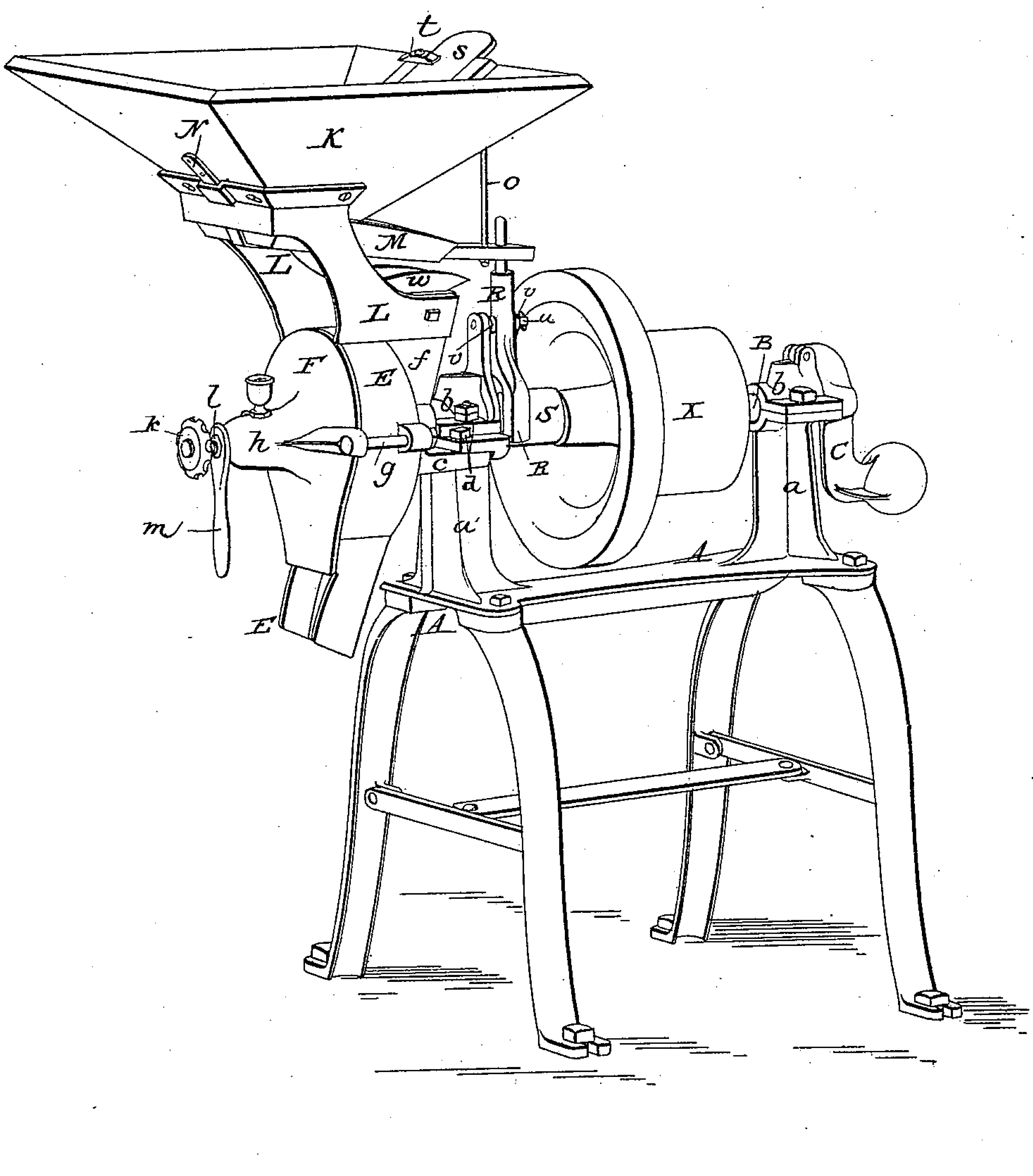
M. J. ALTHOUSE.

GRINDING MILL.

No. 421,063.

Patented Feb. 11, 1890.

Fig. 1.



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(No Model.)

4 Sheets—Sheet 2.

M. J. ALTHOUSE.

GRINDING MILL.

