June 19, 1923. 1,459,305

J. E. KENNEDY

CRUSHING APPARATUS

Filed Dec. 27, 1919

Fig. 1.

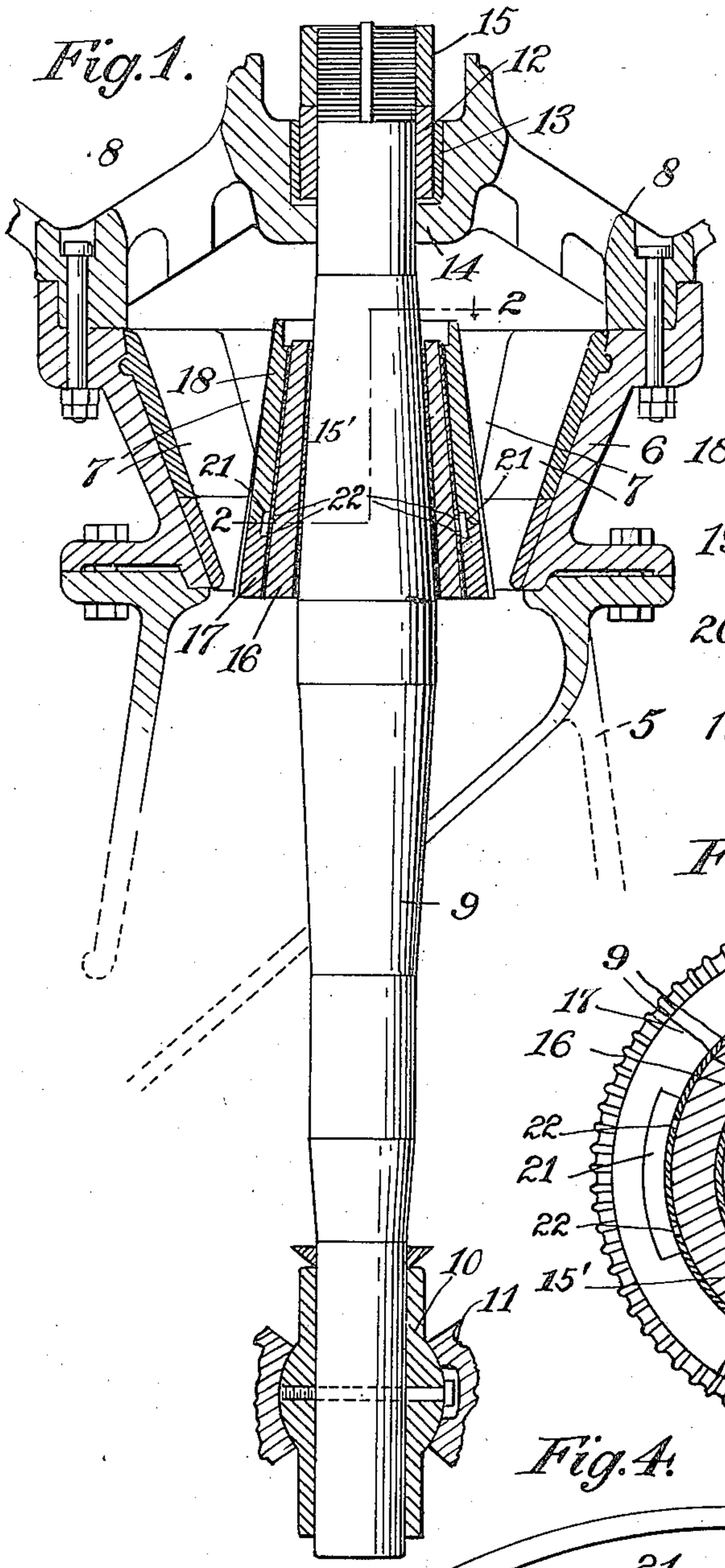


Fig. 3.

