(No Model.) 2 Sheets—Sheet 1.

# R. McCULLY.

## CRUSHING MACHINE.

No. 348,757. Patented Sept. 7, 1886.

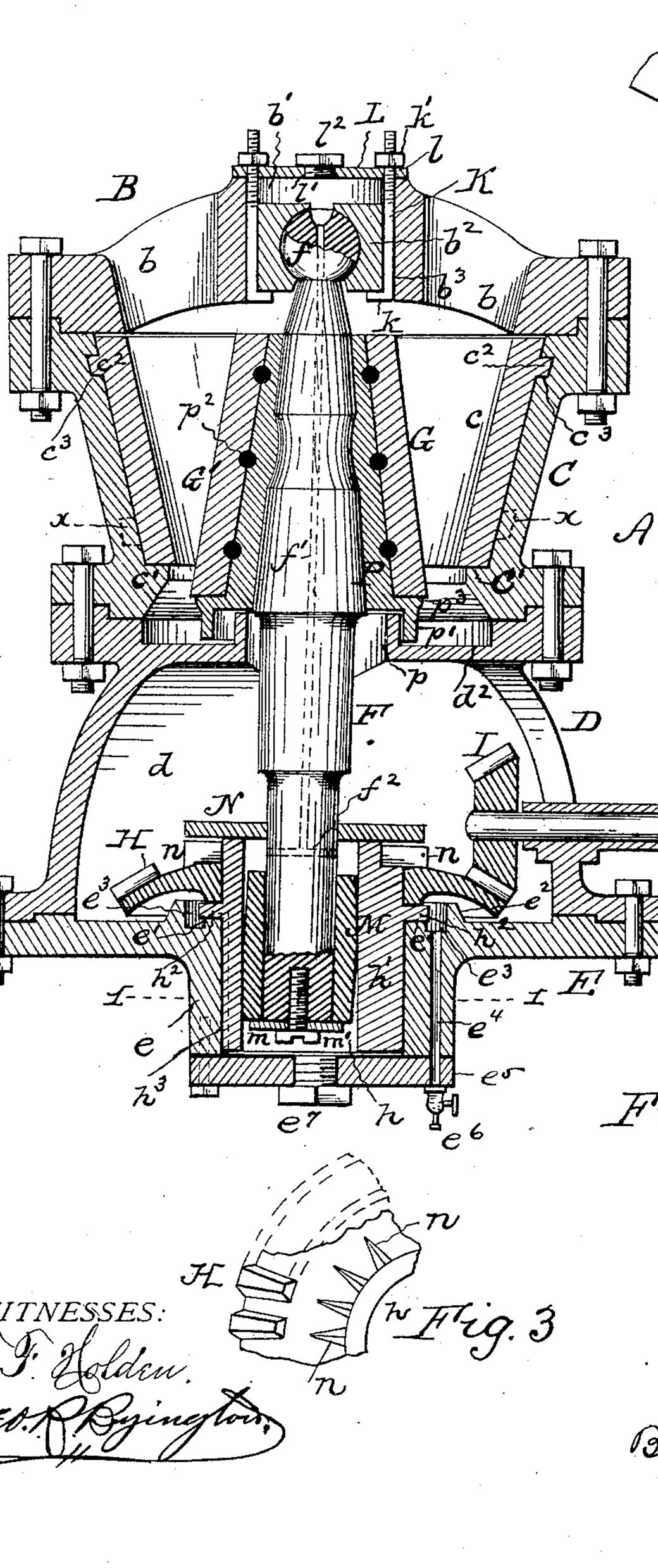


Fig. 1

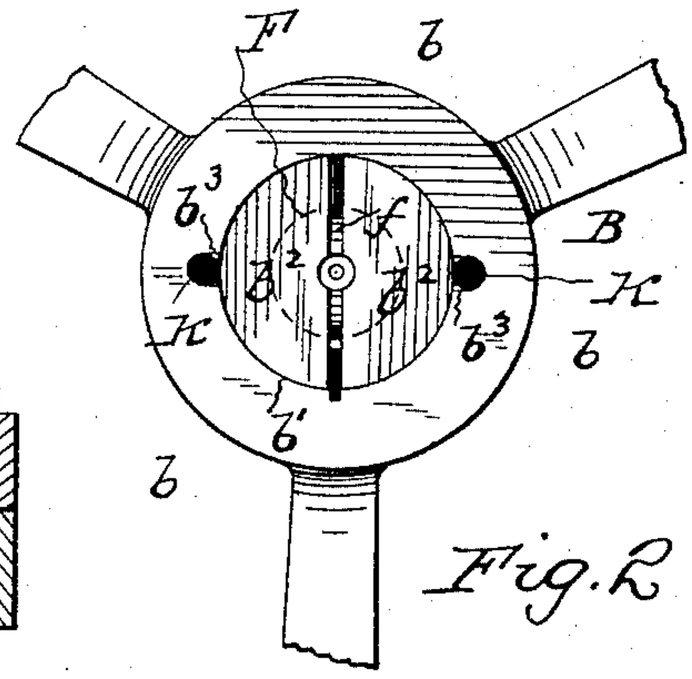


Fig. 2




Fig. 3