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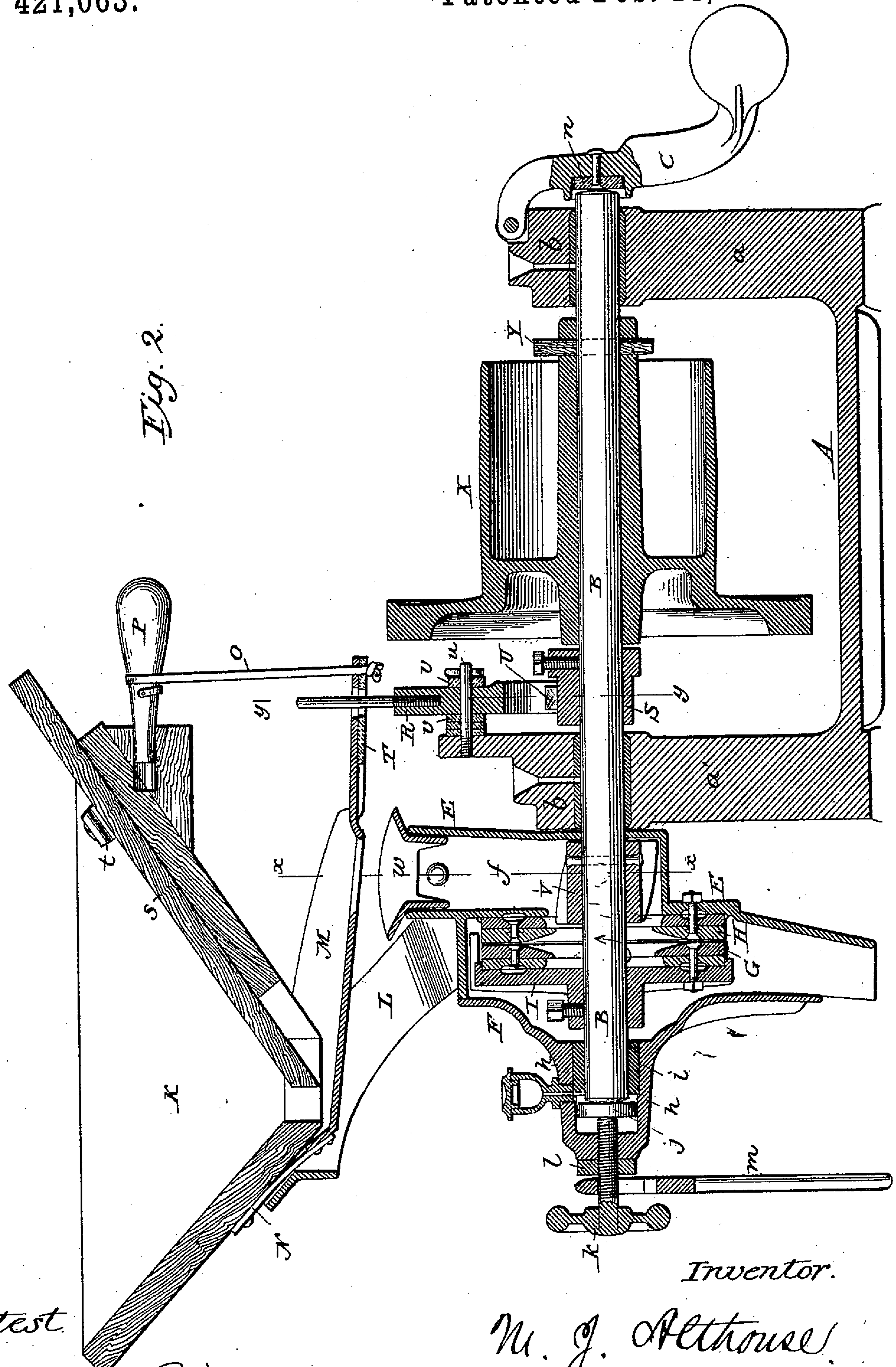
Fig. 2.



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M. J. ALTHOUSE.

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Fig. 3.