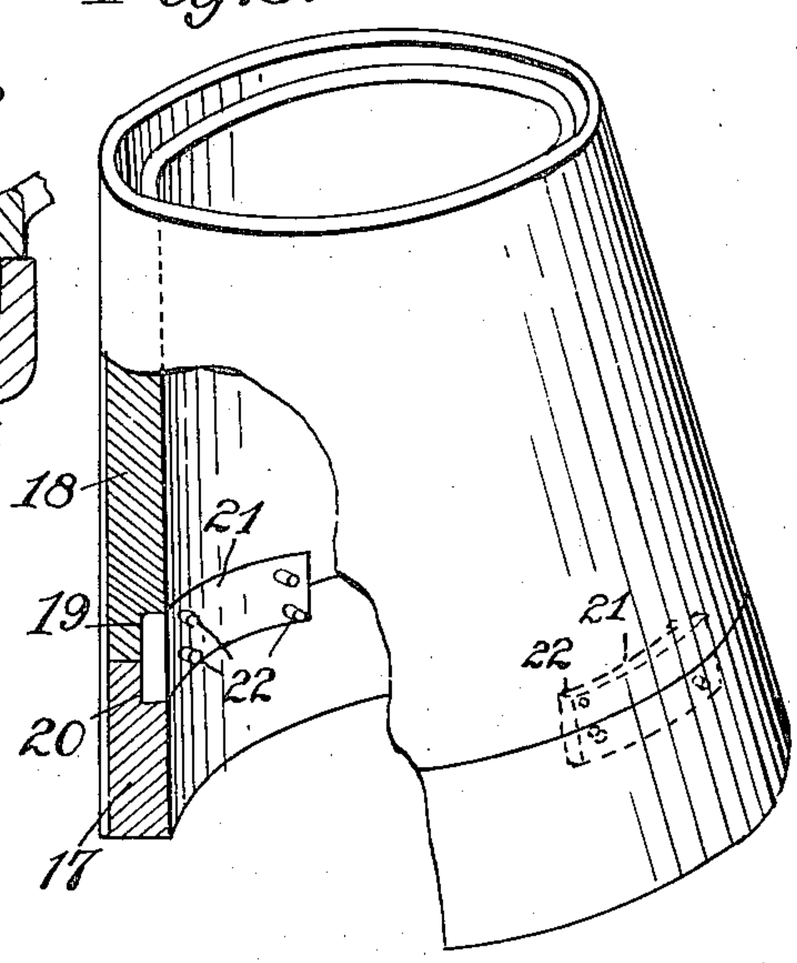


Fig. 2.

