

E. C. GRIFFIN.
CRUSHING OR GRINDING MILL.

No. 403,997.

Patented May 28, 1889.

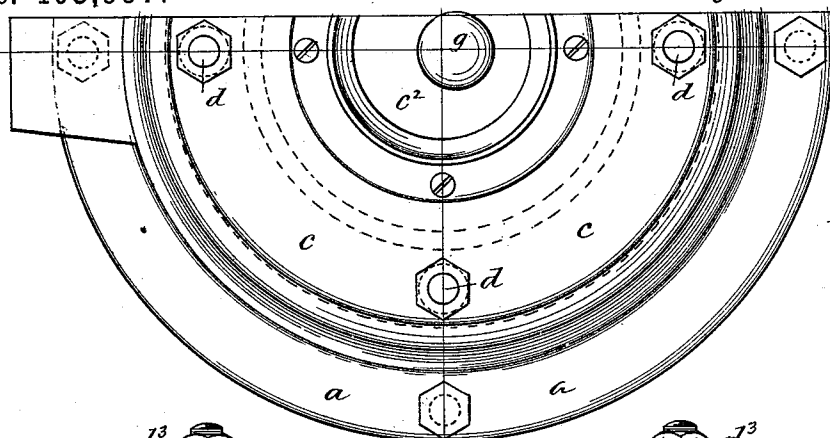


Fig. 2.