ON LINE X—X

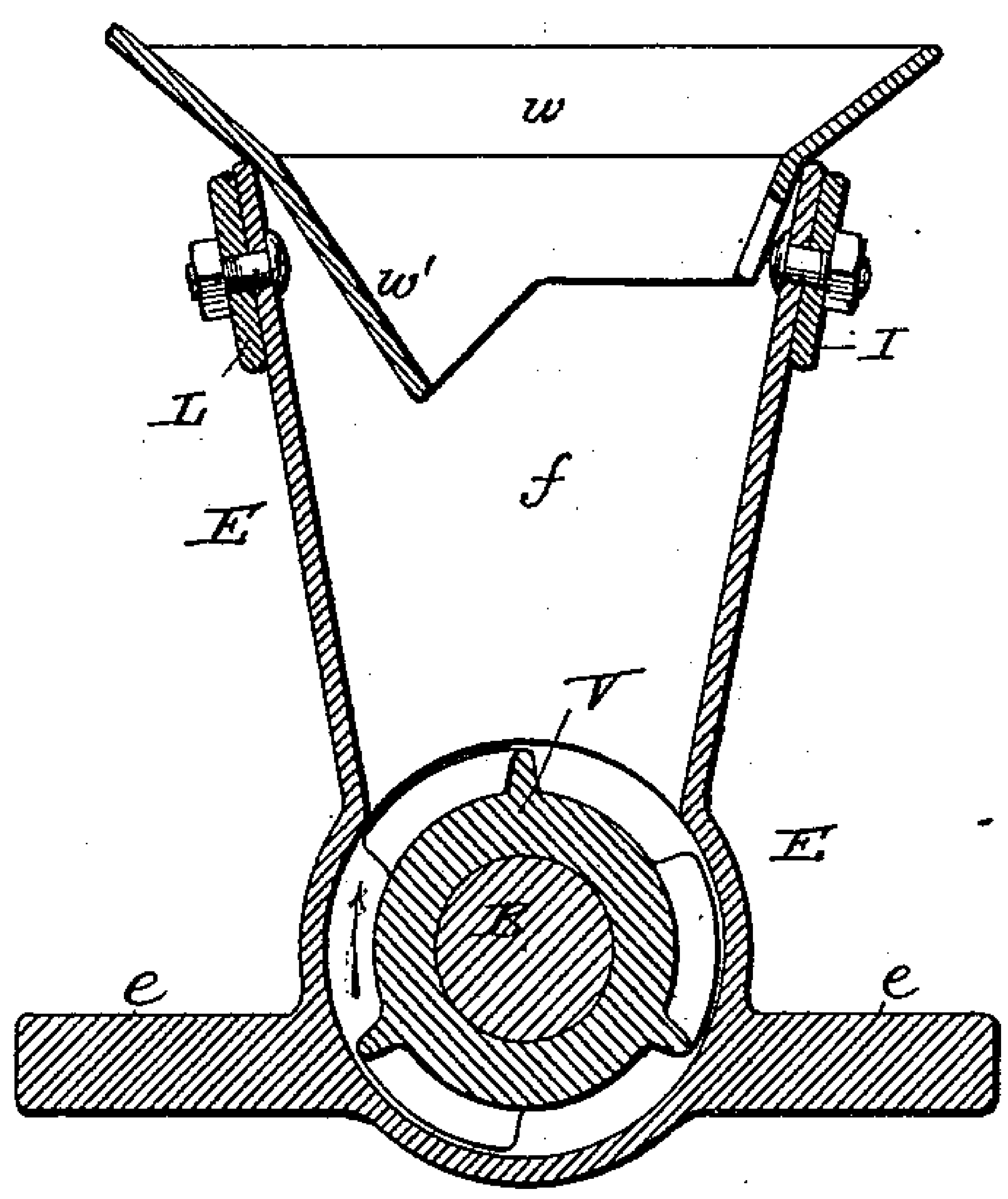
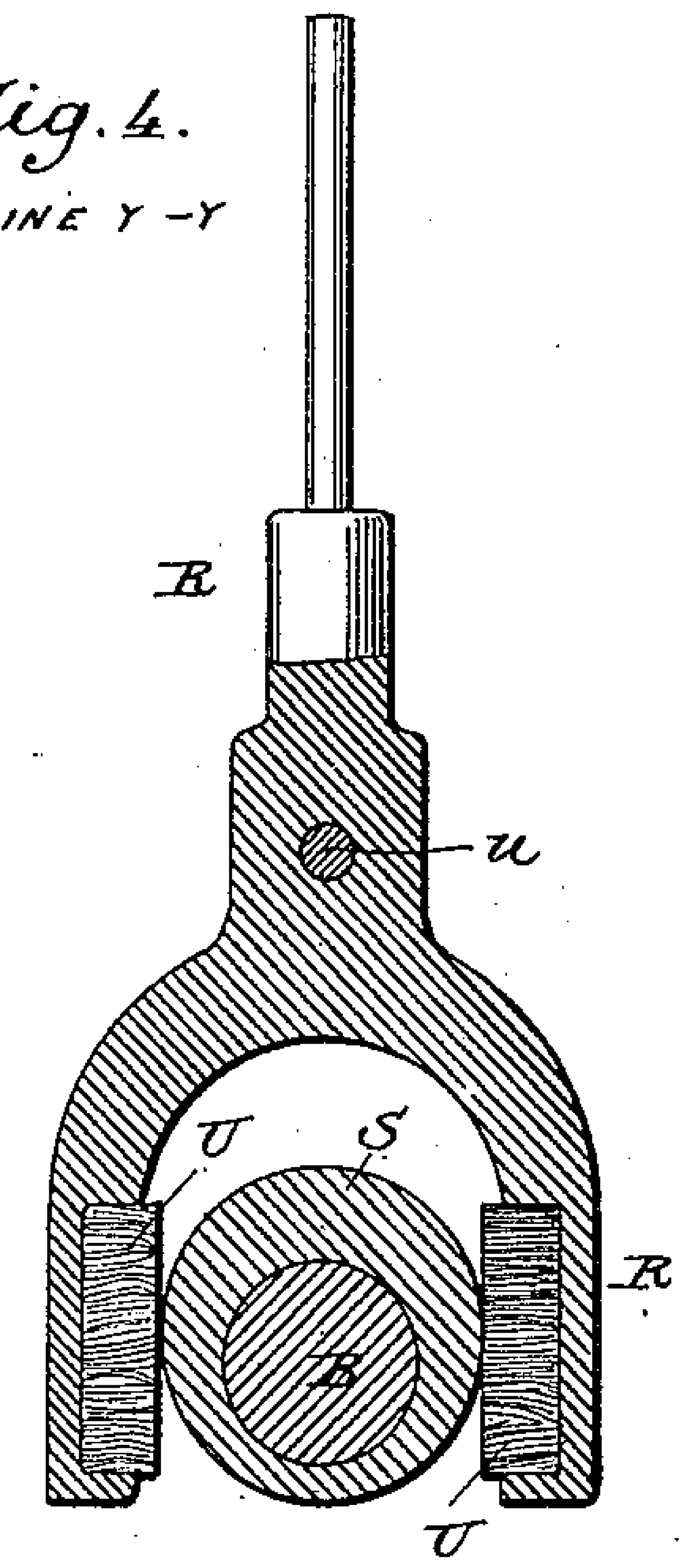


