

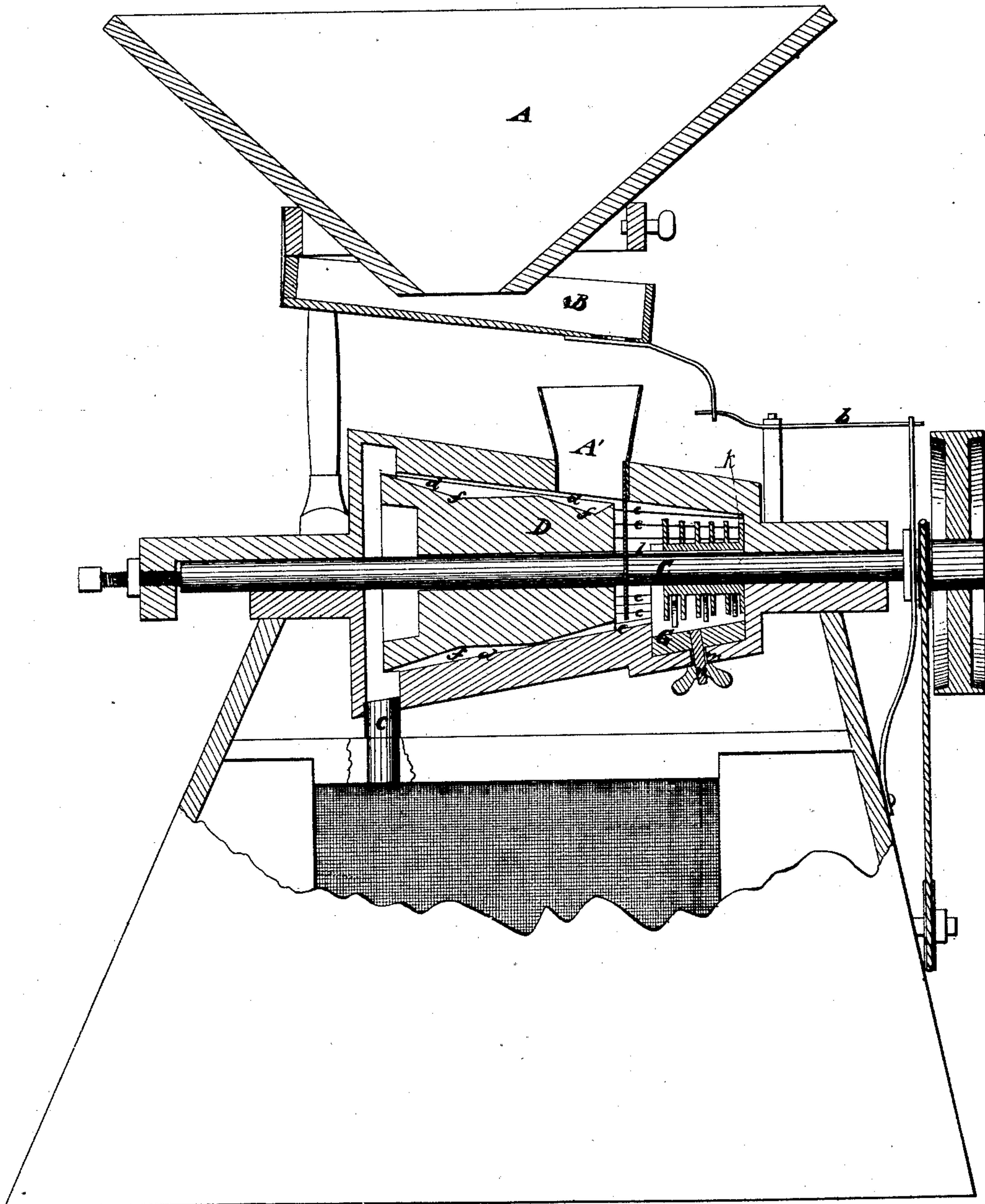
E. COLEMAN.
Grinding Mill.

2 Sheets—Sheet 1.

No. 17,619.

Patented June 23, 1857.

Fig. 1.



Grinding Mill.

2 Sheets—Sheet 2.

No. 17,619.