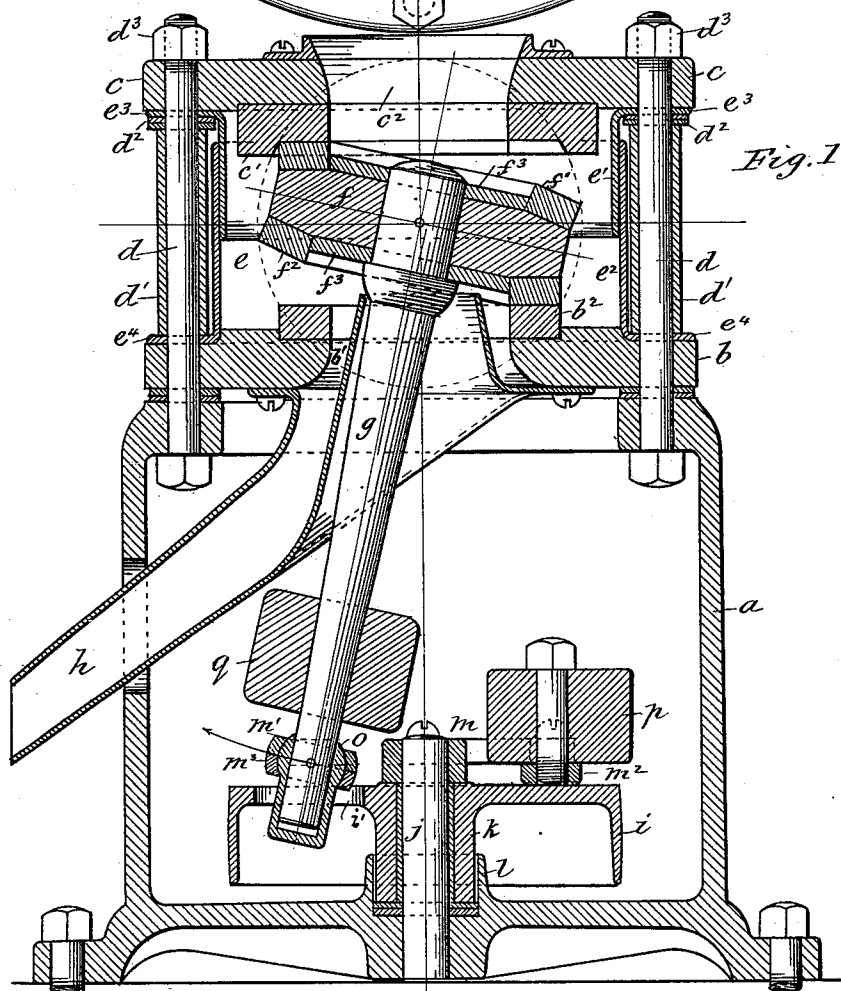


Fig. 1

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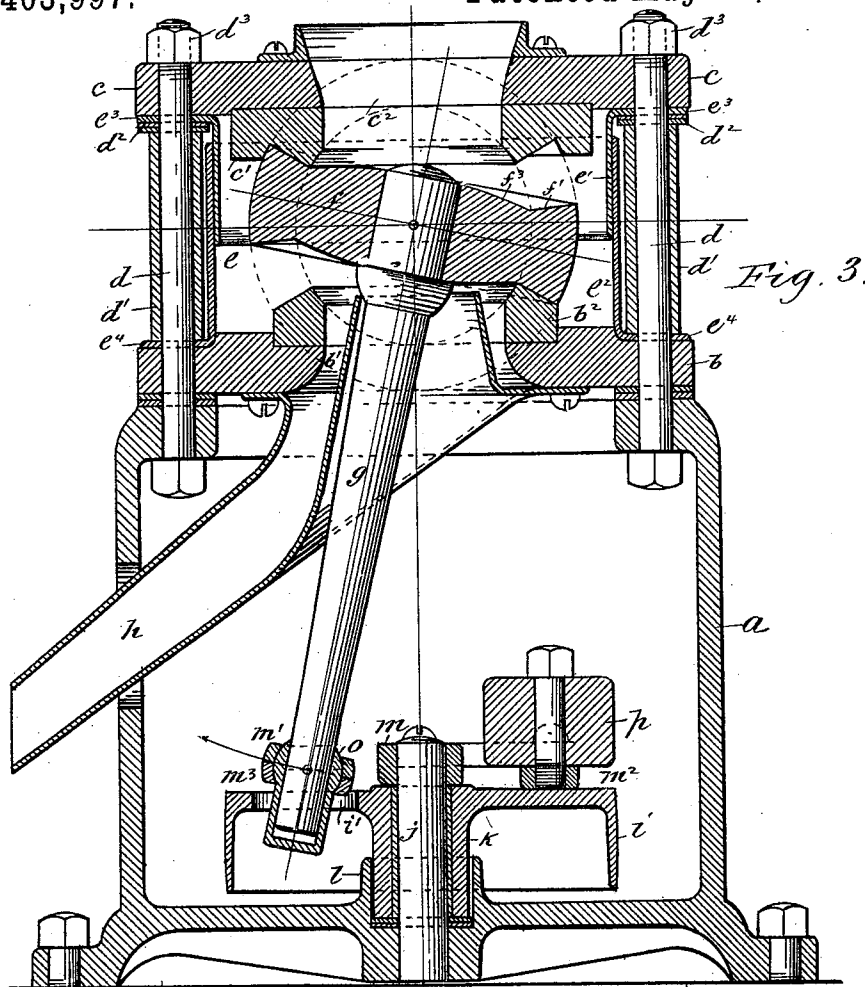
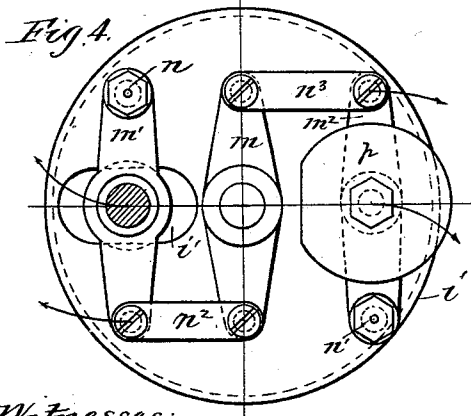
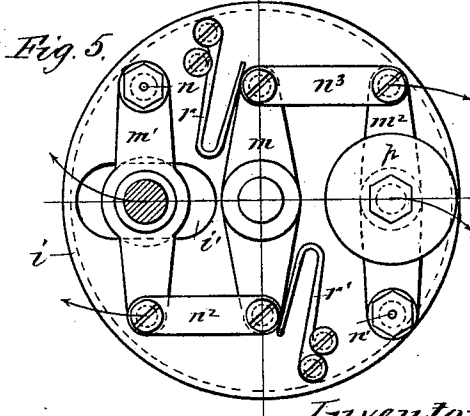
(No Model.)

2 Sheets—Sheet 2.

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UNITED STATES PATENT OFFICE.

EDWIN COLVER GRIFFIN, OF BROOKLYN, ASSIGNOR TO THE GRIFFIN
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CRUSHING OR GRINDING MILL.

SPECIFICATION forming part of Letters Patent No. 403,997, dated May 28, 1889.

Application filed June 1, 1888. Serial No. 275,720. (No model.)

To all whom it may concern:

Be it known that I, EDWIN COLVER GRIFFIN, a citizen of the Dominion of Canada, residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Crushing or Grinding Mills; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention has relation to crushing or grinding mills adapted to be used in crushing or grinding ore, stone, and other similar hard materials; and it consists in the improved construction and arrangement or combination of parts, hereinafter fully disclosed in the description and claims.

