

A. NIEDERMEYER & R. BERNHARD.
CRUSHER.

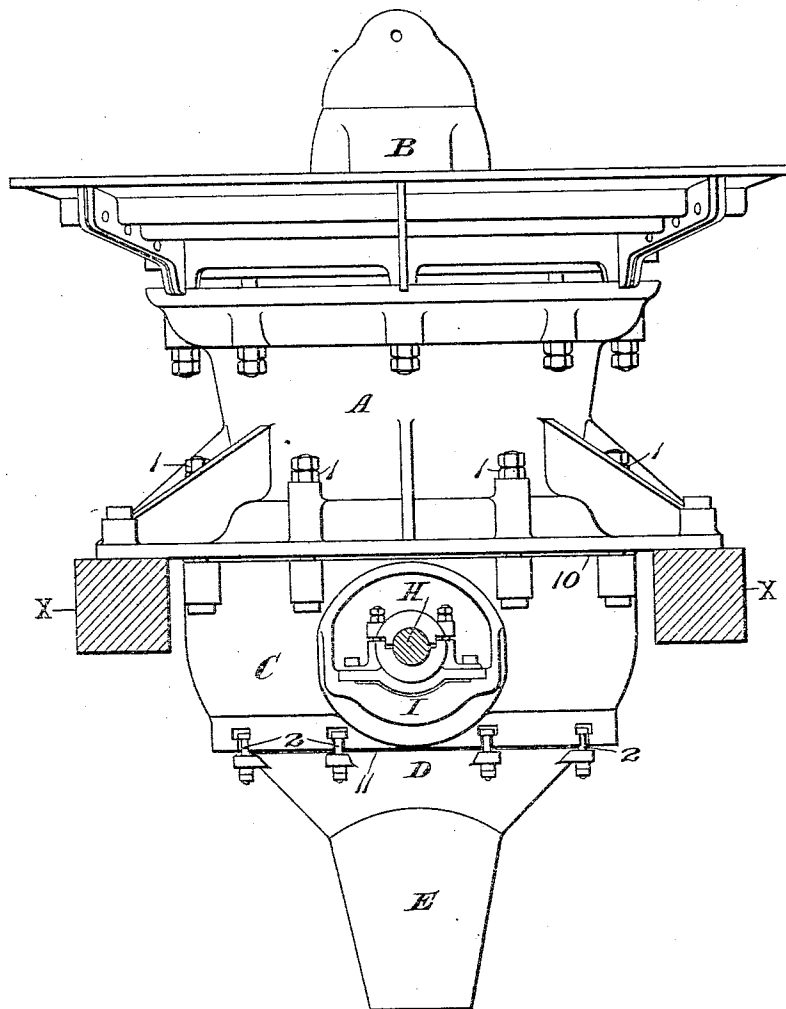
APPLICATION FILED AUG 28 1908.

1,054,135.

Patented Feb. 25, 1913.

2 SHEETS—SHEET 1.

Fig. 1.



Witnesses:
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Philip N. Tilden.

Inventors:
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2 SHEETS-SHEET 2.

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Fig. 2.

