A. NIEDERMEYER & R. BERNHARD.

CRUSHER.

APPLICATION FILED AUG. 2, 1909.

960,232.

Patented May 31, 1910

2 SHEETS—SHEET 1.

Fig. 1.

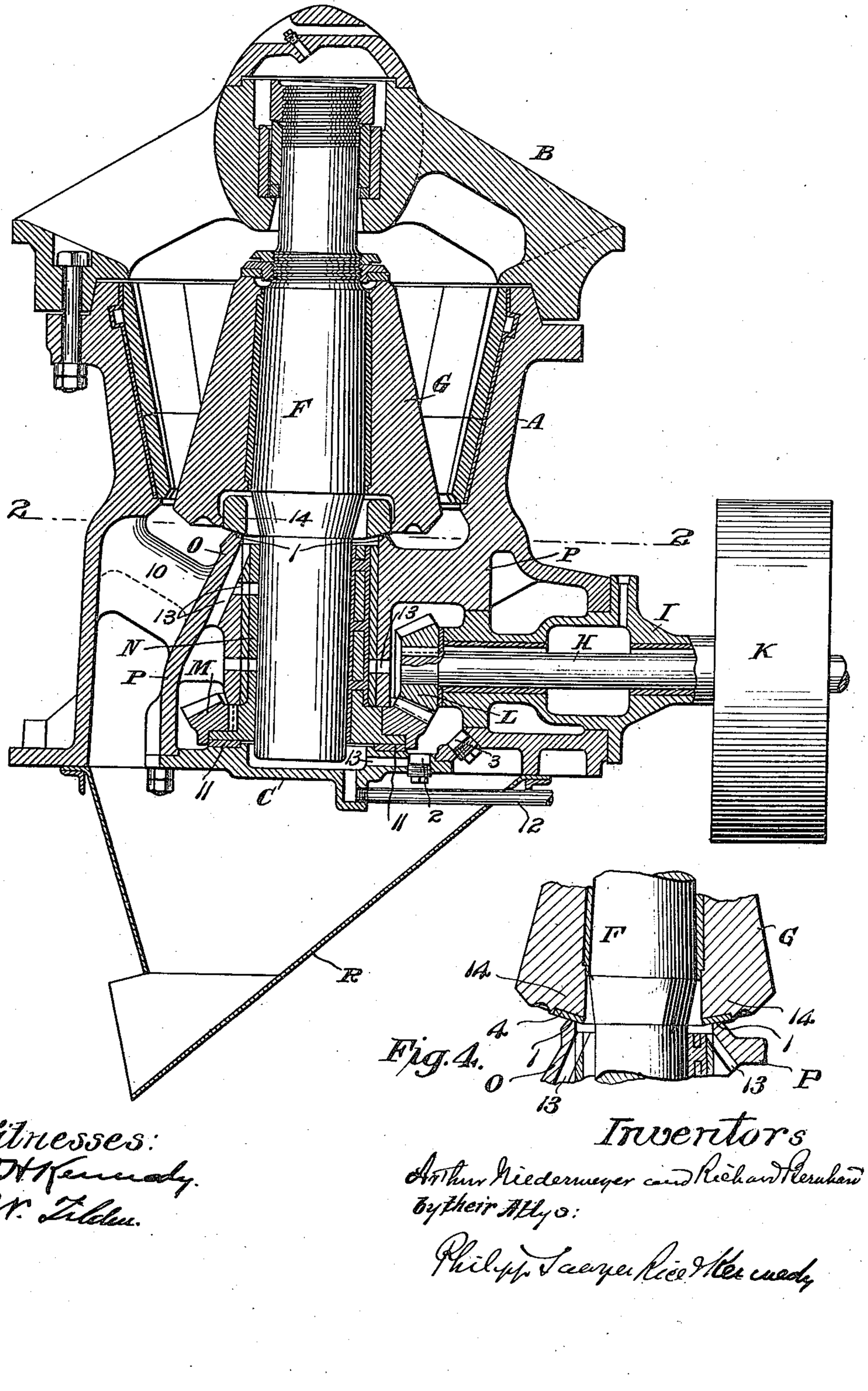

Fig. 4.

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2 SHEETS—SHEET 2.

Fig. 2.