Fig. 4.

ON LINE Y—Y



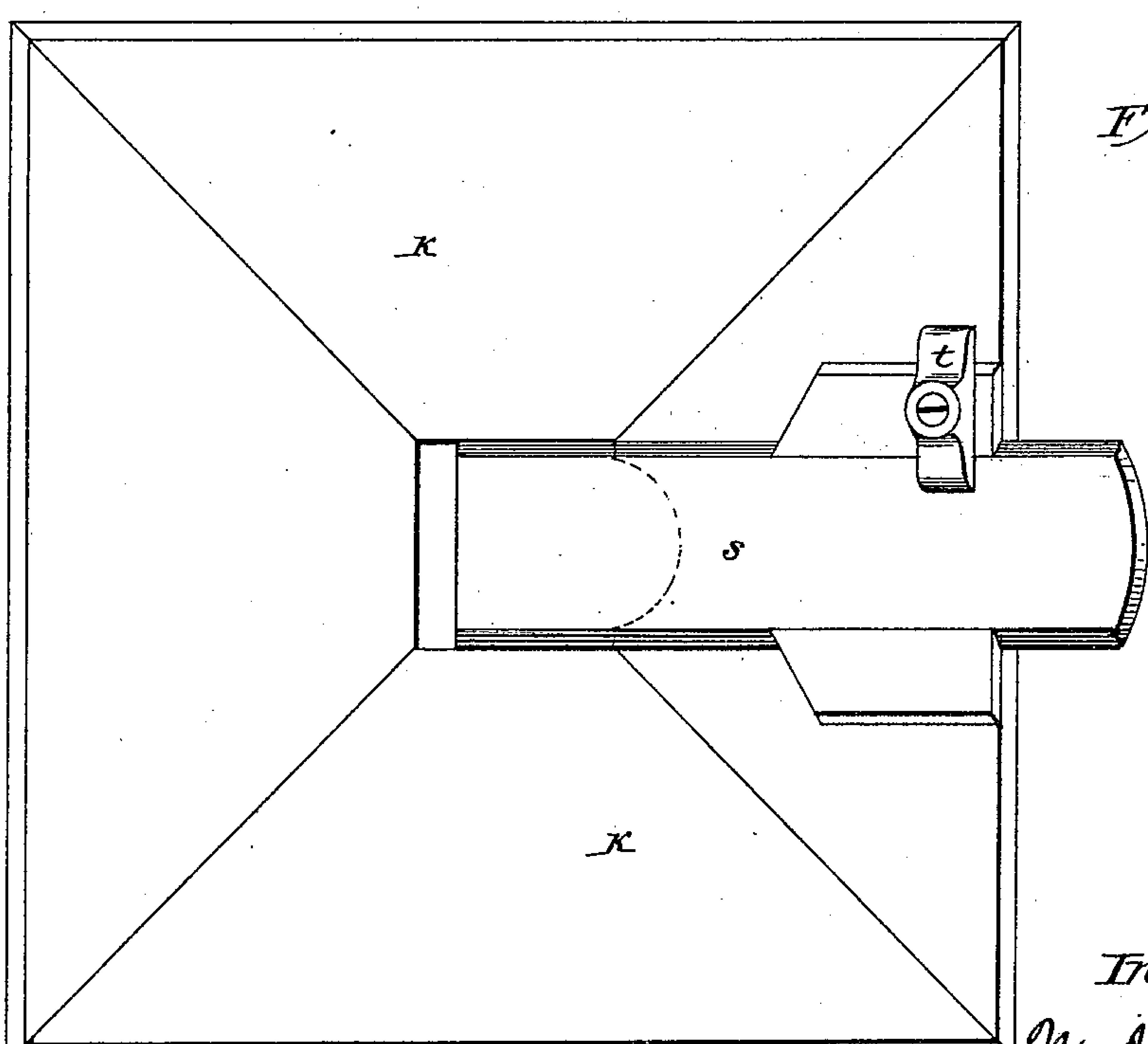


Fig. 5.

