

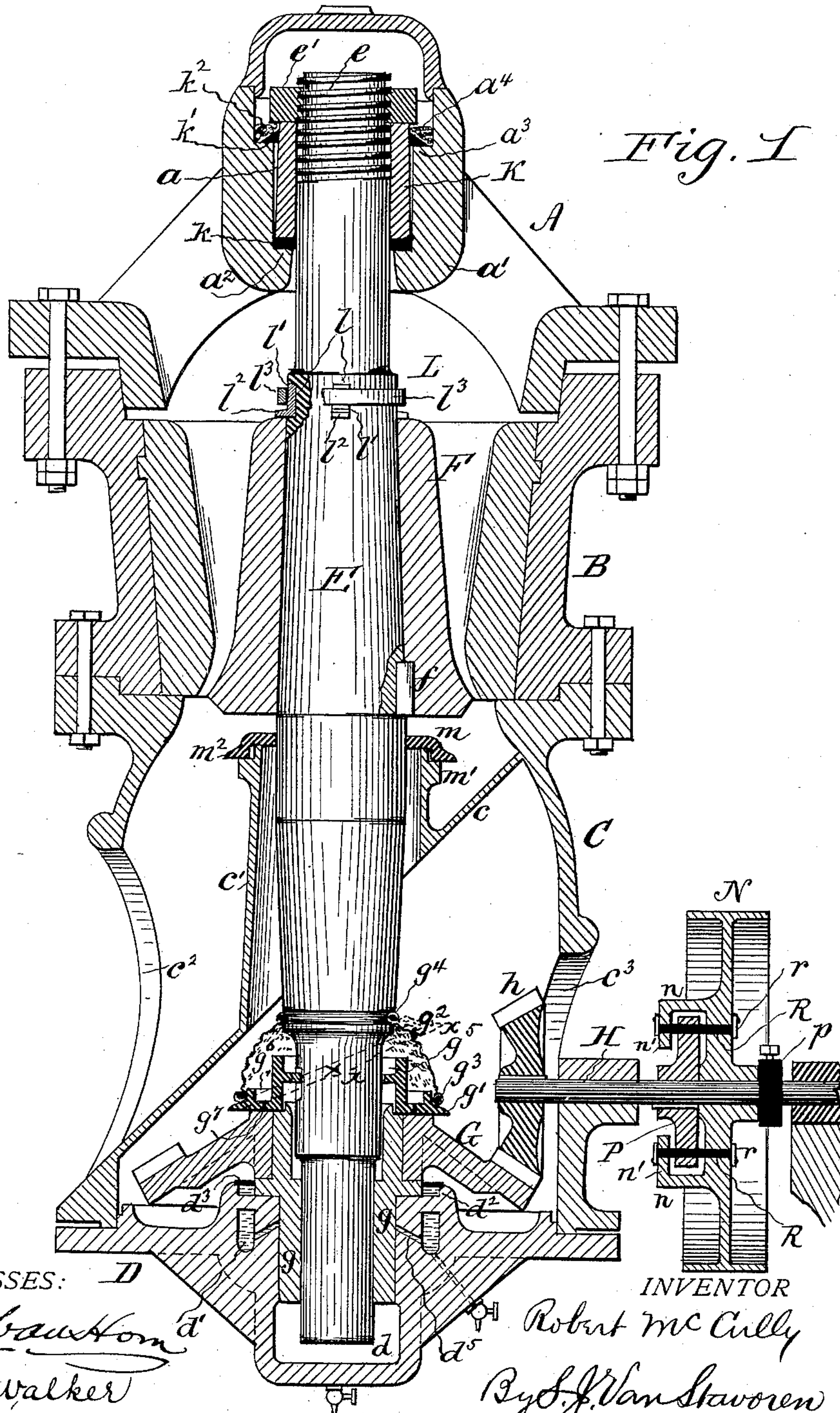
(No Model.)

3 Sheets—Sheet 1.

R. McCULLY.
CRUSHING MACHINE.

No. 463,162.

Patented Nov. 17, 1891.