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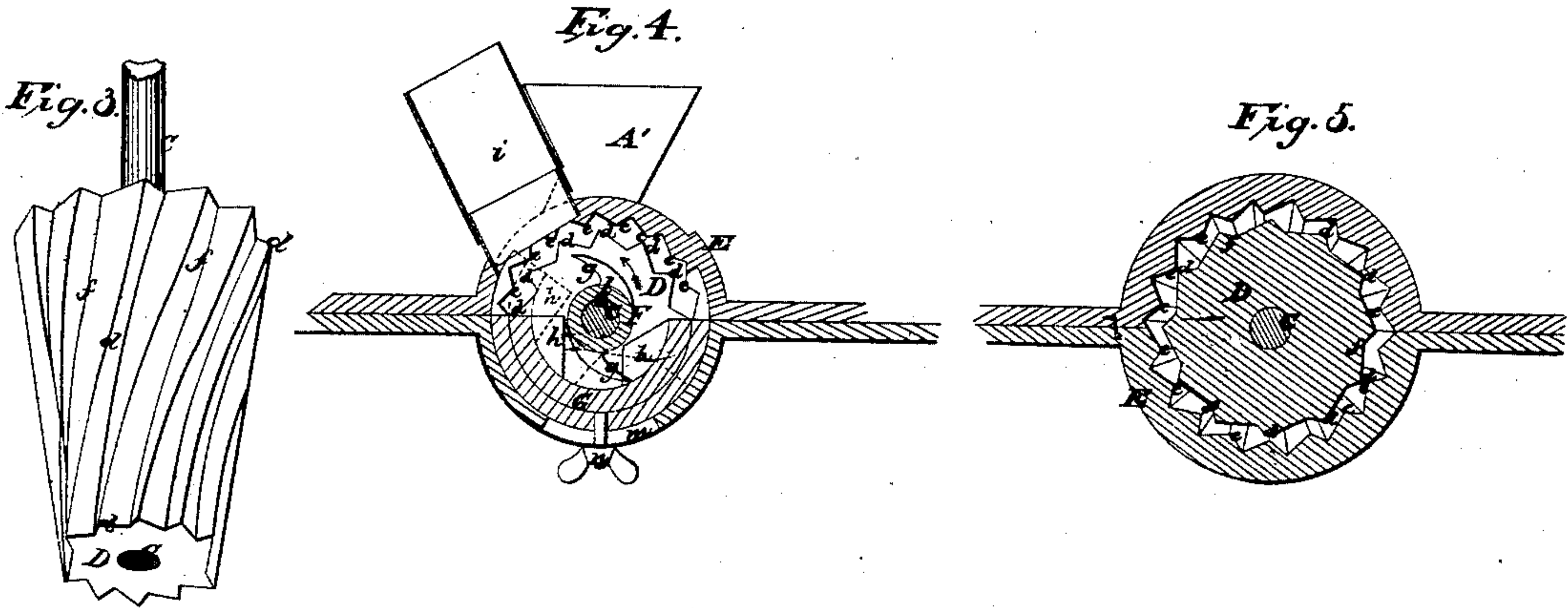
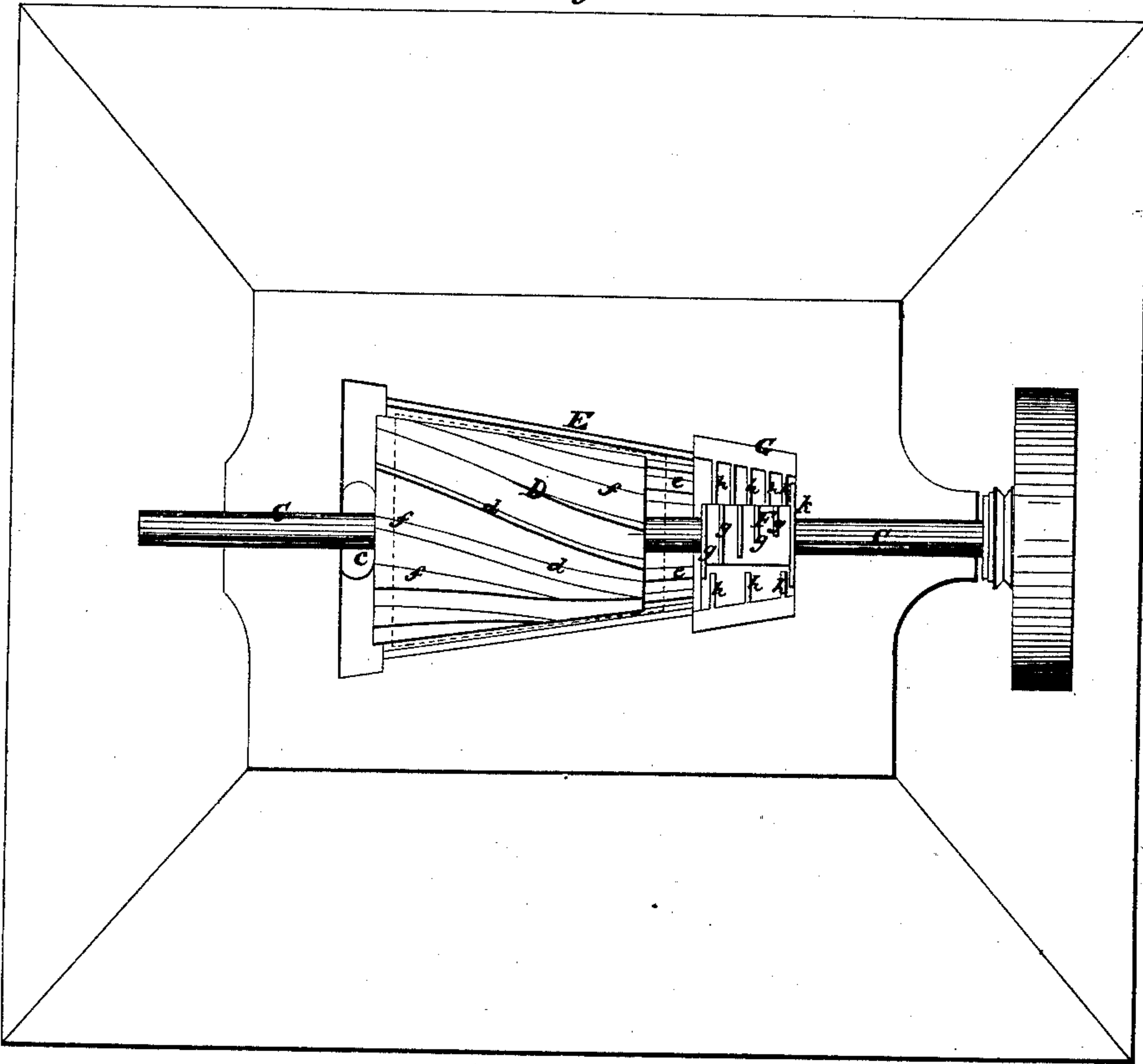