WITNESSES:
F. F. Holden.
Geo. P. Byington.

INVENTOR,
Robert McCully
By S. J. VanStavoren
ATTORNEY

(No Model.)

2 Sheets—Sheet 2.

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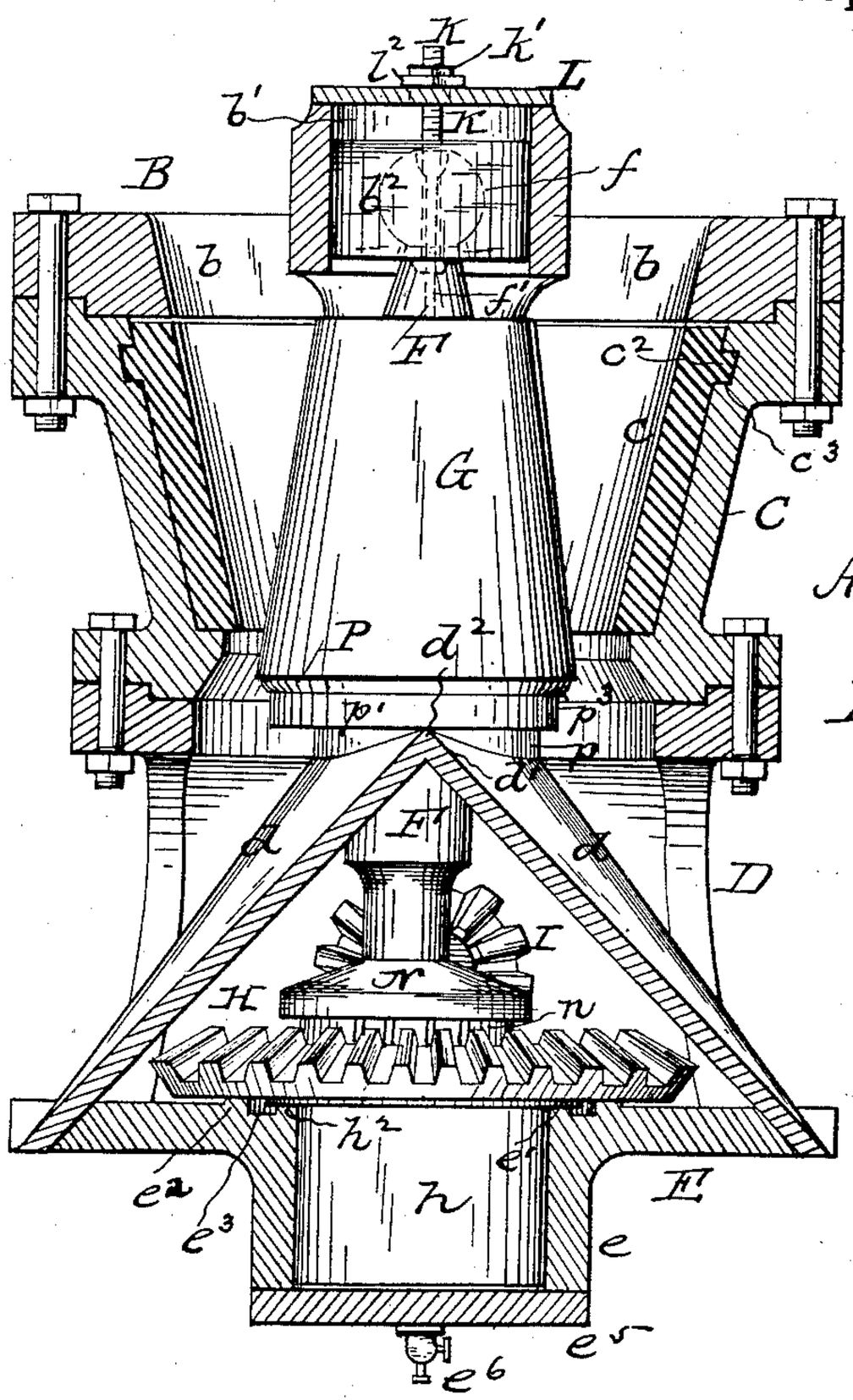