WITNESSES: *D*
Wm. H. Baughman
Chas. W. Walker

INVENTOR
Robert McCully
By J. J. Van Stavern
ATTORNEY

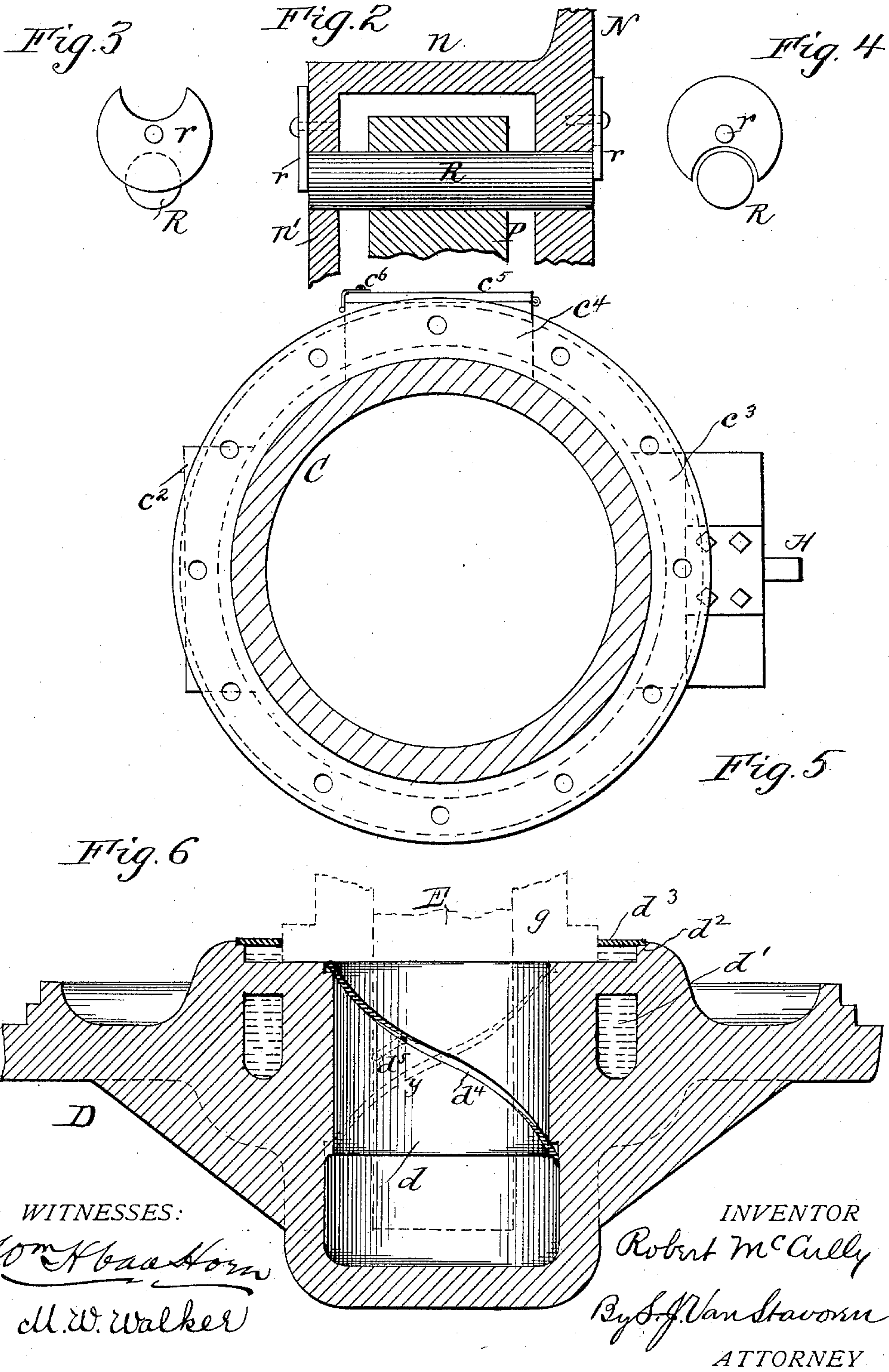
(No Model.)

3 Sheets—Sheet 2.

R. McCULLY.
CRUSHING MACHINE.

No. 463,162.

Patented Nov. 17, 1891.