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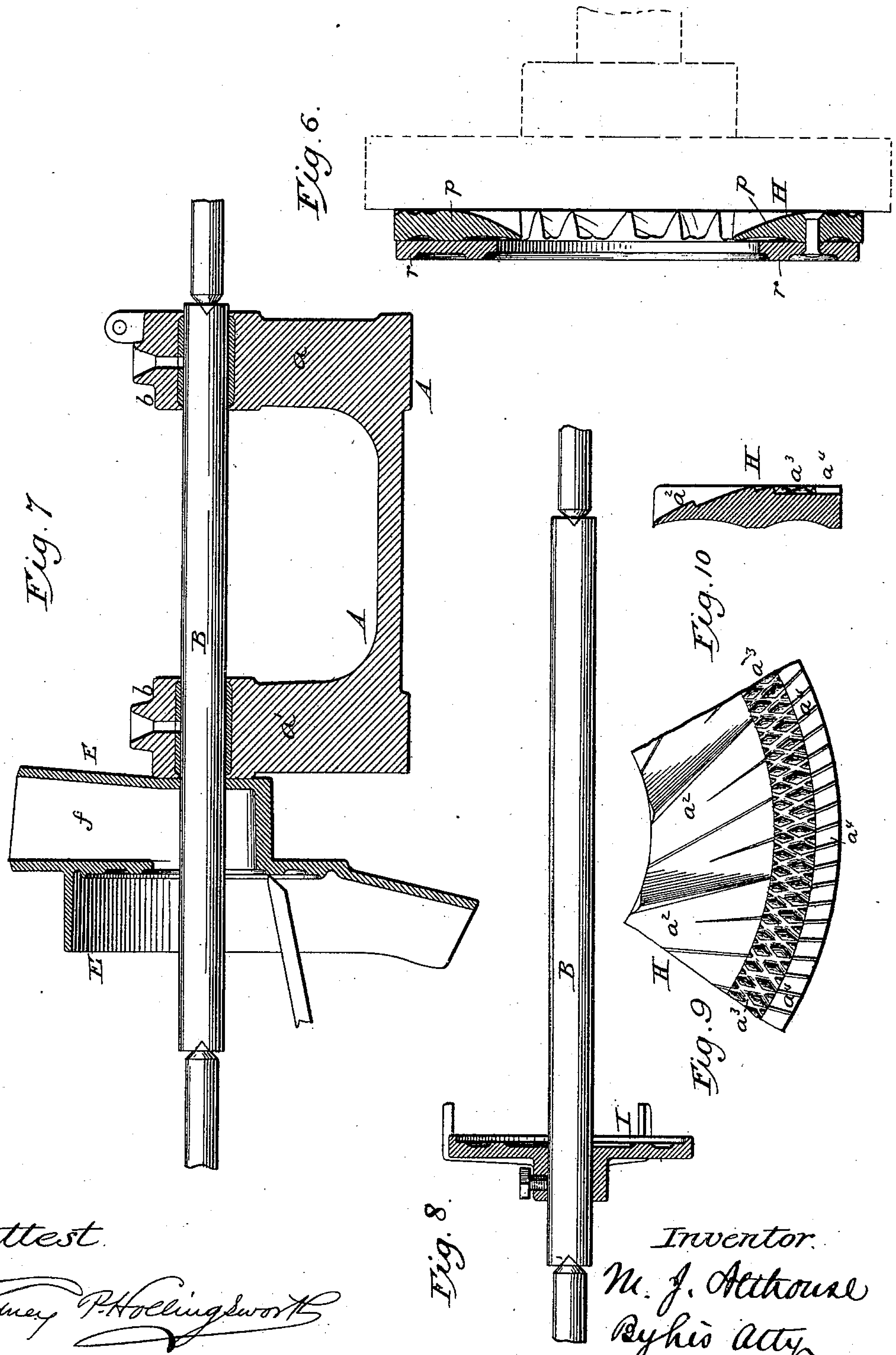
4 Sheets—Sheet 4.