The object of my invention has been to provide a crushing or grinding mill which will have unusually great productive capacity in proportion to its size, and which will exert comparatively great crushing-power upon the stock fed into it, while requiring but little force for driving the same, the power of the machine being increased by an increase of speed with which it is driven.

In the accompanying drawings, in which the same letters of reference indicate the same or corresponding parts in all the figures, Figure 1 represents a vertical sectional view of my improved crushing or grinding mill; Fig. 2, a partial top plan view of the same; Fig. 3, a vertical sectional view of a slightly-modified form of the same; Fig. 4, a top view of the drive-pulley and its links, showing the arm or stem of the crushing-head in section; and Fig. 5, a similar view of the pulley, showing a slight modification in its attached parts.

Referring by letter to the several parts of the machine, *a* indicates the frame or casing, which supports upon its upper part the bottom plate, *b*, which is formed with a central aperture, *b'*, and serves as a support for the annular open lower grinding-disk, *b*².

To the under side of the top plate, *c*, is secured the upper annularly-recessed grinding-disk, *c'*, which, as well as the lower grinding-disk, is secured to its plate by any suitable means or made integral therewith. This up-

per grinding-disk and the top plate are formed with a central aperture, *c*², through which the material to be crushed or ground is fed.

Upright bolts or rods *d* pass through the upper part of the frame, through the bottom plate, and through the top plate, and have sleeves *d'* fitted upon them, which serve to support said top plate at the proper height above the bottom plate, the nuts *d*³ upon the upper ends of the bolts or rods serving to firmly hold the parts in their adjusted positions.

Above the upper ends of the sleeves *d'* are placed washers *d*², by means of which the top plate may be raised or lowered by simply adding or subtracting washers, thereby adjusting the distance between the top and bottom crushing or grinding disks, and thus rendering it easy to compensate for wear in their surfaces and regulate the degree of fineness to which the material is to be crushed or ground.

The casing *e*, within which the crushing or grinding is effected, is formed of two cylindrical overlapping or telescoping shells, *e'* *e*², having horizontally-extending perforated flanges *e*³ *e*⁴, through which the upright bolts *d* pass. By means of these two overlapping shells the height of the casing may be adjusted and its sides remain closed, the lower end of the upper shell telescoping or sliding within the upper end of the lower shell.

The grinding head or runner *f* is placed within the grinding-casing and between the upper and lower crushing or grinding disks, *c'* and *b*². The upper and lower outwardly-inclined marginal portions of the grinding head or runner have correspondingly-inclined crushing or grinding rings *f'* *f*² secured thereto or formed integrally therewith, said rings working into and upon the upper and lower grinding-disks during operation. Within these crushing or grinding rings and secured to or formed integrally with the upper and lower faces of the head or runner are placed or formed plates *f*³ *f*³, which are thinner than the rings surrounding them, and, together with said rings, form depressions for temporarily holding the material while it is carried against the upper crushing-disk. This head

or runner is formed alike on its upper and lower faces, and is removable, in order that it may be placed either face upward or reversed to compensate for wear. It is securely but removably fixed to the upper end of an arm or stem, *g*, which projects downwardly therefrom and through the central apertures in the lower grinding-disk and bottom plate. Through these apertures also projects the inverted-funnel-shaped portion of the inclined discharge-spout *h*, which is secured to the bottom plate at the edges of the central aperture therein, said funnel-shaped portion surrounding the arm or stem and projecting slightly above the upper surface of the lower grinding-ring.

The drive-pulley *i*, to which the power for driving the mill is applied by means of a belt or equivalent gearing, is journaled upon a fixed upright stud, *j*, projecting from the center of the base of the supporting frame or casing, the said pulley having a hub or sleeve, *k*, fitting upon the said stud and projecting into a recess or step, *l*, formed in said base.

A link or lever, *m*, is fulcrumed at its middle upon the upper end of the stud *j* above the pulley *i*. Two similar levers or links, *m'* and *m''*, are pivoted at their ends upon studs *n* and *n'*, attached to the upper face of the pulley near its periphery, and have links *n''* and *n'''* pivoted to their free ends and to the opposite ends of the central lever, *m*. The lever *m'* is formed with a partly-spherical recess, *m'''*, at its middle, within which a correspondingly-shaped bearing or step, *o*, secured to the lower end of the arm or stem of the grinding-head, fits and revolves or rocks, and the lower portion of this bearing or step and of the arm or stem within said step projects down through a radial slot, *i'*, in the upper face of the pulley. A weight or poise, *p*, is secured upon the middle of the lever *m''*, and a corresponding weight or counterpoise, *q*, is secured upon the lower portion of the arm or stem of the grinding-head slightly above the bearing or step *o* and lever *m'*.