WITNESSES:
Tom H. H. Horn
M. W. Walker

INVENTOR
Robert McCully
By S. J. Van Stavern
ATTORNEY

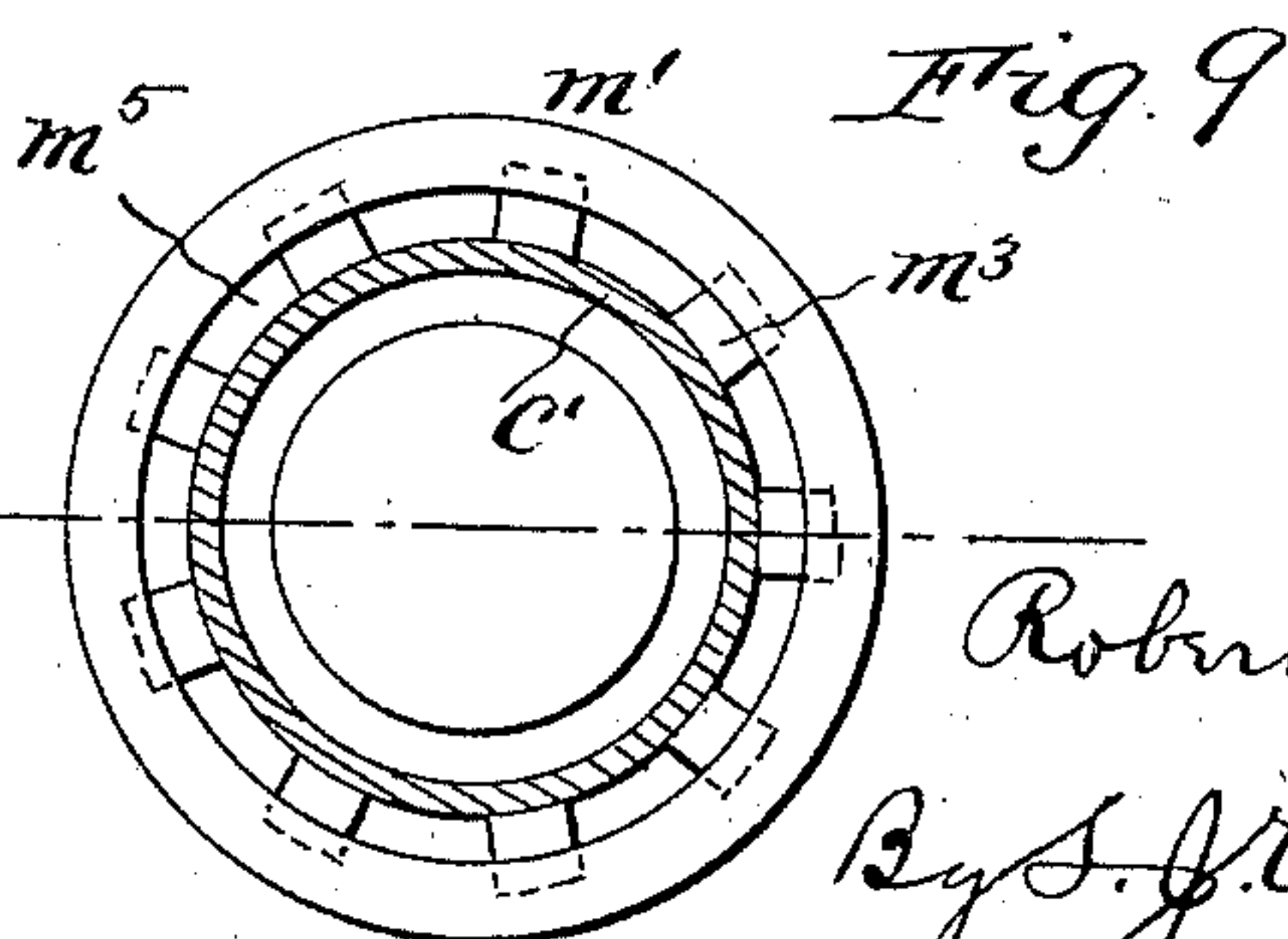
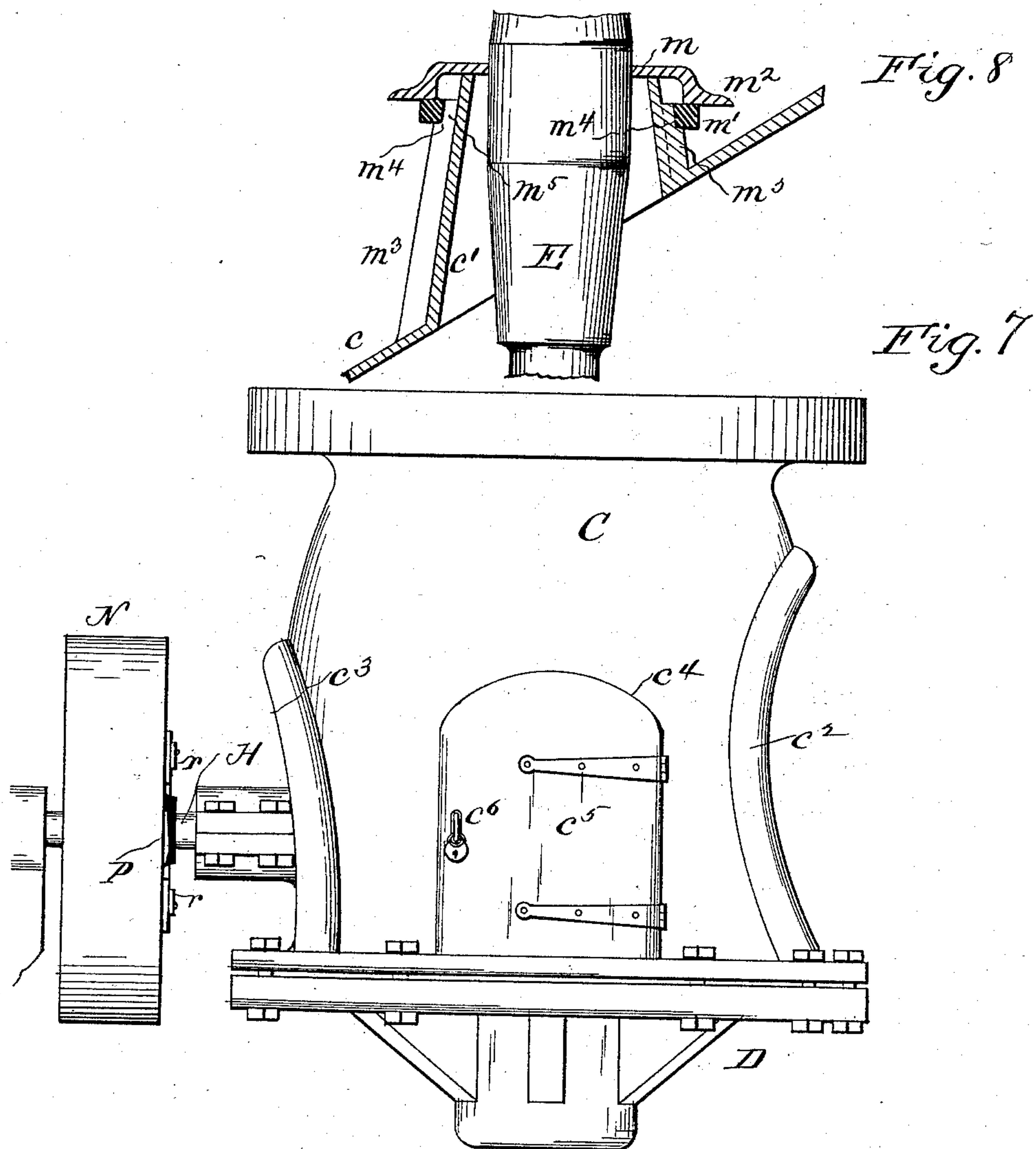
(No Model.)