M. J. ALTHOUSE.

GRINDING MILL.

No. 421,063.

Patented Feb. 11, 1890.



Attest.

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UNITED STATES PATENT OFFICE.

MILO J. ALTHOUSE, OF WAUPUN, WISCONSIN.

GRINDING-MILL.

SPECIFICATION forming part of Letters Patent No. 421,063, dated February 11, 1890.

Application filed June 11, 1886. Serial No. 204,841. (No model.)

To all whom it may concern:

Be it known that I, MILO J. ALTHOUSE, of Waupun, in the county of Fond du Lac and State of Wisconsin, have invented certain Improvements in Grinding-Mills, of which the following is a specification.

My invention relates more particularly to that class of portable mills in which vertical metallic grinding-disks are employed; and it consists in various features of construction, hereinafter specifically described and claimed, having reference to the means for adjusting the distance between the grinding-surfaces, for securing and maintaining parallelism of the grinding-disks, for supporting the feed-hopper, for operating the feed-shoe, and for controlling the feed-gate.

In the accompanying drawings, Figure 1 represents a perspective view of my complete mill. Fig. 2 is a vertical axial section of the same. Fig. 3 is a vertical cross-section on the line *x x* of Fig. 2. Fig. 4 is a vertical cross-section on the line *y y* of Fig. 2. Fig. 5 is a top plan view of the feed-hopper and its gate. Figs. 6, 7, and 8 are sectional views illustrating the manner of constructing the grinding-disks and their supports. Fig. 9 is a face view of a portion of the disks. Fig. 10 is a cross-section of a portion of the disks, showing the dress thereon.

Referring to the drawings, A represents a cast-metal frame or bed-plate, having at its opposite ends two standards *a a'*, provided at the top with bearings and cap-boxes *b*, which receive and sustain opposite ends of a horizontal shaft B, which overhangs the bearings at both ends. The forward standard *a'* has at its top lateral ears or flanges *c*. To these flanges are firmly secured by vertical bolts *d* ears *e*, formed on the rear face of the casing E. This casing, which is designed to receive and inclose the grinding-disks, is cast complete with a marginal flange, a back plate, and a feed-throat *f*, the latter fashioned at its bottom to receive the feed-screw, hereinafter referred to.

The front of the casing E is closed by a vertical removable plate F, secured thereto by means of bolts *g*, as plainly shown in Fig. 1. This front plate is formed with a central hub *h*, which serves as a box or bearing for the forward end of the main shaft, and which is provided with a Babbitt metal lining *i*, as shown. Previous to the introduction of the Babbitt metal I introduce into the hub a hard metal plate *j*, which serves as a bearing between the tempering-screw and the end of the shaft. The introduction of the Babbitt metal reduces the opening to such extent that the escape of the plate is prevented, so that there is no danger of its loss when the parts are disconnected. To the hub *h*, I attach the tempering or adjusting screw *k*, bearing at its inner end against the plate *j*, before referred to. For the purpose of locking this screw firmly in position, that it may not be jarred out of adjustment by the vibration of the mill, I employ a jam-nut *l*, seated thereon and arranged to bear against the end of the hub *h*. In order that this nut may be securely tightened, I provide a wrench or lever *m*, which may be slipped thereon for use and slipped therefrom after the adjustment of the nut, so that it will hang in a pendent position from the screw, as represented in the drawings. By this construction I am enabled to make use of a long wrench or lever by which the nut may be securely tightened, and at the same time to avoid the objection which would exist against a handle rigidly secured to the nut and extending laterally therefrom. When employed as in the drawings, the wrench is retained upon the screw by the wheel or handle at its outer end, so that its loss is impossible. The detachability of the wrench is also advantageous in that it has no tendency to jar the nut out of position, as it would have if permitted to extend laterally therefrom.