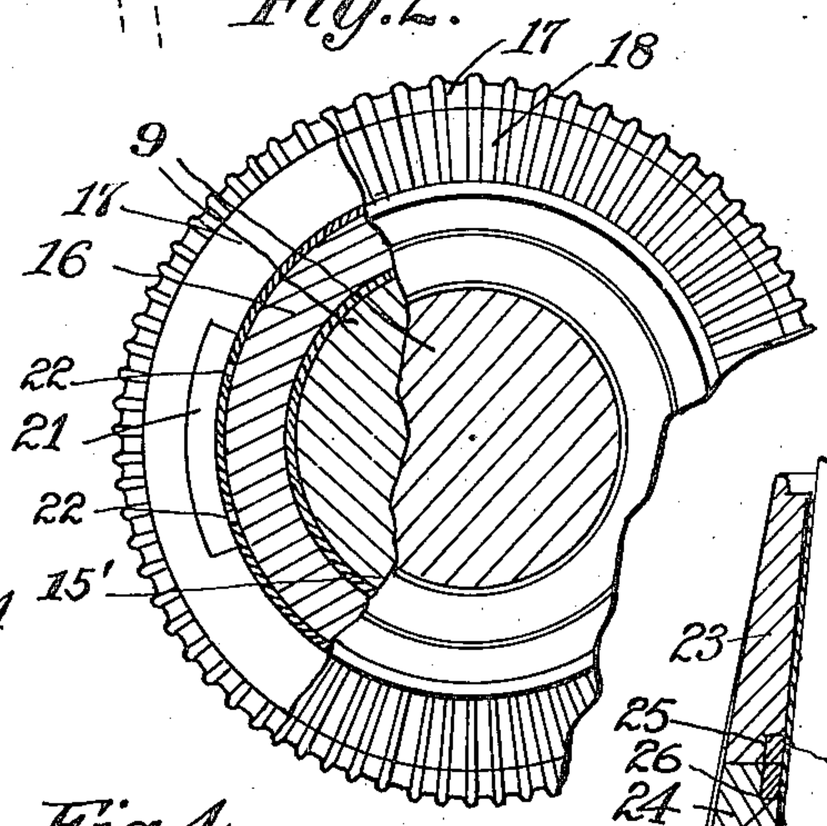


Fig. 5.

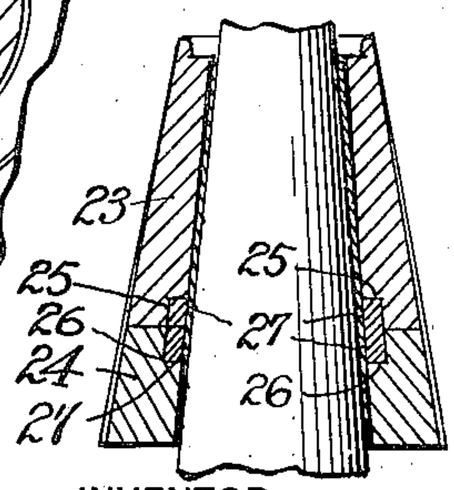
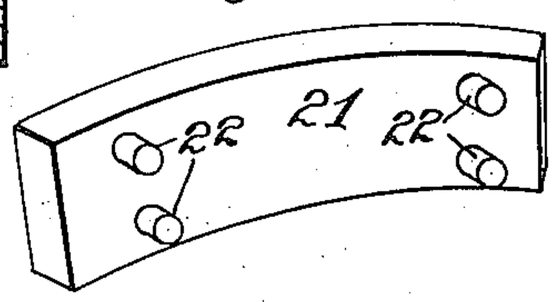


Fig. 4.



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UNITED STATES PATENT OFFICE.

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CRUSHING APPARATUS.

Application filed December 27, 1919. Serial No. 347,827.

To all whom it may concern:

Be it known that I, JOSEPH E. KENNEDY, a citizen of the United States, and resident of the borough of Manhattan, in the city, county, and State of New York, have invented certain new and useful Improvements in Crushing Apparatus, of which the following is a specification.

This invention relates to crushers for crushing rock, ore and the like, and relates particularly to the type of crushers which are commonly termed "gyratory crushers."

In this type of crusher a pair of opposed and concentric crushing faces or jaws are provided one of which jaws, preferably the inner one, is rotatable while the other is fixed. These crushing faces or jaws are inclined at different angles relative to each other whereby they are spaced a considerable distance apart at the feeding end of the jaws, and this space gradually diminishes toward the discharge end of the jaws, one of the jaws being adjustable relative to the other whereby the space between the jaws at the discharge end may be increased and decreased at will in accordance with the desired size of the crushed product. In this type of crusher the rotatable crushing face or jaw is in the form of a head mounted upon a gyratory shaft, and in some instances the head comprises a head having a mantle or shell of a relatively hard and wear resisting material, such as manganese steel. It is the usual practice to make the head and also the mantle, when the head is provided with a mantle, of a single and integral structure and when the head or mantle becomes worn to remove the same from the shaft and substitute another head or mantle discarding the removed head or mantle although a considerable portion thereof may not be worn at all. The greater portion of the wear on the head or mantle, or approximately ninety-five per cent of the wear, is adjacent the lower end or bottom, and when the head or mantle is removed it is necessary to also substitute the upper portion thereof necessitating the renewal and discarding of a portion upon which there has practically been no wear.

It is the object of the present invention to so construct and arrange the head or the mantle, when a mantle is utilized, whereby when the portion adjacent the bottom becomes worn this portion may be discarded and another portion substituted therefor, and the portion which has not been worn at all need not be discarded, thus reducing the cost of upkeep of the crusher and a consequent saving in the same.