3 Sheets—Sheet 3.

R. McCULLY.
CRUSHING MACHINE.

No. 463,162.

Patented Nov. 17, 1891.



WITNESSES:

Wm H. Van Horn
Chas. W. Walker

INVENTOR

Robert McCully

By S. J. Van Stavoren
ATTORNEY

UNITED STATES PATENT OFFICE.

ROBERT McCULLY, OF PHILADELPHIA, PENNSYLVANIA.

CRUSHING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 463,162, dated November 17, 1891.

Application filed August 20, 1888. Serial No. 283,194. (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.

My invention has relation, generally, to crushing-machines having gyratory shafts and crusher-heads, and particularly to that form of the same in which the upper end of the gyratory shaft is cylindrical and fits in a corresponding bore of a sleeve having a tapered outside periphery, so that said sleeve will rotate or move with the shaft end to give to it an extended fulcrum-bearing surface and yet admit of the shaft being vertically adjusted without changing its angle of inclination; and it has for its object improvements in details of construction, which enhance the simplicity, durability, and effectiveness of the machine.

My invention accordingly consists of the combinations, constructions, and arrangements of parts, as hereinafter set forth in the specification, and pointed out in the claims.

Reference being had to the accompanying drawings, Figure 1 represents a vertical section, partly in elevation, of a crushing-machine, with a gyratory shaft suspended or supported from its upper end, embodying my improvements, the shaft being drawn or represented as at the central position of its movement or throw; Fig. 2, a sectional elevation, drawn to an enlarged scale, of part of the driving-wheel for the counter-shaft for the machine, part of a disk or lugs keyed or fixed on said shaft, a frangible or break-bar connecting said wheel and disk, and pivoted washers on the wheel adjacent to the ends of the break-bar for holding it in position and admitting of easy withdrawal of fragments of same when broken and for replacement by a new break-bar; Fig. 3, an end view of said bar and one of the end washers, showing preferable form of washer in its normal position in front of the end of the break-bar; Fig. 4, a like view showing the washer moved out of the way of the end of the break-bar to admit of its withdrawal from and insertion into its bearings or supports; Fig. 5, a plan, partly

sectional, of the chute-chamber of the machine, showing more plainly the chute-exit opening, the counter-shaft opening, and a third opening with door or cover, by means of which access is obtained to the lower interior part of said chute-chamber while the machine is running for oiling the shaft and its driving-eccentric bearing and for other purposes; Fig. 6, a vertical section, drawn to an enlarged scale, of part of the bottom plate of the machine, showing more plainly the spirally-arranged oiling-grooves in the well or bearing for the hub of the driving-wheel for the gyratory shaft; Fig. 7, an elevation of the chute-chamber of the machine, showing more plainly the covered opening therein for obtaining access to the interior of said part below the chute or floor thereof when the machine is in operation; Fig. 8, a vertical section, drawn to an enlarged scale, of the shaft-opening in the chute or floor for said chamber, showing a preferable construction of dust excluder or shield between said opening and the shaft; and Fig. 9, a plan, partly sectional, of the same.