Fig. 4

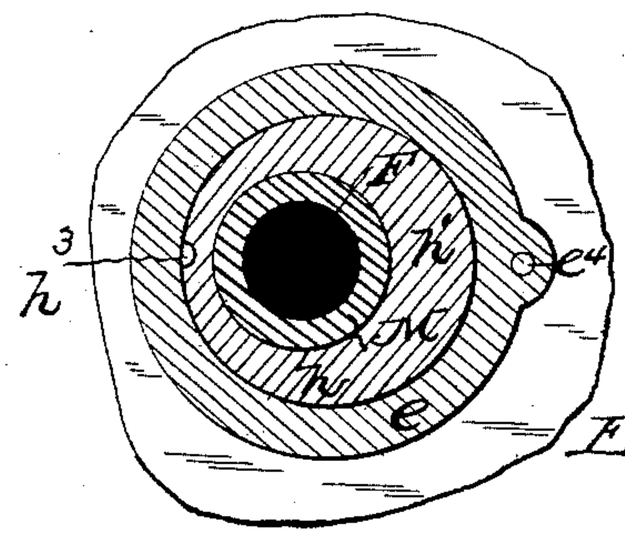


Fig. 5

WITNESSES:
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# UNITED STATES PATENT OFFICE.

ROBERT McCULLY, OF PHILADELPHIA, PENNSYLVANIA.

## CRUSHING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 348,757, dated September 7, 1886.

Application filed August 4, 1885. Serial No. 173,535. (No model.)

*To all whom it may concern:*

Be it known that I, ROBERT MCCULLY, 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 Crushing-Machines, of which the following is a specification, reference being had therein to the accompanying drawings, wherein—

Figure 1 is a vertical central section of a crushing-machine with eccentrically-gyrating shaft, showing my improvements. Fig. 2 is a plan of part of the top section or plate of the machine, showing bearing or boxes for the ball-fulcrum of the gyrating shaft and a cross-section of the bolts for sustaining and vertically adjusting said boxes. Fig. 3 is a plan of part of the gear-wheel for imparting to the crusher-head shaft its eccentrically-gyrating motion, showing the fan-blades on its upper side for preventing entrance of dust to the bearings of said wheel and the eccentric formed thereon. Fig. 4 is a vertical section on a line at right angles to the line of the section shown in Fig. 1, showing more particularly the construction of the chutes; and Fig. 5 is a section through line 1 1, Fig. 1.