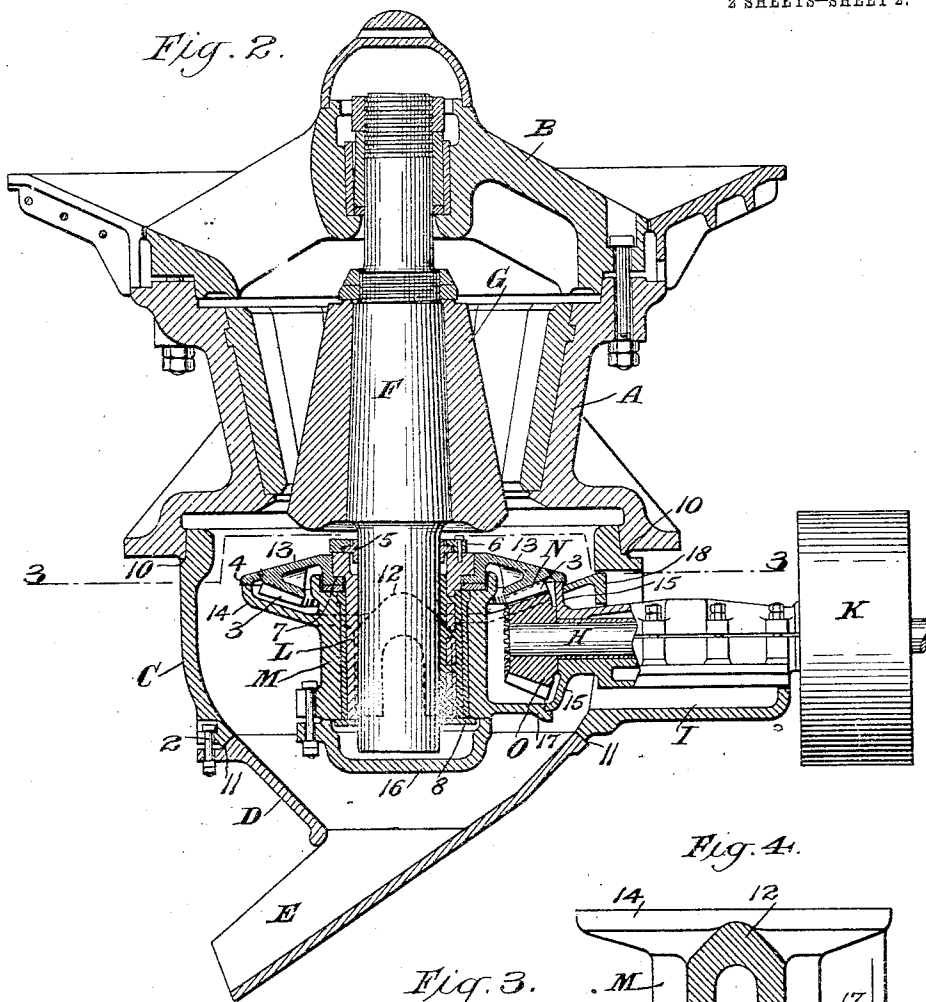


Fig. 4.

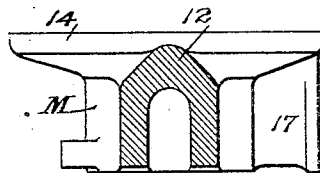
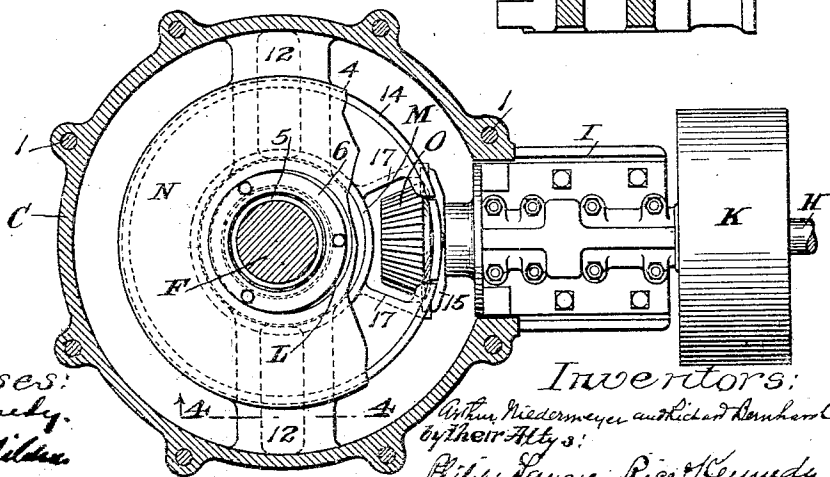


Fig. 3.



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UNITED STATES PATENT OFFICE.

ARTHUR NIEDERMEYER AND RICHARD BERNHARD, OF MILWAUKEE, WISCONSIN,
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CRUSHER.

1,054,135.

Specification of Letters Patent.

