

A. NIEDERMEYER & R. BERNHARD.
CRUSHER.

APPLICATION FILED AUG. 2, 1909.

960,231.

Patented May 31, 1910.

2 SHEETS—SHEET 1.

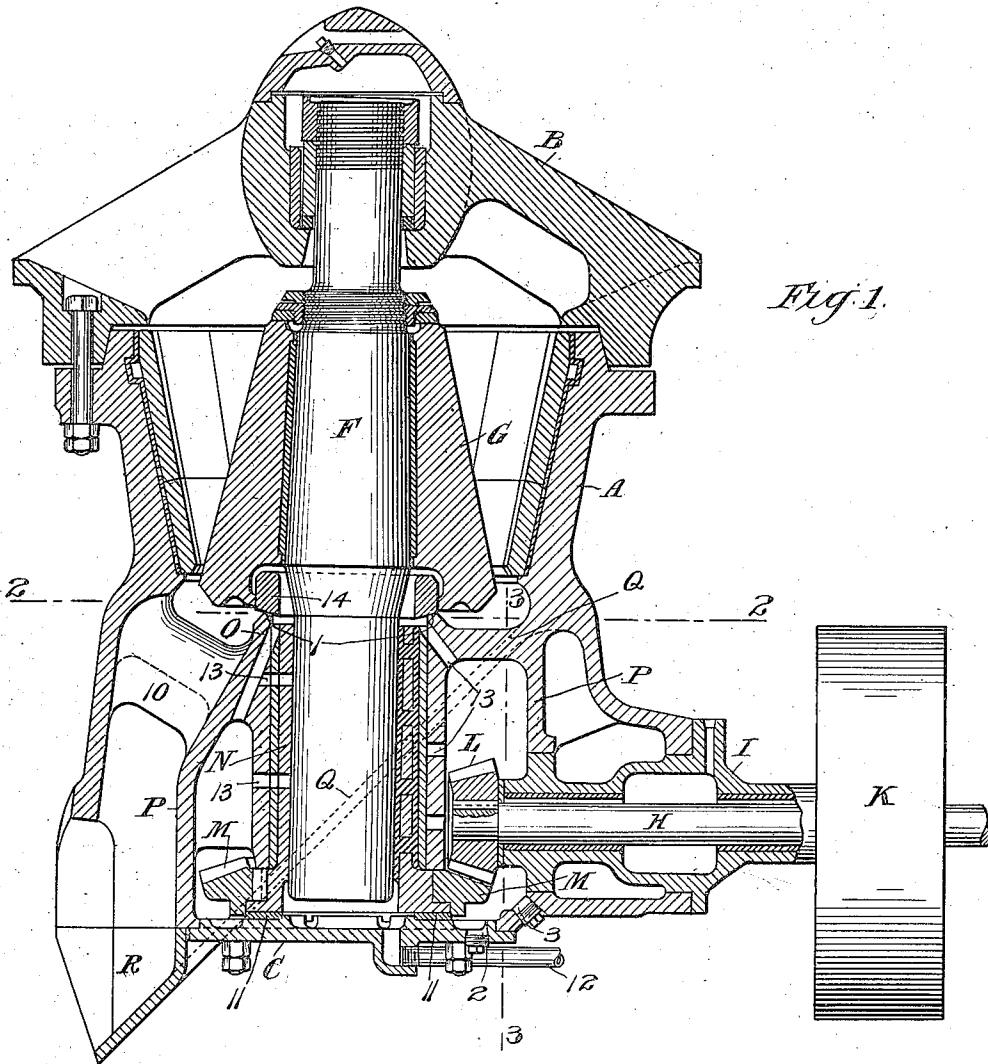


Fig. 1.

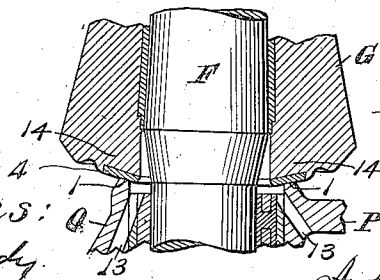


Fig. 4.

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2 SHEETS—SHEET 2.

Fig. 2.