My invention has relation to stone or other crushing machines, wherein is employed an eccentrically-gyrating crusher-head; and it has for its objects to so construct the parts of the machine that it is run or operated with less power than formerly required; that the adjustment of the crusher-head and shaft for varying the fineness of the crushing and for taking up the wear of the crushing-faces is made from the top of the machine; that the eccentric driving-gear for the lower end of the crusher-head shaft is oiled from the top of the machine; that dust or débris is effectually excluded from the eccentric driving-gear bearing; that there is less frictional contact between the sleeve on the lower end of the gyrating shaft and the eccentric bore of the driving-wheel, and that the crushed material is conveyed quickly from the machine without tending to lodge upon or clog up any portion of the chuteways.

My invention accordingly consists of the combination, construction, and arrangement of parts, as hereinafter described and claimed, having reference particularly to an eccentrically-gyrating shaft and crusher-head freely suspended from or wholly supported by the top of the machine by means of bolts or other suitable devices having adjusting-nuts or mechanism for raising or lowering the shaft and crusher-head, to adjust the latter for altering the fineness of the crushing and for taking up the wear of the crushing-faces of the machine; to a tubular gyrating crusher-head shaft having near its lower end lateral orifices or ducts leading to adjacent parts of the eccentric and its driving-gear and bearing of the latter, for effecting the oiling of said parts from the top of the machine, the bearing or box for the driving-gear having a valved outlet-duct for surplus oil, and also a drain-outlet; to a driving-gear having an eccentric bore, and upon its upper side a series of angular projections or blades surrounding said bore, for blowing or fanning away any dust or débris tending to gain access to the eccentric bore of the driving-gear; to a sleeve for the lower end of the gyrating shaft, which sleeve on its outside tapers in reverse directions from its horizontal middle to its ends; and, finally, to a two-way chute the top or meeting edges of which form a sharp ridge for preventing deposition of crushed material thereon, and avoid choking or clogging up the chuteways.

In the drawings, A represents the frame or housing of the machine, of preferably a circular or cylindrical configuration, and is composed of top plate or section, B, having feed-openings *b*, of crushing-chamber C, having crushing-faces *c*, of chute or exit-chamber D, and bottom plate, E.

F represents the gyrating shaft; G, the crusher-head secured thereto; H, the driving-wheel having eccentric bore *h*, and in gear with a wheel, I, upon a suitable power-shaft, *i*.

The top plate or section, B, is provided with the usual or any suitable vertical central opening, *b'*, in which are located the boxes or bearings $b^2$ for the ball-fulcrum *f* of shaft F. The boxes $b^2$ are supported upon the heads *k* of bolts K, placed, preferably, in vertical slots or recesses $b^3$ in the sides of opening *b'*, as more plainly shown in Fig. 2. The bolts K pass upwardly through holes *l* in a plate or cross-bar, L, and are provided with nuts or other suitable devices, *k'*, for impingement against plate L, to afford supports for the boxes

$b^2$, and in turn for the shaft F and the crusher-head G. The shaft and crusher-head have no other supports, as the lower end of the shaft does not rest upon a set or tramming screw, as has heretofore been the case, but merely enters the eccentric bore of the driving-wheel H. (See Fig. 1.) As shaft F is freely suspended or wholly supported from the top of the machine by its ball-fulcrum *f*, the shaft and crusher-head are easily gyrated and an economy in the amount of power required for operating the machine is effected.

To raise or lower the shaft F and the crusher-head G, or to adjust the latter for varying the fineness of the crushing, or for taking up the wear of the crushing-faces of the machine, the nuts $k'$ are simply turned or adjusted in the proper direction to slide the boxes $b^2$ up and down in opening $b'$, and the shaft and crusher-head following therewith, the desired adjustment of the crusher-head is made.

The bolts K and their adjusting mechanism and cross-bar L serve the double purpose of freely or wholly supporting the shaft and crusher-head and for altering the adjustment of the latter from the top of the machine.