Fig. 2.



UNITED STATES PATENT OFFICE.

EZRA COLEMAN, OF PHILADELPHIA, PENNSYLVANIA.

IMPROVEMENT IN GRINDING-MILLS.

Specification forming part of Letters Patent No. 17,619, dated June 23, 1857.

To all whom it may concern:

Be it known that I, EZRA COLEMAN, of the city and county of Philadelphia and State of Pennsylvania, have invented a certain new and useful Improvement in Grinding-Mills; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, in which—

Figure 1 is a vertical section of the mill taken longitudinally through the concave. Fig. 2 is a plan with the shoe, hopper, and top-covering portion of the concave removed. Fig. 3 is a perspective view of the conical grinder and masher detached. Fig. 4 is a transverse section of the cutter and grinder, showing by black and red lines the cutter-concave in different positions. Fig. 5 is a transverse section of the grinder and masher with its concave.

Similar letters of reference indicate corresponding parts in the several figures.

The nature of my invention consists in insuring the rotation of the cob-cutter with the grinder by keying it loosely on the spindle grinder-shaft, and when thus arranged preventing it sliding out of place, whether the grinder be adjusted to grind coarser or finer, by means of a ring or flange which runs between the small end of the mill and the teeth on the sliding concave. By this arrangement the cob-cutter and cylinder are independent of each other as regards longitudinal motion, but dependent on each other when rotating, whereas in all other combined grinders and cob-cutters the cob-cutter is fastened firmly to the shaft or spindle and moves laterally as well as rotates with the cylinder, which would be fatal to the working of any mill regulated by a screw at the end, for as the cylinder was moved in either direction the teeth on the cob-cutter would strike those on the concave, between which they run, and break the mill.

My invention consists, second, in having the cob-concave adjustable in a line concentric with its axis and relatively to the mouth of the feed-hopper, as hereinafter specified, whereby the cutter can be made to cut faster or slower, as desired, in the following manner: When the concave is placed at the lowest point, the cutter will take the greatest hold of the corn, and

consequently cut very fast; but by gradually raising it up it can be made to cut slower and slower until, when entirely up, it will hardly cut at all. Thus the farmer can regulate the grinding of corn in the ear as well as when shelled, which is not the case with any other mill in use. To illustrate, suppose a farmer has a two-horse chain-power worked by weight of the horses, which is the common method of working them. Now suppose one of my mills is at work by it with one horse. The sliding concave is set to give the horse the proper speed and all goes on well. We will now suppose the farmer gets in a hurry and wants to grind faster and puts on the second horse. He now starts them, and off they go, so fast as to endanger both the power and the horses, as the mill does not present resistance enough to overcome the weight of the horses; but by sliding the concave down a certain distance the mill cuts enough faster to overcome the increased power of the second horse, and thus the proper speed is again obtained, and the mill doing twice the work, by the addition of the second horse. In all other mills the only remedy would be to level the horsepower and bring the horses to the capacity of the mill.

It will be seen that the difference between my mill and others is that it can be adapted to the capacity of the power used, while the others require the power to be brought to the capacity of the mill.

To enable those skilled in the art to make and use my invention, I will proceed to describe its construction and operation.

A is a main hopper, into which the stuff or substance to be ground is thrown or fed.

B is a receiving-shoe beneath the main hopper, which shoe may be made to vibrate by means of a shaking device, *b*, set in motion through a rod or lever by an eccentric on the cylinder-shaft C, or the shoe may be operated in any other manner to insure a proper feed to the hopper A' of the concave of the mill.

The concave, hopper, and accompanying devices may be supported by any suitable framing, which I prefer, however, to make of box form and broader at its base than the top, to give a firm stand to the mill and form a receptacle for the ground substance as well as if required, to inclose within it a bolt to ac-

upon the ground substance as it is discharged from the concave by a spout, *c*, at the larger end of the concave, said bolt receiving its motion by band and pulleys from the grinding cone-shaft *C*, which are arranged, as shown, to operate the grinding devices and shake the feeding-shoe at the same time that they set in motion the bolt.

The grinding cone or cylinder *D*, which is here arranged to operate horizontally, differs from other conical grinders that have been made with both straight and spiral ribs or teeth to act in concert with a ribbed concave receiving the substance to be ground at the smaller end and discharging it at the larger end as follows: The grinding cone or cylinder *D* has its teeth *d* set in a twisted form along the body of the cone from the smaller end backwardly as regards the direction in travel or run of the cone, and so beveled or shaped as on said teeth acting in concert with the teeth *e* of the concave *E* on the substance to be ground they present or operate with an ordinary sharp grinding-edge at the smaller or feed end of the cone, but present or act with a flattened surface more in the form of a heater as the teeth approach and run up to the larger or delivery end of the cone, by which means the stuff being operated on is first lacerated and ground, and afterward beaten or mashed, as it were, by a series of pestles acting in a mortar, by which meal or other substance or substances may be ground very fine. The twist given to the teeth may either be in straight or curved lines. The furrows *f* between the teeth *I* make of curvilinear form in direction of their length or give them by straight lines an equivalent shape in such manner that though by reason of the cone's increasing diameter toward its delivery end said furrows increase in their distance from the cone-shaft, they gradually dip inward, as it were, from the smaller to the larger end of the cone, and would form if flattened out a convex line or figure, which shape, twisted, they may be said to be, and by which configuration an easy gradual relief is given to the grinding, the discharge enlarged or quickened, and clogging prevented.