Springs *r* and *r'*, secured to the upper face of the pulley and bearing against the ends of the central lever, *m*, as shown in Fig. 5, may be used to assist or take the place of the weights *p* and *q*. Said springs are so fastened and applied to the pulley as to press against the ends of the central lever, and thus, through the interposed links, push the lower end of the arm or stem of the gyrating head outward.

In the form of crushing and grinding mill shown in Fig. 1 of the drawings the stationary grinding-disks have plane or level contact-surfaces, while the grinding-rings upon the upper and lower marginal portions of the gyrating head are arranged with an outward inclination. Under this construction and arrangement of the crushing-surfaces a slight rubbing or grinding action will take place, which is very advantageous for some materials. When the mill is formed as shown in Fig. 3, the contact-surfaces of the station-

ary disks have an outward bevel, while the contact-surfaces of the gyrating head are beveled inward, this construction and arrangement of the parts operating to effect a positive crushing of the material without any slipping or rubbing action thereon.

The operation of my improved crushing or grinding mill is as follows: The material to be crushed or ground is fed through the feed aperture or hopper onto the upper face of the runner or head, and will first be crushed or ground between the upper grinding-disk and the upper grinding ring or face of said grinding-head, which receives a gyrating motion by means of its arm or stem being carried around by the revolving drive-pulley. Then as the material falls down from between the upper grinding-surfaces and accumulates within the casing it will again be crushed and still further reduced between the lower grinding-surfaces, and will finally pass, when sufficiently crushed or ground, through the discharge-spout and out of the mill.

It will be evident that through the revolutions of the pulley centrifugal force will drive the weights upon the lever and the arm or stem outward, causing the grinding surfaces or rings of the gyrating head to bear with great force against the rigid grinding-disks; also, that if the speed or revolutions of the drive-pulley be increased the crushing force will also be increased, and therefore that the material may be subjected to greater or less crushing or grinding by increasing or decreasing the speed of the drive-pulley; also, by having the arm or stem of the gyrating crushing-head counterbalanced by the weights or springs, or both, and forced with its crushing-surfaces against the stationary disks by the force of the weights or springs, the head will yield to any tough or foreign particles in the material being treated or to any particles too large to be immediately crushed, thus preventing undue strain and friction upon the parts of the mill and possible accidents to the same by breaking of the parts, which, on account of the usual great speed of the revolving parts, might affect the safety of the persons attending to or operating the mill, as well as prove ruinous to the mill itself.

The radial slot in the pulley permits free outward and inward play of the lower end of the arm or stem of the gyrating head, and the spherical-ended bearing or step upon the stem, playing in the correspondingly-shaped recess in the lever, admits of the stem retaining its inclined position with reference to the axis of the pulley while being carried around with the pulley by said lever.

It will be obvious that modifications in the shapes of the crushing or grinding surfaces and in the minor constructions of the parts of the mill may be made without departing from the nature or principle of my invention.

Having thus fully described my invention, what I claim as new is—

1. In a crushing or grinding mill, the com-

bination, with a gyrating runner or head having crushing-surfaces upon its upper and lower faces, of an upper and lower stationary crushing-disk, substantially as described.

5 2. In a crushing or grinding mill, the combination, with a gyrating runner or head having crushing-rings upon its upper and lower faces, of upper and lower stationary crushing-disks, substantially as described.

10 3. In a crushing or grinding mill, the combination of the upper and lower crushing-disks with the intermediate gyrating runner or head provided with depressions and crushing-rings upon its upper and lower faces, substantially as and for the purpose described.

15 4. In a crushing or grinding mill, the combination of the upper annularly-recessed crushing-disk, the lower plane-surfaced crushing-disk, and the intermediate gyrating runner or head provided with depressions and crushing-rings upon its upper and lower faces, substantially as described.

20 5. In a crushing or grinding mill, the combination of the upper and lower crushing-disks, the gyrating arm or stem passing through the latter, and the gyrating head provided with crushing-surfaces upon its upper and lower faces and adapted to be removed from said arm or stem and reversed, substantially as and for the purpose described.

30 6. In a crushing or grinding mill, the combination, with the casing, the top plate, and the upper stationary crushing-disk formed with the central feed-entrance, and the bottom plate and the lower stationary crushing-disk formed with the central discharge-aperture, of the gyrating crushing-head mounted between said upper and lower crushing-disks, substantially as described.