A, B, C, and D severally represent the top plate, crushing-chamber, chute-chamber, and bottom plate of the machine, and E the gyratory shaft having crusher-head F and driving-wheel G meshing with a wheel *h* on counter-shaft H, all of which may be constructed and arranged for operation in the usual or other desired manner, except as hereinafter noted, which exceptions comprise my present improvements.

In the drawings, Fig. 1, I have shown the improvements applied to a machine, the gyratory shaft of which is supported at or suspended from its upper part by means of a screw-thread *e* thereon and a nut *e'* engaging with said screw-thread and resting upon the top of a sleeve K in the bore *a* of hub *a'* of plate A, said sleeve in turn resting upon a shoulder *a²* at the bottom of said bore, as shown, and as described and claimed in another pending application filed by me November 18, 1887, Serial No. 255,468.

My present improvements for the above-described gyratory-shaft support consist, first, in inserting a steel or other like washer *k* between the shoulder *a²* and the bottom edge of

the sleeve K in order to avoid wear of said shoulder, and thus maintain its strength during the life of the machine, and as the washer and the bottom edge of the sleeve wear it is taken up by substituting a new washer for the old or worn washers, and, second, to form or provide another shoulder a^3 at the top of the bore a , upon which rests a washer k' , which snugly fits the sleeve K. The use of this washer provides an oil-chamber a^4 in bore a above the washer and prevents dust, dirt, or other solid substances entering said chamber, gaining access to and packing in the play-space between the sleeve K and bore a , and as such play-space is free from such packing the sleeve K is always free to gyrate easily and to the full extent of its movement in the bore a . Hence undue friction between the bore a and the sleeve K and consequent lateral strains on the shaft, due to the presence of such packing in said play-space in the machines as heretofore constructed, are avoided.

To facilitate directing the movement of the dirt, grit, or other solid substances entering chamber a^4 away from the sleeve K, as well as to increase the area of chamber a^4 in cross-section, the upper surface of washer k' is inclined or tapered from the inner to the outer periphery of the washer to make its outer periphery a feather-edge, and its diameter is less than that of the chamber a^4 , so that said dirt or substances settling down on the washer are by its inclined side directed toward its outer or feather-edge periphery, which moves or pushes the same away from the washer into the space between the latter and the wall of the chamber a^4 , so that such dirt or solid substance cannot find its way through the joint between the washer and the shoulder a^3 to the play-space between the sleeve and the bore a .

If desired, a suitable waste or packing k^2 may be inserted in the oil-chamber a^4 to retain the oil therein and prevent too rapid feeding of oil to the shaft and sleeve bearings or into the bore a .

The crusher-head F may be of any suitable configuration, and it is preferably keyed to shaft E, as shown at f , so as to gyrate therewith, and as shown and described in my other aforesaid pending application; but to prevent upward movement of the crusher-head on the shaft independently of it I dispense with the screw-threads and the jam-nut on the shaft above the crusher-head, as shown in said other pending application, and prefer to substitute therefor the clamping device L, (shown in Fig. 1,) which is constructed as follows: Around the shaft, above the crusher-head and in the periphery of the shaft, are formed or cut two or more recesses or seats l , into which are placed keys l' , having bottom lateral projections l^2 , which extend to and overlap the top of the crusher-head, as shown. The upper parts of the keys l' are preferably flush with the periphery of the shaft and are held in place by a metal ring l^3 , which is driven down

or shrunk upon the shaft. As the keys l' are held against upward movement by the slots or recesses l in the shaft, the toes or projections l^2 on the keys prevent the crusher-head F moving upwardly independently of the shaft. This described construction of clamp L avoids the expense of cutting screw-threads on the shaft, and also the use of the clamping-nut and key or jam-nut therefor, as described in my aforesaid other application.

The chute-chamber C is provided with a chute or incline c , having a tubular shaft-opening c' and a single exit-opening c^2 , preferably, although, if desired, more than one of these openings c^2 may be employed. Said chamber has also in its side the usual opening c^3 for the passage of the counter-shaft H and gearing thereon, and in addition to said openings there is another side opening c^4 , (seen more plainly Fig. 5,) which is so located that it leads into chamber C below the chute or incline c , so that access may be obtained to the interior of chamber C below its chute c while the machine is running for oiling or other purposes without necessitating the use of the counter-shaft opening c^3 for said purposes. The provision of opening c^4 for oiling or other purposes therefore admits of obtaining access to the interior of chamber C below the chute c without stopping the machine, and all danger incident to use of the counter-shaft opening c^3 for the purposes above stated while the machine is in operation is avoided. The opening c^4 is closed by a hinged or removable door c^5 , having a lock or other fastening c^6 , if desired, to prevent inadvertent use of said opening. These various side openings in the chute-chamber may be relatively located around the chamber, as indicated in Fig. 5, or they may be equidistant or radially located, as desired. In any case, however, the lower section-casing C has an oblique or inclined chute or partition c , dividing it into an upper and a lower chamber, and in front of said chute or partition in the wall of the upper chamber is the chute exit-opening c^2 , and in the wall of the lower chamber and back of the chute incline or partition c is the counter-shaft opening c^3 and the secondary opening c^4 , the latter two openings always being in the walls of said lower chamber and relatively located in respect to one another as desired, the opening c^4 having, preferably, a removable cover or door c^5 . This described construction of casing-section C admits of the driving-eccentric for the gyratory shaft E being oiled without stopping the machine, and its operation being continuous the largest extent of product or output is obtainable, which is not the case if the machine is stopped whenever oiling is necessary.