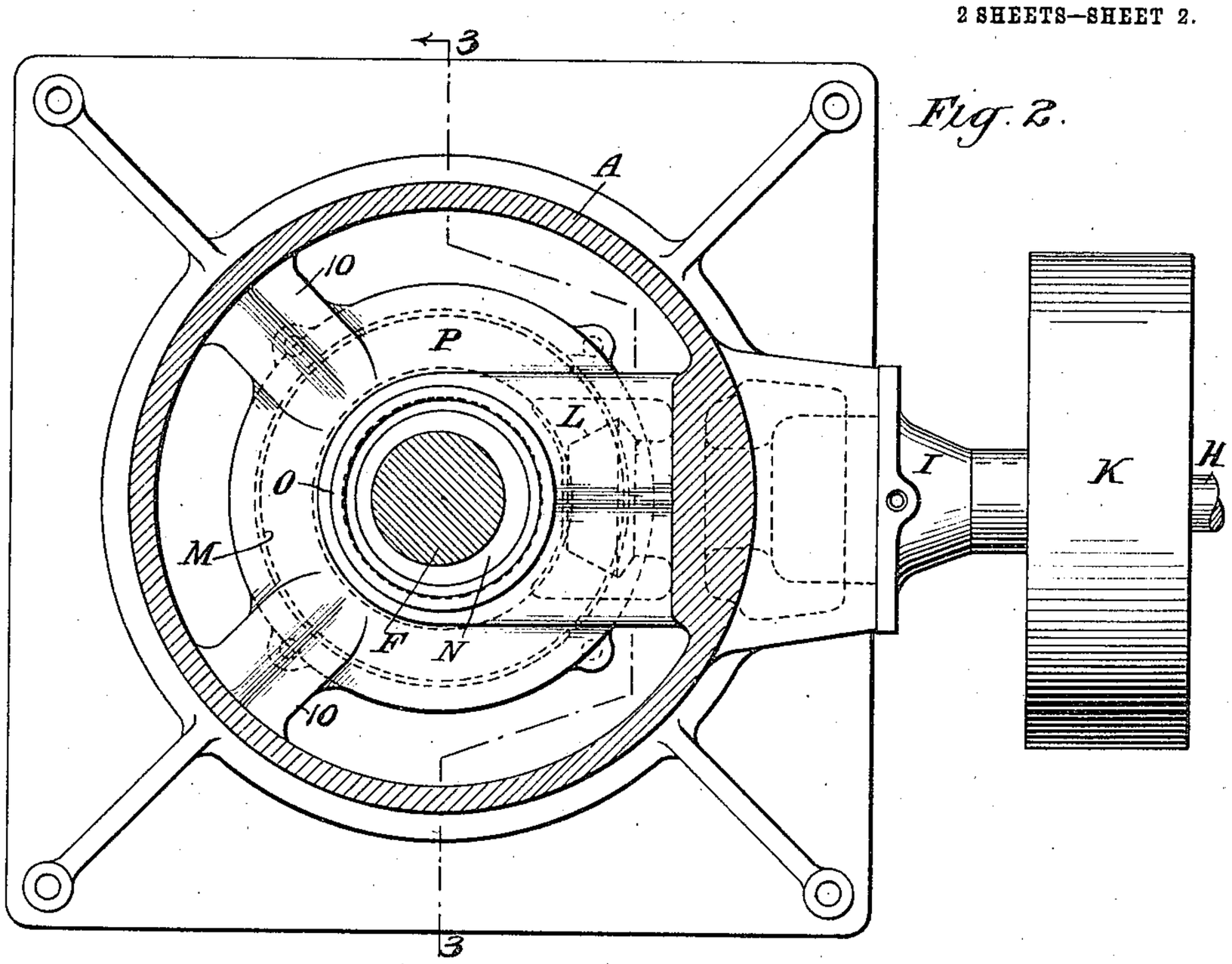