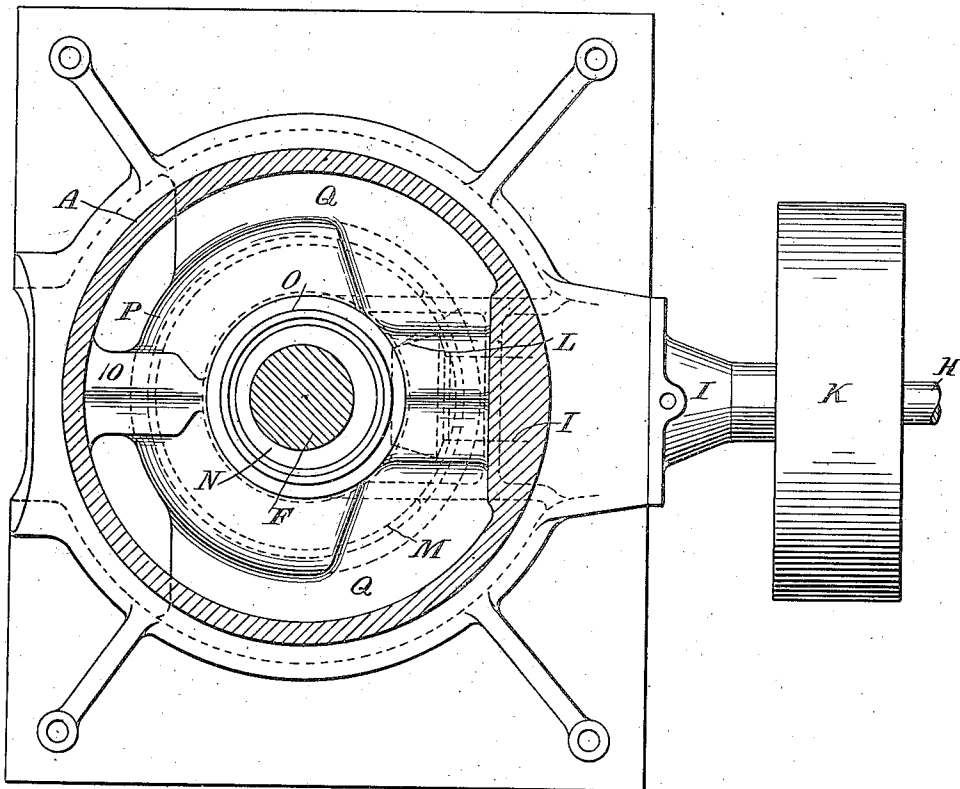
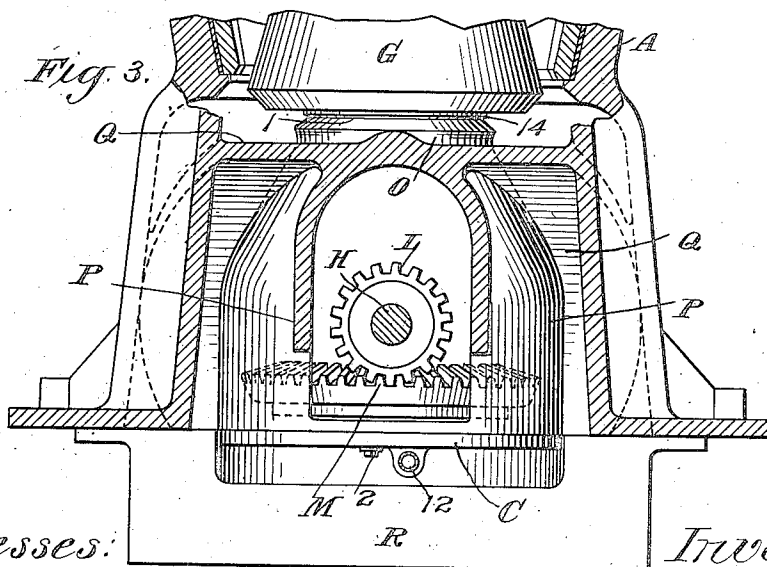


Fig. 3.



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UNITED STATES PATENT OFFICE.

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CRUSHER.

960,231.

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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, with the driving gear at the bottom of the eccentric, so that 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. The crushed material is delivered from the crushing head through the space between the eccentric hub and the casing, and in the preferred form of machine a diaphragm cast with the casing extends through this space to direct the crushed material to the delivery at one side of the machine, but the broader features of the invention may be embodied in a construction not having such a diaphragm, the crushed material being delivered at the bottom of the machine through the space surrounding the eccentric hub and driving mechanism. The space above the eccentric is 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.

The invention includes, in addition to the general features above outlined, certain features of construction and combinations of parts, all as more particularly described

hereafter and particularly 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 the 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. 1. 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 is formed arm 10 extending from the casing to wall P, preferably being rounded on the upper side for free passage of the crushed material. The hub O extends downward

within the gear inclosing chamber to the gear M, in the construction shown, inclosing the shaft and forming a long bearing for the eccentric. An inclined diaphragm Q extends downward from below the crushing head at the counter shaft side of the crusher and through the delivery space between the gear chamber and casing to the bottom of the crusher so as to deliver the material at one side of the crusher and to the delivery chute R, shown as secured to the bottom of the crusher to continue the diaphragm Q. The bottom of the crusher 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 extending through the eccentric and hub.