The upper end of the shaft-opening c' in chute c is provided with a metal dust plate or shield m of any suitable form or construction. I prefer, however, to provide the exterior of said tubular opening c' with an annu-

lar collar m' , located below its top edge, and the plate m with a depending flange m^2 to make the plate of an inverted-dish-shaped form, so that the bottom of the flange m^2 rests upon the collar m' , and the bottom of the plate contacts with the top of opening c' to provide a double joint or tortuous path for the dust or dirt to travel through before gaining access to opening c' .

The collar or ring m' may be cast integral with the tubular opening c' ; but for economy of construction and to prevent lodgment of dirt on said collar I prefer the construction shown in Figs. 8 and 9, wherein the tubular opening c' is cast with outside radially-arranged vertical ribs m^3 , extending to near the top of the opening c' and provided with corner shoulders m^4 , upon which the ring or collar m' is driven or shrunk, and when in position a number of openings m^5 are provided between the collar m' and the outside periphery of the tubular opening c' . Any dust or dirt lodging on or working its way through the joint between the plate-flange m^2 and collar m' is by the gyratory movement of plate m , pushed into and dropped through the recesses or openings m^5 onto the chute c .

The driving-wheel G is provided with a hub g , having an eccentric-bore for the lower end of shaft E , which hub has its bearing in the central well or opening d of the bottom plate D , and said well has an annular communicating oil-chamber d' , and upon the top of wheel G is an oiling plate or chamber g' , all constructed and arranged for operation, substantially as set forth in my aforesaid pending application.

To prevent dust and dirt gaining access to the oiling plate or chamber g' , I surround or cover it with a hood of canvas or other flexible material g^2 , having a bottom annular ring or stiffened edge g^3 , resting upon the plate g' , as hereinafter stated, and its upper edge g^4 is suitably fastened to the shaft E , as shown, or otherwise, as desired. As the hood g^2 is flexible, it accommodates itself to the vertical adjustment of the shaft, and it can be raised, as indicated by dotted lines x , Fig. 1, to admit of access to the oiling-plate g' . The latter has a key connection with the shaft E , as shown and claimed in my aforesaid pending application, and in addition to the central oil-chamber g^5 for the shaft it also has an exterior chamber g^6 , surrounding the former, from which lead ducts g^7 to the top of the wheel G to lubricate the contacting-surfaces of said wheel and oil-plate, so as to avoid undue friction between said parts. The stiffened edge g^3 of the hood g^2 rests upon the plate g' beyond or exterior to the chamber g^6 in said plate, so as to cover the latter as well as the chamber g^5 .

To prevent the oil in chamber d' in bottom plate D being splashed out of said chamber by the rotation of the hub of wheel G , the upper edge of said chamber is formed with a

shoulder d^2 for the reception of washer or cover d^3 , which fits the hub g of the wheel G snugly, as shown more plainly in Fig. 6.

To thoroughly oil the bearings of the hub g in well d , I prefer to cut or form in the wall of the latter spiral grooves d^4 , which communicate with the oil-chamber d' by means of transverse passages d^5 , connecting the same. Two of these spiral grooves are preferably used, each beginning at the upper edge of the well d at diametrically-opposite points and extending half-way around and terminating at the bottom of the bearing or contact surfaces in said well for the hub g . One of these grooves for one half of the well d is indicated in full lines in Fig. 6, and the direction of the other groove for the other half of the well is indicated by the dotted lines Y in said figure. The employment of these grooves provide two gutters or channels of oil in the well or bore d for direct contact with the entire surface of the hub g as it revolves, so that all parts of the same are always effectually oiled and any tendency to heating is avoided, whereas in my other pending application the oiling of the entire surface of said hub is dependent upon the film of oil finding or working its way between the hub and the well-walls.

Any suitable form of break-pin connection for the driving-wheel N on counter-shaft H may be employed; but I prefer the form shown in Figs. 1 to 4, inclusive, wherein the loose wheel N on shaft H is provided with oppositely-located bent arms n , which straddle or overlap a disk P , keyed or otherwise secured to shaft H .