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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 particularly to that class of crushers for stone, ore and the like, known as gyratory crushers, the especial object of the invention being to provide a more compact, lighter and stronger machine of this class, and further to provide a machine which may be adjusted for any desired driving and delivery arrangement, thus avoiding special construction of machine parts to meet different conditions.

In the preferred form of machine embodying the invention, that portion of the machine below the crushing head is shortened by omitting the usual delivery chute and chamber between the crushing head and driving mechanism, and arranging the driving mechanism directly below the crushing head with space between the driving mechanism and casing for the delivery of the crushed material around the driving mechanism to a discharge chute at the bottom of the machine. The crushed material is received by a rotating disk below the head and thrown off the disk by centrifugal force, the top surface of the disk being inclined to aid this action. The disk is preferably formed by the main gear, which for this purpose has its teeth on its under side, the crushed material being delivered from the top of the gear to the annular passage surrounding the driving mechanism, the gear and hub being constructed to form a chamber inclosing and protecting the driving gears and other parts. In order to permit the counter shaft to be set in any desired position relatively to the main shaft, the portion of the casing inclosing the driving mechanism, which carries the counter shaft, is separate from the upper casing inclosing the head and is united to the upper casing by a circular symmetrical joint, so that the lower casing and counter shaft may be positioned as desired relatively to the upper casing. In order to permit the discharge in any de-

sired direction, the hopper casing at the bottom of the crusher, which carries the discharge spout, is made separate from the lower casing and is secured to this lower casing by a circular symmetrical joint, so that the spout may be set to deliver in any direction without regard to the position of the lower casing and counter shaft.

The invention includes, in addition to the general features above outlined, certain features of construction and combinations of parts, all as fully 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 side elevation of the crusher looking from the counter shaft side. Fig. 2 is a vertical central section of the crusher. Fig. 3 is a horizontal section on the line 3—3 of Fig. 2. Fig. 4 is a detail vertical section on the line 4—4 of Fig. 3.

Referring to said drawings, A is the upper casing or shell carrying the spider B, and C the lower casing or shell inclosing the driving mechanism, with the hopper casing D below it carrying the discharge spout E. The crusher shaft F carrying the crushing head 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 countershaft bracket I on casing C and is shown as driven by the usual pulley K.

The upper and lower casings A, C are secured together by the circular joint 10, symmetrical throughout, so that the lower casing C may be turned to any position relatively to the upper casing A, and the counter shaft H thus adjusted at any desired angle relatively to the main shaft. The two casings A, C are shown as bolted together by bolts 1, and the upper casing is provided with extended flanges forming brackets which will rest on the foundation or supports X thereon, so that the bottom casing with the driving mechanism may be removed downward from the upper casing carrying with it the counter shaft and gearing. The lower casing C and hopper casing D are secured together by a circular

joint 11 symmetrical throughout, so that the hopper with its discharge spout E may be turned to any desired position relatively to the casing C, and the hopper casing D is shown as secured to the casing C by bolts 2.

Referring now to the specific construction of the parts within the casing C, the shaft is actuated by the eccentric L which may be of the usual or any suitable form, and is mounted to rotate within the fixed central hub M carried by arms 12 extending inward from the opposite sides of the casing C. The main driving gear N has its top surface 13 immediately below the crushing head G, which surface is inclined outward, and the driving teeth 3 on its under side engaging the pinion O on the counter shaft II. The casing C is of such size as to provide an annular delivery space surrounding the gear N and hub M, through which the crushed material passes from the top of the gear N downward around the driving mechanism to the hopper D and spout E. To inclose and protect the gearing and eccentric, the gear N has an outer flange 4 and the hub M a flange 14, co-acting to inclose the gearing except above the counter shaft II and exclude grit and similar matter from the gear chamber. The counter shaft bearing is provided with a flange 15 which co-acts with flange 4 on the gear to practically close the space above the counter shaft and this flange 15 also co-acts with horizontal and vertical flanges 17 on the hub M to form an oil tight chamber inclosing the pinion in which the pinion may rotate in oil. The hub M is also provided with a bottom cap 16 to retain the lubricant. A guard 18 will preferably be secured to the top of the counter shaft bearing to deflect the crushed stone to each side of the bearing, and the arms 12 will preferably be formed with inclined top surfaces, as shown in Fig. 4, so as to offer small resistance to the passage of the crushed stone downward to the discharge.