The shaft F is preferably made hollow, or has a bore, $f''$, which extends downwardly to lateral openings or ducts, $f^2$, located below the top edge of the hub of the driving-gear H, as shown more plainly in Fig. 1.

The oil is poured into the top of the shaft through an opening, $l'$, in plate or cross-bar L, which opening is closed by a screw or removable plug, $l^2$. Plate L is preferably made large enough to completely cover or form a cap for opening $b'$, to exclude dust therefrom and keep the bearing-surfaces of the ball-fulcrum intact. The latter, as well as the driving-wheel, are oiled from the top of the machine, and, if preferred, at the same time. The driving-gear H has an elongated hub, $h'$, which, if desired, may be formed separately from the wheel, as shown. The hub $h'$ has its bearing in a box, *e*, formed on plate E, and is held in position to support wheel H by means of an outside flange, $h^2$, resting upon the top edge, $e'$, of box *e*. Surrounding the edge $e'$ is an annular flange, $e^2$, forming a correspondingly-shaped gutter, $e^3$, adjacent to the hub-flange $h^2$, and from this gutter a duct, $e^3$, leads down through the walls of box *e* to its lower edge and through its cap or cover $e^5$ and is furnished with a stop-cock, $e^6$. If desired, the cap may have removable or screw plug $e^7$, for a purpose hereinafter to be described. The wheel H or its hub $h'$ has an eccentric bore, *h*, for the reception of the lower end of shaft F, and by means of which the eccentrically-gyrating motion is imparted to said shaft. The lower end of the latter is preferably provided with a suitable sleeve, M, held in place by a washer-plate, *m*, and screw $m'$ on the bottom of the shaft. Sleeve M may be made or configured in any desired way, or, in other words, it may be a straight cylindrical sleeve, as heretofore employed. I prefer, however, to use a sleeve the outside of which is tapered transversely from its middle toward its ends, as shown in Fig. 1, the degree or inclination of the taper being the same or about that of the inclination given to the shaft F by the eccentric bore of the driving-gear. Only a portion of the top and lower tapered parts of the sleeve M are at any one time in contact with the eccentric bore *h* of hub $h'$ during the rotation of the latter or during the gyration of the shaft F, and the amount of frictional contact between sleeve M and eccentric bore *h* is thereby materially reduced without affecting the effectiveness of the machine.

The bearing or contacting faces of the shaft F, sleeve M, and wheel H are oiled from the tubular shaft F, and this is accomplished in substantially the following manner: When the lubricant is poured into shaft F, the cock $e^6$ is opened. The oil escaping from lateral shaft-ducts $f^2$ falls upon the sleeve M and works its way downwardly between sleeve M and eccentric-bore *h* to fill the spaces above and below said sleeve, and thence works upwardly between hub $h'$ and box *e* until it reaches the top edge, $e'$, between which and the flange $h^2$ it works out and overflows into gutter $e^3$, and finally passes out through duct $e^4$. As soon as the oil escapes from cock $e^6$, or before this occurs, the filling operation is stopped. The cock $e^6$ is closed when the oil ceases to drip therefrom, and a supply of oil is then contained in box *e* for thorough lubrication of the sleeve and eccentric and driving wheel bearings during the operation of the machine. Any accumulations of thickened or gummy oil in box *e* may from time to time be drained away by unscrewing or removing plug $e^7$.

To facilitate the upward passage of oil between box *e* and hub $h'$ the latter, preferably, is formed with outside vertical recesses, $h^3$, (see more plainly Fig. 5,) of which any suitable number may be used.