On the 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 B, 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, as shown in Fig. 4, or may be formed and permanently attached to the head in any suitable manner. The engaging surface of the ring is preferably Babbitt or other similar metal as shown at 4 in Fig. 4. While the spherical form of the engaging surfaces of the ring 14 and seat 1 is preferable, other inclined surfaces, as conical surfaces, may be used. 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 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 opening 2, the meshing of the gears may be examined through the 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 other gyratory crushers, 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 the bracing and support of the eccentric hub and gear chambers by the diaphragm 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.

What is claimed is:—

1. In a gyratory crusher, the combination

with the crusher shaft and crushing head thereon, of shaft driving mechanism including an eccentric directly below the head, and an eccentric hub and gear inclosing chamber below the head with space between the outer casing and the hub and gear chamber for the delivery of the crushed material.

2. In a gyratory crusher, the combination with the 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 with space between the outer casing and the hub and gear chamber for the delivery of the crushed material, and an inclined diaphragm in said delivery space.

3. In a gyratory crusher, the combination with the crusher shaft, the crushing head thereon and the shaft driving mechanism including an eccentric, of an eccentric hub directly below the crushing head, and a dust excluding ring engaging the hub and closing the space between the hub and crushing head.

4. In a gyratory crusher, the combination with the crusher shaft, the crushing head thereon, and the shaft driving mechanism including an eccentric, of an eccentric hub directly below the crushing head, and a dust excluding ring separate from the head and engaging the hub and closing the space between the hub and crushing head.

5. In a gyratory crusher, the combination with the 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 with an annular space surrounding the chamber between the chamber and casing for the delivery of the crushed material.

6. In a gyratory crusher, the combination with the 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, an eccentric hub surrounding the eccentric and formed integrally with the casing and with a chamber arranged to inclose the gearing with an annular space surrounding the chamber between the chamber and casing for the delivery of the crushed material, and an inclined diaphragm formed integrally with the casing and chamber and extending downward through the delivery space from the casing at the top of the eccentric above the counter-shaft gear to the bottom of the crusher.

7. In a gyratory crusher, the combination with the 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, an eccentric hub surrounding the eccentric and formed integrally with the casing and with a chamber arranged to inclose the gearing with an annular space surrounding the chamber between the chamber and casing for the delivery of the crushed material, an inclined diaphragm formed integrally with the casing and chamber and extending downward through the delivery space from the casing at the top of the eccentric above the counter-shaft gear to the bottom of the crusher, and a support connecting the gear chamber and hub with the casing on the side opposite the counter-shaft gear chamber.

8. In a gyratory crusher, the combination with the crusher shaft and crushing head thereon, and a hub and shaft driving mechanism below the head, of an outer casing below the head, and an inner casing within said outer casing and inclosing the hub and driving mechanism, said inner casing being of less diameter than the outer casing and separated from the outer casing to provide a delivery space for the crushed material extending downward between the outer and inner casings.

9. In a gyratory crusher, the combination with the crusher shaft and crushing head thereon, and a hub and shaft driving mechanism below the head, of an outer casing below the head, and an inner casing within said outer casing and inclosing the hub and driving mechanism, said inner casing being of less diameter than the outer casing and separated from the outer casing to provide a delivery space for the crushed material extending downward between the outer and inner casings, and an inclined diaphragm in said delivery space arranged in a plane crossing the driving mechanism.

10. In a gyratory crusher, the combination with the crusher shaft and crushing head thereon, of an eccentric and eccentric hub directly below the crushing head and a dust excluding ring carried by the head and having an inclined seat on the top of the hub.

11. In a gyratory crusher, the combination with the crusher shaft and crushing head thereon, of an eccentric and eccentric hub directly below the crushing head, and a dust excluding ring separate from the shaft and head and having a spherical seat on the top of the hub struck from the center of motion of the crusher shaft.

12. In a gyratory crusher, the combination with the crusher shaft and crushing head thereon, of an eccentric and eccentric hub directly below the crushing head and a dust excluding ring separate from the shaft and head and seated on the hub, said ring having an extended vertical surface

engaging the head to permit adjustment of the latter in engagement with the ring.

13. In a gyratory crusher, the combination with the crusher shaft and crushing
5 head thereon, of an eccentric and eccentric hub below the head, a driving gear at the bottom of the eccentric and a counter shaft gear above the driving gear, a gear chamber within and integral with the casing and
10 providing an annular space surrounding the chamber between the chamber and casing

for the delivery of the crushed material, and a cap at the bottom of the casing closing the chamber.

In testimony whereof, we have hereunto 15 set our hands in the presence of two subscribing witnesses.

ARTHUR NIEDERMEYER.
RICHARD BERNHARD.

Witnesses:

THOMAS W. WEARE,
L. F. SNYDER.