The approaching limbs n' of arms n , the disk P , and the web or spoke arms of wheel N are provided with registering openings, through which are inserted the break pins or bars R for connecting said disk and wheel, and the break-bars therefore have a direct bearing at three points, one at each end and one at their center, which prevent the bar being twisted or subjected to torsional strains, as is the case when the break-bar is fastened at only two points, as heretofore. The ends of the break-bars are preferably flush with the wheel-web and with the limbs n' of arms n to admit of pivoting to said parts washers or covers r , which drop in front of said bar ends to keep them in position. Any suitable form of washers or covers r may be employed; but I prefer the crescent form shown in Figs. 3 and 4.

In the drawings I have for strength illustrated two oppositely-located break-bars; but, if desired, for ordinary or small machines one break-bar only need be used.

The wheel N is held in position on shaft H by an adjustable collar p , as usual.

In a companion case, Serial No. 213,797, I have shown, described, and claimed, broadly, a form of flexible dust shield or protector between the gyratory shaft and the driving-wheel, and hence I do not herein make any broad claim to a form of flexible shield in it-

self, but only when combined with a plate g' separate from and resting on the top of the driving-wheel and connected to the gyratory shaft so as to gyrate therewith, the lower part of said shield resting loosely upon plate g' , so as to admit of raising such lower edge from plate g' for oiling or other purposes.

I do not herein claim, broadly, the top frame-plate having a central hub-bore with inwardly-projecting flange at its bottom, combined with a gyratory shaft having an upper cylindrical and screw-threaded end provided with a nut, and a sleeve on said shaft end between said nut and hub-flange having a cylindrical bore and a tapered periphery, as the same form part of the subject-matter of another pending application filed November 18, 1887, Serial No. 255,468; nor do I broadly claim herein the combination, with a gyratory shaft, a detachable crusher-head having at its bottom and in its bore a vertical recess with lower open end, a correspondingly-located key on said shaft for engagement with said crusher-head recess for preventing horizontal and downward movement of the crusher-head, and devices on the shaft at the top of the crusher-head for preventing upward movement of the crusher-head on the shaft, as the same form part of the subject-matter of said other pending application, Serial No. 255,468. Nor do I herein broadly claim the combination, with a gyratory shaft and its driving-wheel or other fixture, of a flexible shield having end hubs or rims united by a curved part, one of said hubs being secured to the shaft and the other being in engagement with the driving wheel or fixture, as the same forms part of the subject-matter of another pending application, filed September 17, 1886, Serial No. 213,797.

The sleeve K snugly fits the upper part of the shaft E and is tapered on its outside, so that its periphery gradually decreases from below upward, or it is wider or has its greatest exterior diameter at its bottom in order to gyrate with the shaft E. The top of the latter is provided with a screw-nut or other supporting-head e' , resting upon the top of sleeve K, and by means of which, if desired, the shaft is vertically adjusted.

I do not herein claim the section-casing C, having inclined chute c dividing the casing C into an upper and a lower chamber, a chute-opening c^2 in said upper chamber, a counter-shaft opening c^3 in the lower chamber, and the large or man-hole opening in the latter intermediate of the openings c^2 and c^3 and below the chute c with a removable cover or door, as the same forms the subject-matter of a separate application filed by me April 8, 1891, Serial No. 388,123, the latter being a division of the present application.

What I claim is—

1. In a crushing-machine, the combination of the gyratory shaft E, sleeve K, having an outside taper and gyrating with shaft, the top plate A, having central hub provided with

a bore or opening a , a shoulder a^2 at the bottom of said bore, a washer k between said shoulder and sleeve, and a nut or supporting device e' at the top of shaft E and resting on sleeve K, substantially as set forth.

2. In a crushing-machine, the combination of a gyratory shaft E, sleeve K, gyrating with said shaft, the top plate A, having a suitably-formed central bore or opening a to admit of the gyration of said shaft, shoulder a^2 at the bottom, and a shoulder a^3 near the top of said bore, and a loose washer K' , resting on said shoulder a^3 and fitting said sleeve, substantially as set forth.

3. In a crushing-machine, the combination of gyratory shaft E, having a nut or supporting device e' at its top, sleeve K, having an outside taper and gyrating with shaft E, the top plate A, having central bore or opening a , shoulder a^2 at the bottom and shoulder a^3 near the top of said bore, and loose washer k' , resting upon said shoulder and fitting said sleeve and having an outer feather edge or periphery, substantially as set forth.

4. In a crushing-machine, the combination of gyratory shaft E, having a nut or supporting device e' at its top, sleeve K, top plate A, having central bore or opening a , lower and upper shoulders a^2 a^3 in said bore, washer k between shoulder a^2 and sleeve K, and loose washer k' , resting upon shoulder a^3 and fitting said hub, substantially as set forth.