For the purpose of urging the shaft constantly toward the tempering-screw, and thus maintaining the separation of the grinding-disks, I employ a weighted lever C, pivoted to the rear standard *a* at its upper end and bearing against the shaft, as shown.

I am aware that springs are commonly employed to act endwise on the shaft of a grinding-mill; but in practice I have discovered that the employment of a weight is advantageous, in that it gives a more steady and smoother action of the parts than can be secured by a spring, and this mainly for the reason that the inertia of the weight prevents it from responding to those momentary variations in pressure and the lateral strains and vibration of the driving-belt which would affect the spring. While a spring permits a constant reciprocation of the shaft endwise, it is found that a weight will respond only to pressures which are continued for an appreciable length of time. When the weight is employed, the distance between the grinding-surfaces can be maintained more steadily and uniformly than when the spring is used. This is especially true where the shaft is driven at a high rate of speed by means of a belt and driving-pulley, in which case, were it not counteracted, the quick lateral vibrations of the driving-belt would impart to the shaft a dancing endwise motion. A spring being sensitive to the least pressure would not counteract this dancing motion. A weight, however, owing to its inertia, requires a continued pressure to move it and would not respond to the sudden and quick vibrations of the driving-belt.

In order to reduce the friction and prevent noise, I seat in the inner face of the lever *a* leather bearing *n*, as shown in Fig. 2.

Passing now to the grinding mechanism, G and H represent the two metallic disks, constructed, as usual, with central openings. The rotary disk G is bolted firmly to a disk or plate I, bolted to the main shaft, while the stationary disk H is bolted to the inner face of the casing E. In mills of this class as ordinarily constructed great difficulty has been experienced in securing and maintaining the necessary parallelism of the grinding-surfaces, and the mills have commonly been provided with screws and other appliances by which to effect the necessary adjustment of the disks. In order to avoid the trouble and expense incident to the ordinary construction, to secure absolute accuracy of adjustment, and to prevent the disks from losing their adjustment under any circumstances, I have devised the peculiar construction which I will now describe.

Each of the grinding-disks is constructed, as shown in Figs. 2 and 6, of two parts—a front plate or grinder proper *p*, which may be of ordinary form and of a hard material, and a rear plate *r*, of soft cast-iron or equivalent soft metal, adapted to be worked by cutting-tools. These plates, being cast separately, are bolted, riveted, or otherwise secured firmly together, as shown in the drawings, after which the grinding-face of the disk *p* is applied to the face-plate of a lathe or equivalent machine and the rear side of the disk *r* faced off in a perfectly-true plane parallel with the plane of the grinding-surface and its periphery finished to a circular form concentric with the axis of rotation. To reduce the weight and avoid unnecessary labor in finishing the rear face, I propose to form the disk *r* with one or more raised surfaces or ribs, so that it will only be necessary to face off these portions. Having thus provided the grinding-disks, I secure the plate I, which is to carry the movable disk on its shaft B, or an equivalent shaft, place it in a lathe, and form in its forward face a recess of suitable size to receive the back plate *r* of one of the disks. By thus forming the recess in the disk I, I am enabled to bring its peripheral portion truly concentric and its rear face at right angles to the axis of the shaft. When the grinding-disk is seated therein and bolted thereto, the face of the disk must be in absolutely accurate adjustment for grinding purposes.

In order to secure an accurate adjustment of the stationary disk I place the mill-frame and casing E on a shaft in a lathe and turn the face or seat for the stationary disk therein, as indicated in Fig. 7. When the recess is thus formed, it follows that the disk formed as before described will, when seated therein, have its axis coincident with and its face parallel with the rotary disk. Being thus constructed, the parts may be bolted firmly in their operative positions. No adjusting devices are necessary and no skill need be exercised in the adjustment, it being impossible to place the parts in any other than the proper position.