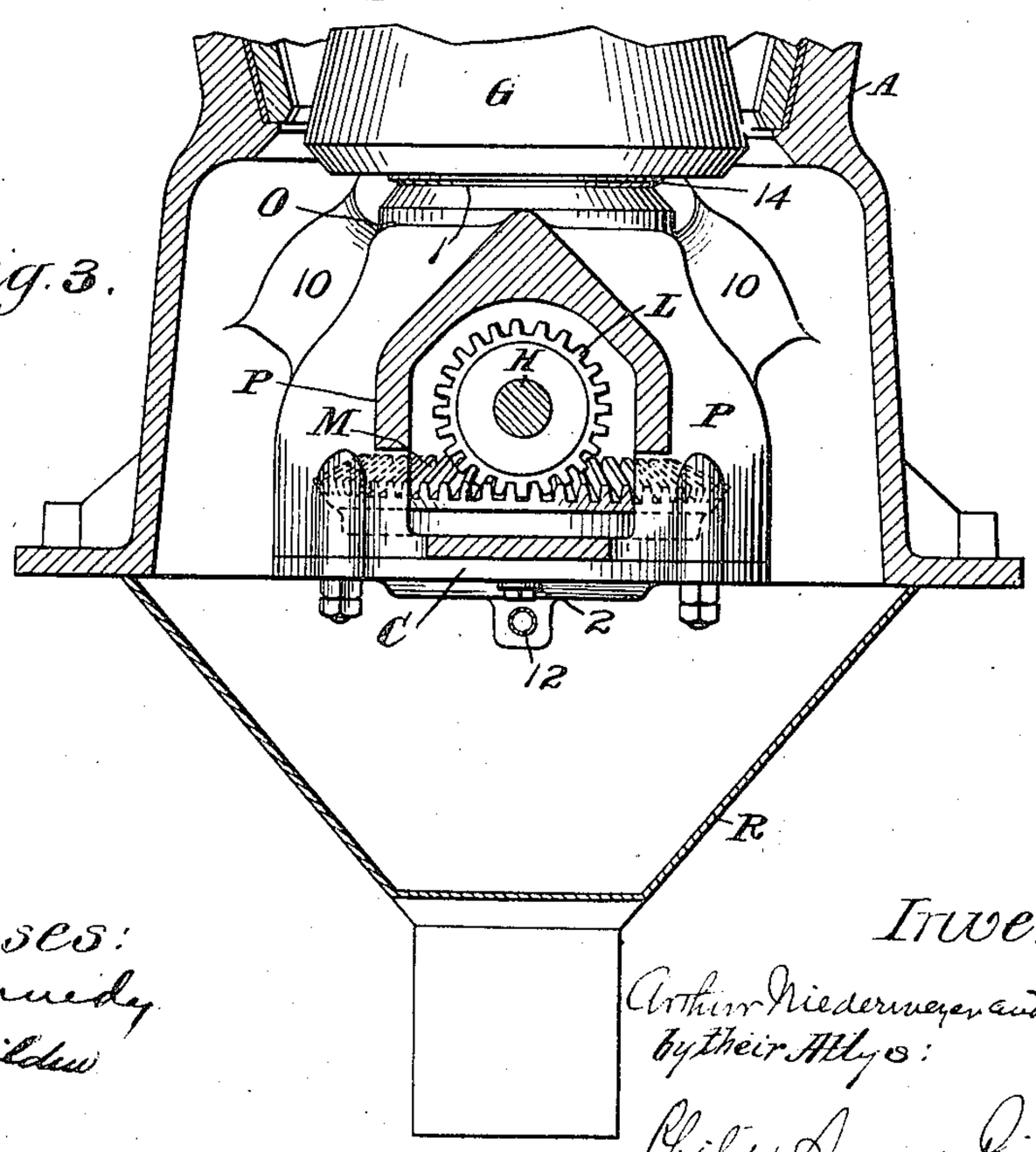