The concave's hopper *A'*, which receives the substance to be ground, I give the ordinary spreading form to at its mouth or top, but give it a reverse inclined direction on its front side, where it joins the concave, to facilitate the feed to the grinding-cone and prevent the agitation kept up by the grinder from choking said feed.

F is a rotary cutter, to be used where one is required, as common to other mills, for the purpose of cutting up certain substances before introducing them to the grinding portion proper of the mill—as, for instance, in grinding corn-cobs, and so forth. This cutter has the usual teeth or prongs, *g*, working between ribs or teeth *h* of a concave, *G*, that is covered in at top and is provided with a feed-spout, *i*. The position of this rotary cutter and its con-

cave is next to the smaller end of the grinding-cone and its concave, to which they form an extension, as it were, and preferably, perhaps, of similar taper form, and between which a free and uninterrupted communication is established for the particles cut by the cutter *F* to pass down into the concave *E* of the grinder.

H is an elastic guard, which at the front of the cylinder *D* separates the two concaves *E* and *G*. This elastic guard serves the purpose, when the cutter *F* is not needed and the feed is direct to the grinding-cone *D*, of preventing nails and other foreign substances entering with the feed from getting into the cutting-concave and producing damage, while the elastic character of said guard gives an easy action to it that prevents breakage of it or choking at the feed end of the cone.

The cutter *F*, as will be observed, is on the same shaft, *C*, as the grinding-cone; but while it is kept in a fixed place of rotation by means of a collar, *k*, the grinding-cone *D*, which is fast on its shaft *C*, is adjustable in direction of its length in the concave to grind coarse or fine, as required, as common to such devices, by sliding or setting up longitudinally the shaft by set-screw from the outside without disturbing the rotary cutter *F*, that operates in connection with the grinding-cone on a shaft, *C*, common to them both. This is accomplished partly by means of the collar *k* on the cutter, that keeps it in place, and by the cutter being hung loosely on the shaft, but connected therewith by a key or keyway, *l*, so that the shaft in rotating drives the cutter, but is separately adjustable through it. In this manner an independent adjustability of the grinder is established without affecting the cutter, to suit the grinder to the cutter, without any stoppage, while both are operated by one common driver and a sameness of relative velocity is preserved.

The concave *G* of the cutter—that is, the cutting lower portion of it, which is all that need be referred to here—is armed, as specified, with ribs or teeth *h*. These teeth are in two sets, the one set at the back and the other set on the front side of the cutter, the front set, which are of angular or tooth form, serving, in conjunction with the teeth *g* of the revolving cutter, to effect the cut by the passage of the cutter-teeth between them, while the back set of teeth in said concave serve as a comb to clear the cutter.

To regulate the cut of this revolving cutter *F*, I make its concave *G* adjustable on its bed circularly in direction of the traverse of the cutter or adversely thereto by means of a slot, *m*, in said bed and a set-screw, *n*, connected with the concave, whereby the teeth of the concave may be set into deeper or longer or shorter gear, as required, with the teeth of the rotary cutter, to cut small or large, as clearly represented by black and red lines in Fig. 4 of the drawings. This adjustability I find a most perfect and easy one, and it and the other

features of my improvement I have referred to make the mill as a whole, without exception, the best of its kind.

I am aware that concaves have been adjusted eccentrically in order to grind finer or coarser, but not to grind faster or slower. Therefore I do not claim an eccentric adjustment of the concave of a grinder; but

What I do claim as my invention, and desire to secure by Letters Patent, is—

1. Having the concave of a cob-cutter adjustable in a circular line concentric with its axis and relatively to the mouth of the feed-

hopper by means substantially as specified, so that it may be set to grind faster or slower, substantially as and for the purposes set forth.

2. The means herein specified for insuring the rotation of the cob-cutter with the grinder and its retention in proper place when the grinder is adjusted longitudinally, substantially as and for the purposes set forth.

EZRA COLEMAN.

Witnesses:

WM. HINKLE,

WILLIAMS OGLE.