The top of the hub of wheel H is closed by a cap or collar, N, which is preferably loose upon shaft F and rests loosely upon the top of the hub. This cap is made large enough in diameter to extend over a series of angular or other shaped wings or projections *n*, formed on the upper side of the wheel H surrounding the hub eye or opening *h*. As the wheel H revolves its wings or projections *n* fan the air about the upper part of the hub of said wheel, and as the cap N rests upon said hub and extends over the wings *n* it tends to direct the air-currents produced by the latter in an outwardly direction or away from the wheel-hub. These currents blowing or directed outwardly from the hub of wheel H fan or blow from it any dust tending to gain access to the bore of the hub. Consequently its inner working-surfaces are kept free from foreign dirt or grit.

The chute chamber or section D is provided with two ways or chutes, *d d*, arranged on opposite sides of the machine. The upper or meeting edges, $d'$, of the chutes form a trans-

verse sharp ridge, $d^2$, of the same inclination as that of the chutes, to prevent the lodgment of crushed material thereon and provide for quick exit of the material from the machine without tending to clog on the chuteways.

From the ridge $d^2$ and chuteways projects upwardly an annular flange, $p$, which is surrounded by a like flange, $p'$, depending from a sleeve, P, which may be secured in the usual or any suitable manner, as shown, to shaft F, to receive the crushing-faces G′ of the crusher-head G. I, however, prefer to cast sleeve P on said shaft. These annular flanges $p\,p'$ tend to prevent dirt or dust passing into the chamber D beneath its chutes, as the crushed material falls upon the chutes outside of said flanges.

The crusher-faces G′ may be constructed as desired, and are preferably connected to sleeve P by molten lead or metal keys $p^2$ in the usual manner.

To firmly support the crusher-head G upon sleeve P, the latter is preferably formed near its bottom with a shoulder, $p^3$, upon which the crusher-head G rests.

The casting of the sleeve P upon the shaft F, in addition to the use of the molten-metal connection for the crushing-faces G′ and sleeve P, admits of securing a crusher-head, the parts of which are firmly secured to the shaft and to each other without fitting or finishing. The chamber C is formed near its bottom with a like shoulder, $c'$, to support its crushing-faces $c$, and to prevent the latter moving or rising in said chamber they are formed near their upper ends with outside projecting flanges, $c^2$, which fit into correspondingly-shaped adjacent recesses $c^3$ in chamber C.

If desired, two flanges may be formed on the faces $c$ and two recesses made in chamber C, as indicated by dotted lines $x$, Fig. 1, to more effectually maintain said crushing-faces in place.

By the employment of the flanges $c^2$ and recess $c^3$ the advantage of obtaining the full thickness of the crushing-faces at their top parts is obtained, and they are therefore not liable to break off. Said flanges and recess also prevent the upward crushing strains or pressure against the faces $c$ falling upon the joint between chamber C and its top plate, B, and hence all tendency to loosening the bolts connecting said parts is avoided. The various sections of the frame of the machine are suitably flanged, bolted, as shown, or they may otherwise be secured together, as desired.

In the drawings I have shown two bolts, K, for the boxes $b^2$ of shaft F, and these bolts located between the boxes and the sides of the opening $b'$ in top section, B; but I do not limit myself thereto, as other means shown and described in an application of even date herewith, Serial No. 173,536, may be substituted for said bolts.

What I claim is—

1. In a crushing-mill, an eccentrically-gyrating shaft, in combination with devices for wholly and freely suspending the shaft and for adjusting it from the top of the machine, substantially as shown and described.

2. In a crushing-machine, the combination of a crushing-chamber, an eccentrically-gyrating shaft and crusher-head, suitable boxes for the fulcrum of the shaft, and devices for supporting said boxes and moving them up and down to adjust the shaft and the crusher-head, as and for the purpose set forth.

3. In a crushing-machine, the eccentrically-gyrating shaft F, in combination with boxes $b^2$, cap L, and supporting and adjusting devices K, substantially as shown and described.

4. The combination of frame A, having crushing-chamber C and top section, B, provided with central opening, $b'$, eccentrically-gyrating shaft F, having crusher-head G, boxes $b^2$, cap L, and supporting and adjusting bolts K, substantially as shown and described.