40 7. In a crushing or grinding mill, the combination of an upper and lower stationary crushing-disk, a drive-pulley concentric with said stationary disks, a runner or head having crushing-surfaces upon its upper and lower faces, and an arm or stem pivotally connected at an eccentric point of said pulley and operating to impart a gyrating motion to said runner or head as arranged between the stationary disks, substantially as described.

50 8. In a grinding or crushing mill, the combination of an upper and lower crushing-disk, a drive-pulley journaled concentric therewith, a runner or head having crushing-surfaces upon its upper and lower faces, an arm or stem pivotally connected at an eccentric point of said drive-pulley and having radial play at the same point, and means for forcing said stem outward, substantially as described.

60 9. In a grinding or crushing mill, the combination of an upper and a lower crushing-disk, a drive-pulley journaled concentric therewith, a runner or head having crushing-surfaces upon its upper and lower faces, an arm or stem pivotally connected at an eccentric point of said drive-pulley and having radial play at the same point, and a weight connected to

said arm or stem to force it outwardly by centrifugal force, substantially as described.

10. In a crushing or grinding mill, the combination of an upper and lower crushing-disk, a drive-pulley journaled concentric therewith, a runner or head having crushing-surfaces upon its upper and lower faces, an arm or stem pivotally connected at its end at an eccentric point of said pulley and having radial play at the same point, a series of connected levers mounted upon said pulleys, and a weight attached to the end of the stem or arm at or near the point of its pivotal attachment, substantially as described.

80 11. In a crushing or grinding mill, the combination of the stationary crushing-disks, an intermediate gyrating runner or head having an arm or stem, a drive-pulley journaled concentric with the said head and having a radial slot for the free passage and play of the lower end of said arm or stem, a lever fulcrumed concentric with said pulley, levers pivoted at their ends at diametrically-opposite points on the face of said pulley and arranged parallel with the central lever, one of said levers having a weight secured at its middle, a weight secured to the lower end of the arm or stem of the gyrating head, and links connecting the middle lever to the opposite ends of the levers which are parallel therewith, substantially as described.

12. In a crushing or grinding mill, the combination of the centrally-open upper and lower crushing-disks, the gyrating runner or head having crushing-surfaces upon its upper and lower faces, an arm or stem passing through the central opening of the lower crushing-disk, a drive-pulley journaled concentric with said crushing-disks and having a radial slot for the free passage and play of the arm or stem, a lever fulcrumed at its middle concentric with said pulley, a lever pivoted at one end at an eccentric point of the pulley near its periphery and having a weight secured to its middle, a link connecting the free end of said lever with the corresponding end of the central lever, a lever pivoted to said pulley at a diametrically-opposite point to the other lever and having a partly-spherical recess in its middle, a spherical bearing or step fitted in said recess, and a link pivotally connecting the free end of this lever and the end of the central lever, substantially as described.

13. In a crushing or grinding mill, the combination of a cylindrical casing, a top and bottom plate provided with central apertures forming, respectively, the feed and discharge apertures, crushing-disks secured to the inner sides of the top and bottom plates and having central apertures, a gyrating runner or head having crushing-surfaces upon its upper and lower faces and having an arm or stem projecting through the central apertures of the bottom plate and its crushing-disk, and a discharge-spout secured around the dis-

charge-apertures and provided with an inverted-funnel-shaped flange surrounding the said arm or stem and projecting above the lower crushing-disk, substantially as described.

14. In a crushing or grinding mill, the combination of a top plate and a bottom plate having crushing-disks secured upon their inner sides, a gyrating runner or head having crushing-surfaces upon its upper and lower faces and playing between and upon said crushing-disks, bolts passing through and connecting said plates and provided with nuts and enlarged heads, sleeves surrounding said bolts, and removable washers fitted upon said bolts between the upper ends of the sleeves and the under side of the top plate, substantially as and for the purpose set forth.

15. In a crushing or grinding mill, the combination of a top plate and a bottom plate

having crushing-disks upon their inner sides, an intermediate gyratory crushing runner or head, bolts connecting the top and bottom plates and provided with nuts and enlarged heads, a casing consisting of cylindrical flanged shells fitted upon the bolts and telescoping at their meeting ends, sleeves surrounding the bolts and separating the top and bottom plates, and washers removably placed upon the bolts between the upper ends of the sleeves and the perforated flanges of the shells, substantially as and for the purpose set forth.

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

EDWIN COLVER GRIFFIN.

Witnesses:

LAMBERT S. QUACKENBUSH,
THOMAS J. HUSTON.