5. In a crushing-machine, the combination of shaft E, having vertical seats or recesses l , crusher-head F, secured to the shaft E below said vertical seats or recesses, keys in said recesses overlapping the crusher-head, and a band or ring surrounding said keys, substantially as set forth.

6. In a crushing-machine, the combination of gyratory shaft E, crusher-head F, seats l in said shaft, keys l' , having bottom lateral projections l^2 , and a fastening-ring l^3 , substantially as set forth.

7. In a crushing-machine, the combination of a gyratory shaft, a crusher-head on said shaft, recesses and keys on the shaft above the crusher-head, a ring l^3 for said keys, and a vertically-rigid key f at the bottom of the crusher-head between it and said shaft, substantially as set forth.

8. In a crushing-machine, the combination of a gyratory shaft E, chute c , having tubular shaft-opening c' , collar m' on the exterior periphery of opening c' and below its top edge, and a rigid or metal-plate shield m , surrounding said shaft and shaft-opening and having a depending edge flange m^2 , the bottom side of shield m resting upon the top edge of opening c' and the underside of flange m^2 resting upon collar m' , substantially as and for the purpose set forth.

9. In a crushing-machine, the combination of gyratory shaft E, the chute c , having the central tubular part c' , provided on its outside with the ribs m^3 and the shoulders m^4 , the collar m' on said shoulders, and metal

plate m , having flange m^2 , substantially as set forth.

10. In a crushing-machine, the combination of gyratory shaft E, driving-wheel G, plate g' , separate from and resting on the top of said wheel and gyrating with said shaft, and flexible hood g^2 , fastened at its upper edge to said shaft and its lower edge resting loosely on plate g' , substantially as set forth.

11. In a crushing-machine, the combination of gyratory shaft E, driving-wheel G, plate g' , separate from and resting on the top of said wheel and loosely keyed to said shaft, and flexible hood g^2 , secured at its upper end to the shaft and having a stiffened lower edge or rim resting on said plate, substantially as set forth.

12. In a crushing-machine, the combination of gyratory shaft E, driving-wheel G, the plate g' , having central oiling-chamber and a second oiling-chamber surrounding said central chamber, said plate resting upon wheel G and loosely keyed to said shaft, and hood g^2 , surrounding or inclosing the oil-chambers in said plate, substantially as set forth.

13. In a crushing-machine, the combination of gyratory shaft E, driving-wheel G, oiling-plate g' , having two separate concentric oiling-chambers and resting on the top of wheel G, and hood g^2 , connected at its upper part to the shaft E and its lower part or edge resting upon plate g' outside of its oiling-chambers, substantially as set forth.

14. In a crushing-machine, the combination of gyratory shaft E, driving-wheel G, having hub g , the bottom plate D, having well d , concentric oiling-chamber d' , communicating with said well, and a cover or washer d^3 at the top of said chamber d' and fitting said hub, substantially as set forth.

15. In a crushing-machine, the combination of bottom plate D, having well d , an oiling-chamber d' , the top edge of which is provided with a shoulder d^2 , driving-wheel G, having hub g , and washer or cover d^3 on shoulder d^2 and fitting said hub g , substantially as set forth.

16. In a crushing-machine, the combination of a gyratory shaft, a driving-wheel G, counter-shaft H, gearing between said shaft and wheel, fixed disk P, loose wheel N, having arms n straddling said disk, and break-bar having end and central bearings in said wheel N, arms n , and disk, substantially as set forth.

17. In a crushing-machine, the combination of a gyratory shaft E, driving-wheel G, counter-shaft H, the fixed disk P, loose wheel N, having arms n straddling said disk, registering openings in said arms, disk, and wheel web or spokes, and break-bars passing through said openings, substantially as set forth.

18. In a crushing-machine, the combination of a gyratory shaft E, driving-wheel G, counter-shaft H, the fixed disk P, loose wheel N, having arms n straddling said disk, registering openings in said arms, disk, and wheel web, break-bars passing through said openings, and end pivoted covers or washers, substantially as set forth.

19. In a crushing-machine, the combination, with a gyratory shaft E, driving-wheel G, having hub g provided with an eccentric bore for shaft E, bottom plate D, having well d , spiral grooves or channels d^4 in the walls of well d , an annular oil well or gutter surrounding well d , and passages or ducts d^5 between said spiral grooves and gutter, substantially as and for the purpose set forth.

20. In a crushing-machine, the combination of a gyratory shaft E, driving-wheel G, having an eccentric bore g for shaft E, collar g' on the top of said driving-wheel, a flexible shield g^2 , secured at its upper end to shaft E and its lower end resting on said collar g' , chute-chamber opening c' , and metal shield m on the top of opening c' and surrounding shaft E, substantially as set forth.

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

ROBERT McCULLY.

Witnesses:

S. J. VAN STAVOREN,
CHAS. F. VAN HORN.