The oil bonnet and dust cap for the eccentric consists of the steel collar 5, which fits the shaft so as to rotate therewith but permit the shaft to slide through the collar. This collar 5 has a horizontal flange or rib, over which takes a flange on a ring 8 bolted to the top of the eccentric, so that the collar is thus held down and prevented from rising with the shaft when the latter is adjusted. Below the bonnet or collar 5 is a lubricant cup, which will preferably be filled with grease.

As the driving pressure is on the under side of the gear it is necessary to provide some means for holding the gear from lifting. This result is secured by providing the gear N with a flange 7 taking under a shoulder on the eccentric, and the eccentric is prevented from lifting by a bottom flange or

ring 8 bolted on the eccentric, which engages the bottom of the hub M.

It will be seen that the main shaft of the 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 is one of the weakest parts, and a stronger shaft of smaller diameter is possible. The eccentric is mounted close to the crusher head, also, which secures a very rigid construction. The shortening of the shaft 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 of the machine. The oil bonnet construction shown provides for all joints being metal to metal, which with the lubricant forced out of the bearing prevents the entry of dust or grit. The provision for adjustment of the counter shaft bearing at any desired angle to the main shaft, and the adjustment of the hopper casing and discharge spout as desired, are important, as enabling a single standard machine to be used under any driving and delivery conditions. The removing of the eccentric and gearing without removing the shaft is convenient, as the whole lower casing C may be dropped from the casing A with all the driving mechanism, including the counter shaft, and the eccentric and main gear then withdrawn from the top of the casing C.

It is to be understood that the invention is not to be limited to the particular construction or arrangement of the devices shown embodying the invention, as many modifications may be made within the scope of the claims. While the invention has been made in connection with and is especially intended for that class of crushers known as gyratory crushers, it will be understood that the broader features of the invention are applicable also to crushers of other classes, and the claims not limited to gyratory crushers are intended to be so construed.

What is claimed is:—

1. In a crusher, the combination with the crushing devices, of a rotating disk below the crushing devices arranged to receive the crushed material and a casing inclosing the rotating disk with an annular delivery space surrounding the disk between the disk and casing for the delivery of the crushed material below the disk.

2. In a crusher, the combination of a vertical crushing head, a rotating disk below the crushing head of larger diameter than the head and having its top surface inclined outward, and a casing inclosing the rotating disk with an annular delivery space surrounding the disk between the disk

and casing for the delivery of the crushed material below the disk.

3. In a crusher, the combination of a vertical crusher shaft and crushing head thereon, a gear on the shaft below the crusher head having its teeth on the under side and its top surface arranged to receive the crushed material, driving mechanism for the gear and shaft, and a casing inclosing the gearing with an annular space about the gearing between the gearing and casing for the delivery of the crushed material below the driving mechanism.

4. In a crusher, the combination of a vertical crusher shaft and crushing head thereon, a gear on the shaft below the crusher head having its teeth on the under side and its top surface arranged to receive the crushed material, said gear having an annular flange outside the teeth, a fixed hub surrounding the shaft below the gear and having a flange co-acting with the gear flange to form a closed chamber for the gearing, and a casing inclosing the chamber between the chamber and casing with space about the chamber for the delivery of the crushed material below the gearing.

5. In a gyratory crusher, the combination with the vertical crushing head, of a rotating disk below the head of larger diameter than the head and arranged to receive the crushed material, an eccentric and driving gearing below the disk, and a casing inclosing the gearing with space surrounding the gearing between the casing and gearing for the delivery of the crushed material below the gearing.

6. In a gyratory crusher, the combination with the vertical crushing head, of a rotating disk below the head of larger diameter than the head and arranged to receive the crushed material, an eccentric and driving gearing below the disk, means for forming a closed chamber for the eccentric and gearing and a casing inclosing the chamber with space between the casing and chamber for the delivery of the crushed material below the gearing.