5. In a crushing-machine, the combination of annular crushing-chamber C, having at its lower edge an inwardly-projecting annular shoulder, $c'$, and at its upper edge annular recesses or grooves $c^3$, annular crushing-faces $c$, the bottom edges of which rest upon shoulder $c'$ and have outside flanges, $c^2$, fitting in grooves $c^3$, and top plate, B, substantially as shown and described.

6. In a crushing-machine, the combination of a crushing-chamber, an outlet-chamber having chuteways and an upwardly-projecting flange, $p$, an eccentrically-gyrating shaft having sleeve P, provided with shoulder $P^3$, and depending flange $p'$, surrounding flange $p$, and the crusher-head G, secured to said sleeve, substantially as shown and described.

7. In a crushing-machine, the combination of tubular shaft F, having lateral ducts $f^2$, driving-gear H, having hub $h'$, provided with an eccentric bore, $h$, an outside annular flange, $h^2$, and vertical groove or recess $h^3$, extending downwardly from flange $h^2$, bottom section, E, having bearing $e$, gutter $e^3$, plate $e^5$, and a valved outlet-duct, $e^4$, leading from gutter $e^3$, substantially as shown and described.

8. In a crushing-machine, the combination of tubular shaft F, having lateral openings $f^2$, cap or cover L, having oil-supply opening $l'$, driving-gear H, eccentric hub $h'$ for said shaft, having outside flange, $h^2$, and vertical groove $h^3$, bottom section, E, having bearing $e$, gutter $e^3$, valved duct $e^4$, and plate $e^5$, provided with drain-outlet $e^7$, substantially as shown and described.

9. In a crushing-machine, the combination, with its gyratory shaft F, of driving-wheel H, having projections $n$, and a plate or collar, N, loose on shaft F and resting upon the upper edge of the hub of wheel H, as and for the purpose set forth.

10. In a crushing-machine, the combination of a suitable crushing-chamber, chamber D, having two oppositely-located chutes, $d\,d$, the upper or meeting edges of which form a diametrical ridge across the top of said chamber, and a central opening having upwardly-projecting flange $p$ in said ridge, and a gy-

ratory crusher-head, G, having bottom flange $p'$, surrounding flange $p$, substantially as shown and described.

11. In a crushing machine, the combination of a suitable crushing-chamber, shaft F, having crusher-head G, driving-wheel H, having eccentrically-arranged bore, and sleeve M, tapering on its outside in opposite directions from its middle to its ends, as and for the purpose set forth.

12. In a crushing-machine, the combination of shaft F, having ball-fulcrum $f$, boxes $b^2$, supporting and adjusting mechanism for said boxes, driving-gear H, having eccentric bore $h$, sleeve M, loosely secured to the lower end of shaft F, and washer and screw device $m\ m'$, substantially as shown and described.

13. In a crushing-machine, the combination of a suitable crushing-chamber, top plate, B, tubular gyrating shaft having ball-fulcrum $f$ and crusher-head G, boxes $b^2$, bolts K, for supporting and adjusting said shaft and crusher-head, and plate L, having removable plug $l^2$, substantially as shown and described.

14. In a crushing-machine having a tubular gyrating shaft with lateral ducts $f^2$, in combination with driving-wheel H, having vertical recess $h^3$, and plate E, having bearing $e$, gutter $e^3$, and outlet $e^4$ from the latter, substantially as shown and described.

15. In a crushing-machine, the shaft E, having a sleeve, P, cast directly thereon, and crushing-faces G', affixed to said sleeve by lead or like metal keys $p^2$, substantially as shown and described.

16. In a crushing-machine, a suitable crushing-chamber and crusher-head having crushing and pulverizing faces combined with a gyratory shaft for said crusher-head, having a ball-fulcrum, boxes for said fulcrum, and supporting and adjusting screws K for said boxes, substantially as shown and described.

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

ROBERT McCULLY.

Witnesses:

S. J. Van Stavoren,

Chas. F. Van Horn.