In the drawing accompanying and forming a part of this specification, Figure 1 is a sectional elevational view of a portion of a gyratory crusher illustrating an embodiment of my invention, only so much of the crusher being shown as is essential to an understanding of the invention.

Figure 2 is an enlarged view taken substantially on the line 2—2 of Figure 1 looking in the direction of the arrows.

Figure 3 is a perspective view, partly in section, of my improved mantle.

Figure 4 is a perspective view of a key to lock the mantle sections against rotative movement relative to each other in the operative position thereof, or to hold the head sections against rotative movement relative to and independent of each other; and

Figure 5 is a sectional side elevation showing another embodiment of the crusher head mounted upon the shaft.

Similar characters of reference designate like parts throughout the different views of the drawing.

In Figures 1 to 3 of the drawing I have shown an embodiment of my invention in connection with a crusher comprising a hollow base or standard 5 upon which a shell 6 is mounted in fixed position the inner wall of which shell inclines and converges downwardly in the form of an inverted truncated cone. This shell constitutes one of the crushing members or jaws and is provided with a wear resisting lining consisting of separable concave sections of manganese steel, as shown at 7, whereby a portion of said wear resisting lining may be removed and another portion substituted without discarding the whole of the sections permitting of the removal only of such portion which may have become worn due to the crushing operation. A perforated cover or spider 8 is mounted upon the shell 6 and through the spaces of which the material to be crushed is delivered to the feed end of the shell 6 and for a purpose to be hereinafter described.

A vertical shaft 9 passing axially through the shell 6 is rotatably mounted adjacent the lower end by a ball and socket bearing the ball member 10 which is fixed to the shaft and the socket portion being located in the

frame-work of the crusher, as shown at 11. The shaft is rotatably suspended at the upper end by a ring 12 mounted on the shaft engaging in a bushing 13 engaging in an opening in the cover 8, the bottom of the ring resting upon an annular shoulder 14 extending inward from the wall of the opening of the cover. The shaft is secured in position and to have axial adjustment by a nut 15 threaded onto the end of the shaft.

A portion of the shaft within the shell 6 has a downwardly and outwardly inclining or diverging portion 15′ on which is mounted a crusher head or jaw concentric and in opposed relation to the shell 6, said head comprising a cone shaped core 16 with a cone shaped shell or mantle of wear resisting material, such as manganese steel, mounted thereon to extend around the same. To mount the core upon the shaft without the necessity of machining the core or shaft the bore through the core is of greater diameter than the shaft, and to secure the core in position the core is wedged in position on the shaft and a fused or melted material, such as zinc, is poured into the space between the core and shaft and which metal will serve to fix the core to the shaft when it cools. To obviate the necessity of removing and discarding the core due to wear or otherwise the peripheral wall or surface of the core is provided with a wear resisting mantle or shell of manganese steel. As stated the greater portion or approximately ninety-five per cent, of the wear due to the crushing operation comes on the lower portion of this shell or mantle. It is the common practice to make the mantle of a onepiece structure and as the lower portion of the mantle becomes worn it is necessary to also discard the unworn portion of the mantle requiring the replacing of a portion of the shell for which there is no necessity and which is expensive. To obviate the necessity of discarding the unworn portion of the mantle the mantle is made of tubular axially separable sections 17, 18, preferably of cone shape as shown. The internal wall of these shell sections is inclined and arranged relative to the inclination of the angle of the wall of the core whereby the internal diameter at the bottom of the lower shell section is substantially the same as the outside diameter of the bottom of the core to lie contiguous thereto with the remaining portion of said shell section and the upper shell section spaced from the core, this space preferably increasing in area from the bottom to the top of the upper shell section. This space between the shell sections and core is filled with a fused or melted metal such as zinc, and as this fused metal cools and hardens it serves to secure the shell sections to the core.