7. In a crusher having driving mechanism below the crushing devices, including a vertical driven member and counter shaft, the combination with an upper casing inclosing the crushing devices, of a lower casing inclosing the driving mechanism and carrying the counter shaft, said casings being united by a circular symmetrical joint, whereby the lower casing and counter shaft may be set in any desired position relatively to the upper casing.

8. In a crusher having driving mechanism below the crushing device, including a vertical driven member and counter shaft, the combination with an upper casing inclosing the crushing devices, of a lower casing inclosing the driving mechanism and carrying

the counter shaft, said casings being united by a circular symmetrical joint, whereby the lower casing and counter shaft may be set in any desired position relatively to the upper casing, and a hopper below the lower casing having a delivery spout and secured to the lower casing by a circular symmetrical joint, whereby the spout may be set in any desired position relatively to the lower casing.

9. In a crusher, the combination with an upper casing inclosing the crushing devices, of a lower casing inclosing the driving mechanism and carrying the counter shaft, said casings being united by a circular symmetrical joint whereby the lower casing and countershaft may be set in any desired position relatively to the upper casing, and flanges on the upper casing extending outside the lower casing for supporting the crusher and permitting the lower casing to be removed downward.

10. In a gyratory crusher, the combination with the crushing devices and the eccentric, main gear and the counter shaft and its gear below the crushing devices, of an upper casing inclosing the crushing devices and by which the crusher is supported, and a lower casing removable downward from the upper casing between the crusher supports and carrying the eccentric, gearing, and counter shaft.

11. In a gyratory crusher the combination with the crushing head and vertical shaft carrying the crushing head, and the eccentric, main gear, and the counter shaft and its gear below the crushing head, of an upper casing inclosing the crushing head and by which the crusher is supported, and a lower casing removable downward from the upper casing and shaft between the crusher supports and carrying the eccentric, gearing, and counter shaft, said lower casing being open at the top for the receipt of the crushed material and removal of the main gear and eccentric.

12. The combination with the crusher shaft F, of main gear N having its teeth on the under side, eccentric L, and hub M having a flange co-acting with the gear N to form a chamber inclosing the gear teeth and eccentric, substantially as described.

13. The combination with the crusher shaft F, of main gear N having its teeth on the under side, eccentric L, hub M having a flange co-acting with the gear N to form a chamber inclosing the gear teeth and eccentric, counter shaft gear O and its shaft bearing, and flanges on the counter shaft bearing and hub forming a closed chamber for the counter shaft gear, substantially as described.

14. The combination with the crusher shaft F, eccentric L and hub M, of gear N having flange 4, flange 14 on the hub below

gear flange 4, flanges 17 on the hub, and counter shaft bearing having flange 15 engaging flanges 17 to form a closed chamber, substantially as described.

5 15. The combination with the crusher shaft F, of casing C, arms 12 extending inward from the casing, and central hub M carried by said arms and supporting the shaft driving mechanism, with delivery
10 space within the casing around and below the hub, substantially as described.

16. In a gyratory crusher, the combination with the crusher shaft and crushing head thereon, of shaft driving mechanism below the head, an outer casing below the head separated from the driving mechanism to provide a delivery space extending about the driving mechanism inside the casing and means including a part of the driving mechanism for inclosing the driving mechanism
20 within said delivery space.

17. In a gyratory crusher, the combination with the crusher shaft and crushing head thereon, of shaft driving mechanism

including a main gear and countershaft gear, an outer casing below the head separated from the driving mechanism to provide a delivery space extending about the driving mechanism, and means for inclosing the gearing within said delivery space. 25 30

18. In a gyratory crusher, the combination with the shaft and crushing head thereon, of an eccentric and eccentric hub below the head, a main gear and countershaft gear below the head, an outer casing separated from the eccentric hub to provide a delivery space extending about the hub inside the casing, and means for inclosing the gears for protection from the crushed material. 35

In testimony whereof, we have hereunto set our hands, in the presence of two subscribing witnesses. 40

ARTHUR NIEDERMEYER.
RICHARD BERNHARD.

Witnesses:

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."