Fig. 3.



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UNITED STATES PATENT OFFICE.

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CRUSHER.

960,232. Specification of Letters Patent. Patented May 31, 1910.

Application filed August 2, 1909. Serial No. 510,689.

To all whom it may concern:

Be it known that we, ARTHUR NIEDERMEYER and RICHARD BERNHARD, both citizens of the United States, residing at Milwaukee, county of Milwaukee, and State of Wisconsin, have invented certain new and useful Improvements in Crushers, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

This invention relates to that class of gyratory crushers employing a shaft carrying the crushing head and operated by driving mechanism below the head, the especial object of the invention being to provide a more compact, lighter, and stronger machine of this class.

In accordance with the present invention, that portion of the machine below the crushing head is shortened by locating the eccentric and eccentric hub directly below the crushing head and providing space around the eccentric hub and chamber that incloses and protects the driving mechanism, between the chamber and the casing, for the delivery of the crushed material around the driving mechanism to a discharge chute below the mechanism. The space below the head which is usually occupied by the diaphragm is utilized for the eccentric, and the crushing shaft and portion of the crusher below the crushing head thus may be made much shorter, while the construction is simple, strong and convenient of manufacture. The space above the eccentric is preferably closed by a ring forming a dust excluding device, which ring preferably has a spherical or conical seat on top of the eccentric hub, the spherical seat being struck from a center at the fulcrum point of the shaft in the spider, so as to prevent vertical rubbing action or tipping of the ring as the head gyrates.

For a full understanding of the invention, a detailed description of a crusher embodying the invention in its preferred form will now be given, and the features forming the invention then specifically pointed out in the claims.

In the accompanying drawings, which show a gyratory crusher of a well known type embodying all the features of the invention in their preferred form, as applied to such a crusher:—Figure 1 is a vertical central section of a crusher. Fig. 2 is a horizontal section on the line 2 of Fig. 1. Fig. 3 is a vertical section on the line 3 of Fig. 2. Fig. 4 is a detail showing a modification of the dust excluding ring.

Referring to said drawings, A is the casing or shell carrying the spider B and closed at the bottom below the driving mechanism by the cap C. The crushing shaft F carrying the crushing head G is shown as suspended in the spider B by the well known suspension of the McCully patents, but may be supported otherwise within the invention. The counter shaft H is mounted in the counter shaft bearing I, and is shown as driven by the usual pulley K, this counter shaft H carrying the usual bevel gear L engaging driving gear M to drive the shaft through the eccentric N.

The general construction and operation of the crusher shown, except as pointed out hereafter, is the same as of the well known McCully crushers.

Referring now to the specific construction of the crusher for embodiment of the present invention, the usual diaphragm between the crushing head G and the driving gear and eccentric, by which the crushed material is delivered above the eccentric and the driving mechanism covered and protected, is omitted, and the eccentric hub O and eccentric N are placed directly below the crushing head with the driving gear M at the bottom of the eccentric. This eccentric hub O is preferably formed integral with the casing and with the wall P forming a chamber inclosing the gears L, M, so as to cover and protect the driving mechanism. On the counter shaft side, the wall of the chamber inclosing the counter shaft gear L connects the eccentric hub to the casing, and on the opposite side are formed arms 10 extending from the casing to wall P, preferably being rounded on the upper side for free passage of the crushed material. The crushed material is delivered downward between the gear chamber and casing to the bottom of the crusher, and, as shown, delivery chute R is attached to the bottom of the crusher to direct the crushed material as desired, it obviously being possible to arrange this chute so as to deliver at any point about the crusher. The bottom of the gear chamber below the gear is closed by cap C bolted on the bottom of the crusher, the eccentric N running on the bearing ring 11 on this cap.

The machine is preferably lubricated by grease, which is introduced through the cap C below the shaft M through grease pipe 12 on cap C, so that the lubricant passes first to the eccentric bearing surfaces, and then to the other moving parts of the crusher through the grease holes 13.

On top of the eccentric hub O is a seat 1 which is preferably spherical with its surface struck from the center on which the shaft gyrates in the spider P, on which runs a dust excluding ring 14, moving with the head G and having a corresponding spherical surface engaging the spherical seat 1 on the eccentric hub O. This ring 14 is shown in Fig. 1 as formed separately from the crushing head G, so that the crushing head and shaft may be raised to adjust the crushing head without interfering with the closure formed by the ring 14 at the top of the eccentric hub O. Where vertical adjustment of the head is not required, this ring 14 may be formed integral with the crushing head or may be formed and permanently attached to the head in any suitable manner. In Fig. 4 the ring 14 is shown as formed integral with the crushing head, being preferably faced with Babbitt or other similar metal 4 on its engaging surfaces. The chief advantage of the inclined surface is that the vertical rubbing action and tipping of the ring as the head gyrates which would result if the engaging surfaces were flat, are avoided, the best results being secured with the spherical surfaces.

It will be seen that in the crusher shown there is no opening through which the grease or other lubricant forced in may escape except at the top of the hub around the ring 14, and around the counter shaft H, and these are the only openings through which dust could enter the driving mechanism. The grease or other lubricant will be forced out through these openings, closing them absolutely against the entry of dust, so that the crusher shown is dust proof as to the driving mechanism.