Referring now to the means for delivering the material to the grinding devices, K represents a large hopper located with its throat substantially over the casing in which the disks are located and supported by means of arms L, having at the top flanges, which are secured to the hopper, and at its lower end two arms, which embrace and are bolted to the feed-throat *f*, their lower edges bearing upon and receiving support from the top of the casing, as shown. In this hopper I mount a sliding feed-regulating gate *s*, and as a means of holding this gate in the required adjustment I pivot to the hopper a button *t*, one end of which may be turned over into forcible contact with the slide, as shown. I have found by long practical experience that this simple device will securely hold the slide in the proper position, and that, unlike the more complicated devices commonly used for the purpose, it is not liable to be unlocked by the vibration of the mill. Beneath the hopper I mount a vibratory feed-shoe M, suspended at its upper end by a strap or other flexible connection N and at its lower end by a strap or cord O, wound upon a spindle P, seated in a bearing on the under side of the hopper and held in place by frictional engagement. By turning this spindle the shoe may be given more or less inclination, as desired. For the purpose of vibrating the shoe I pivot to one of the standards an upright lever R, the upper end of which passes through an opening at the shoe, while the lower end embraces an eccentric S, secured on the main shaft. The opening in the shoe is larger than the end of the lever, and the shoe is recessed to receive a leather bushing T, which is secured therein to form a bearing for the end of the lever, this arrangement preventing noise and clatter between the shoe and lever. To reduce the friction and prevent noise at the lower end of the lever, I recess the inner faces of its arms and secure therein wooden blocks U, which present their grain endwise toward the eccentric. These blocks or bushings are thoroughly saturated with oil or paraffine previous to their introduction, this treatment increasing their durability and rendering the use of additional lubricants unnecessary. As a further means of preventing noise I mount on the spindle u, which supports the lever R, and on opposite sides of said lever two washers v, of rubber or equivalent elastic material.

For the purpose of delivering the material from the feed-throat through the inner grinding-disk to the grinding-surfaces I provide the main shaft with a feed-screw V, as usual. In order that this screw revolving at a high speed may be prevented from throwing the material outward at the top of the throat, I seat in the top of the latter a small hopper-like casing w, one edge of which extends downward and inward within the feed-throat, as shown at w', its edge terminating at a considerable distance above the screw, so that the matters which may be rejected or thrown outward by the screw toward that side of the hopper will lodge beneath and be arrested by the flange or edge. This flange w' may be, however, secured to the feed-throat in any other manner, if preferred, the essential feature of the invention in this regard consisting simply in having an inwardly-extending flange above the feed-screw.

In order to impart motion to the mill, I provide the main shaft between its standards with a driving-pulley X, of appropriate form, secured thereto by a wooden safety-key Y, or otherwise, as may be preferred.

The grinding-disks may be provided with a dress or grinding-surface of any suitable character; but for ordinary usage I recommend the peculiar dress represented in Figs. 9 and 10 of the drawings. As will be seen on reference to these figures, each disk is provided with a series of coarse feeding-furrows a^2, leading from the center outward, with a draft or inclination to the rear in order to urge the material rapidly and forcibly outward. These teeth, which diminish in depth toward their outer ends, terminate midway between the inner and outer edges of the disk, or thereabout. They are encircled by an annular series of grinding-teeth a^3, of what is commonly known as the "diamond pattern," produced by the various teeth crossing each other at a slight angle, as shown in the drawings. These teeth serve to rapidly reduce the material which enters between them. Having but a slight tendency to urge the grain outward, they permit it to pass backward in a circular or circumferential path, so that it is subjected to a grinding action for an appreciable period of time. Outside of these diamond teeth, at the periphery of the disk, there is a series of grinding-teeth a^4, presenting upright forward faces and sharp cutting-edges. The last-named teeth, receiving the coarsely-ground material from the diamond teeth, reduce it rapidly and uniformly to a fine meal, which is delivered at the periphery.

Having thus described my invention, what I claim is—

1. In a vertical disk-grinder, the fixed grinding-disk and the horizontal shaft provided with a grinding-disk and a driving-pulley and mounted to move endwise in its bearings, in combination with the tempering-screw acting on the shaft to approximate the disks and the weighted lever, as distinguished from a spring acting on the shaft to separate the disks, whereby the disks may be adjusted to run close together without danger of their being thrown together by vibration of the driving-belt.

2. In combination with the shoe M, having an opening through its end, the vibratory actuating-arm R, extended therethrough, and the leather bushing T, secured, as shown, to the shoe and closely encircling the arm R to hold the same out of contact with the shoe.

3. In combination with a support, the tempering-screw having the enlarged head, the jam-nut on the said screw of a diameter less than that of the head of the tempering-screw, and the removable nut-operating handle adapted to encircle the jam-nut and the tempering-screw, whereby the handle may be applied to turn the nut or be suspended from the tempering-screw at will.

4. A grinding-disk provided with the feeding-furrows, the diamond dress immediately encircling the same and acting to grind the material back and forth, and the peripheral teeth having the abrupt forward faces and cutting-edges encircling the diamond dress and arranged to receive and reduce the material delivered from the diamond dress, substantially as set forth.

In testimony whereof I hereunto set my hand, this 17th day of May, 1886, in the presence of two attesting witnesses.

MILO J. ALTHOUSE.

Witnesses:

PHILIP T. DODGE,
WILLIAM R. KENNEDY.