The counter shaft bearing I in the form shown consists of a solid sleeve, which may be bored and faced at both ends and will be fitted with the usual bronze or babbitted bushings. This simplifies the construction greatly and enables the machine to be kept in proper working condition by unskilled labor, the counter shaft bearing being removable as a single piece with the counter shaft H and its gear L, and the return of the shaft and gear to proper position being assured by the return of the counter shaft bearing I. The driving gear M and eccentric also are readily removed and replaced through the opening at the bottom of the crusher, when the cap C is removed.

In this construction of crusher, it has been usual to provide a door in the casing, for examination of the meshing of the gears and their condition, room for such door being provided by the considerable depth of the casing below the crushing head and diaphragm. In the present short frame crusher, provision for examination of the gears is made by two openings 2, 3 into the gear casing below the counter shaft, these openings being so located that by inserting a lighted candle or other light through the opening 2, the meshing of the gears may be examined through opening 3 which is in line with the mesh line of the gears.

It will be seen that the main shaft of this crusher is very short, as compared with the shafts of the gyratory crushers now in use, so that the tendency of the shaft to deflect under heavy strains is largely reduced. This construction materially strengthens the machine, as the shaft in previous crushers has been one of the weakest parts, and a stronger shaft of smaller diameter is made possible by the present invention. The mounting of the eccentric close to the head also secures a very rigid construction. The shortening of the shaft and lower portion of the casing not only reduces largely the height and weight of the machine, but also makes it much easier to dismantle the machine on account of the greatly reduced weight. The integral construction of the casing and gear chambers and eccentric hub, and the bracing and support of the eccentric hub and gear chambers by the arms 10 also enables the machine to be made lighter for equal strength.

It is to be understood that the invention is not to be limited to the particular construction or arrangement of the devices shown as embodying the invention, but modifications may be made therein within the scope of the claims while retaining the invention defined by the claims.

The crusher shown is covered by the broader claims of application Serial No. 510,688 filed August 2, 1909, and all novel features of construction shown but not claimed herein are claimed in said application Serial No. 510,688.

What is claimed is:—

1. In a gyratory crusher, the combination with a crusher shaft and crushing head thereon, of shaft driving mechanism including an eccentric directly below the head, an eccentric hub and gear inclosing chamber below the head, and an outer casing providing an annular delivery space extending to the bottom of the crusher about the gear chamber through which the crushed material is delivered below the driving mechanism.

2. In a gyratory crusher, the combination with a crusher shaft and crushing head thereon, and shaft driving mechanism including an eccentric and gearing for driving the eccentric, of an eccentric hub be-

low the crushing head, a dust excluding ring engaging the hub and closing the space between the hub and crushing head, a gear inclosing chamber, and an outer casing providing an annular delivery space extending to the bottom of the crusher about the gear chamber through which the crushed material is delivered below the driving mechanism.

3. In a gyratory crusher, the combination with a crusher shaft and crushing head thereon, of an eccentric below the head, a driving gear at the bottom of the eccentric, a counter-shaft gear engaging the top of the driving gear, and an eccentric hub surrounding the eccentric and formed integrally with the casing and with a chamber arranged to inclose the gearing, the casing and chamber being formed to provide an annular delivery space extending to the bottom of the crusher about the gear chamber through which the crushed material is delivered below the driving mechanism.

4. In a gyratory crusher, the combination with the crusher shaft and crushing head thereon, of shaft driving mechanism below the head, a chamber inclosing the driving mechanism, and an outer casing separated from the chamber to provide an annular delivery space extending to the bottom of the crusher about the chamber through which the crushed material is delivered below the driving mechanism.

5. In a gyratory crusher, the combination with a crusher shaft and crushing head thereon, of eccentric N and eccentric hub O below the head, driving gear M and counter-shaft gear L above the gear, gear chamber P integral with the casing and separated from the casing to form an annular delivery space extending to the bottom of the crusher about the gear chamber through which the crushed material is delivered below the driving mechanism and a cap C closing the bottom of the chamber within said annular delivery space.

In testimony whereof, we have hereunto set our hands in the presence of two subscribing witnesses.

ARTHUR NIEDERMEYER.
RICHARD BERNHARD.

Witnesses:
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THOMAS W. WEARE.