To lock the shell sections together to prevent rotative movement of one shell section relative to and independent of the other shell section on the core mating or opposed recesses 19, 20 are provided in the abutting ends and inner wall of said sections with the upper and lower shoulders of said recesses located adjacent the abutting line of the sections.

Keys 21 engage in a pair of opposed recesses, said keys preferably being flush with the inner wall of the shell sections and held in place by the upper and lower shoulders of the recesses. To center and maintain the shell sections in spaced relation on the core pins 22 projecting inward from the keys are adapted to engage the core. It will be obvious that as the fused metal is poured into the space between the shell sections and core that it will flow around the pins and between the keys and core serving to secure the keys in the shell recesses. To facilitate the crushing operation the mantle sections are longitudinally fluted the depth of which flutes is greatest at the bottom and gradually diminish in depth toward the top.

In the embodiment of the invention shown in Figure 5 a core or head only is provided, the wear resisting mantle being omitted and said core or head being made of a hard and wear resisting material. This head also comprises axially separable sections 23, 24 having recesses 25, 26 in the abutting ends and inner wall of the sections for the engagement of keys 27, similar to the keys 21, Figure 4, to hold said head sections against rotative movement one relative to the other on the shaft, and to center and maintain the same in spaced relation to the shaft for the reception of a fused or melted metal to fasten the head to the shaft.

Variations may be resorted to within the scope of my invention, and portions thereof may be used without others.

Having thus described my invention, I claim:

1. In a gyratory crusher, a rotatable support, a crushing member comprising tubular sections mounted upon the support in axial abutting relation and arranged with segmental recesses in the abutting ends adapted to be brought into opposed relation when the sections are in abutting relation, and common means to engage in said recesses to hold the sections against rotative movement, one relative to and independent of the other on the support.

2. In a gyratory crusher, a rotatable support, a crushing member comprising tubular sections mounted on support in axial relation, and arranged with recesses circumferentially disposed around the abutting ends and inner faces of the sections adapted to be brought into opposed relation when the sections are in abutted rela-

tion, and keys fitting in the opposed recesses to hold said sections against rotative movement one relative to the other and arranged with means to project inwardly beyond the inner faces of the sections to engage the support to maintain the crushing member in spaced relation to the support.

3. In a gyratory crusher, a rotatable support, a crushing member comprising tubular sections mounted on a shaft in axial abutting relation and arranged with opposite and corresponding recesses in the abutting ends and cut through the inner faces of the sections, a key engaging in a pair of opposite recesses to extend flush with the inner faces of the sections, and pins projecting from said key beyond the inner surface of the sections for engagement with the support for the purpose specified.

4. In a gyratory crusher, the combination with a rotary crushing member comprising axially separable tubular sections and a core upon which the tubular sections are mounted, and common means to lock the separable sections of the crushing member against rotative movement one relative to the other and maintain the same in spaced relation to the core for the purpose specified.

5. In a gyratory crusher, the combination with a shaft, of a core mounted on the shaft, a mantle to engage around said core comprising axially separable sections having mating recesses in the ends, and a key to engage in the recesses to lock the sections against rotative movement one relative to and independent of the other on the core and means projecting inwardly from the key to engage the core to maintain the mantle in spaced relation to the core for the purpose specified.

6. In a gyratory crusher, the combination with a rotatable shaft, of a cone shaped core mounted on the shaft, an axially separable cone shaped shell to engage over the core having opposite mating recesses in the ends and inner wall of the shell sections, a key to engage in a pair of opposed recesses to lock the shell sections against rotative movement one relative to the other on the core and having inwardly projecting pins to engage the core and maintain the shell in spaced relation to the core for the purpose specified.

7. In a gyratory crusher, the combination with a rotary shaft having a cone shaped core fixed thereon, of a cone shaped shell to engage around the core comprising axially separable sections with the inclination of the inner wall of the shell arranged so that the internal diameter of the shell at the bottom will be substantially of the same diameter as the external diameter at the bottom of the core with the upper portion of the inner wall of the shell spaced from the core, means being mating recesses in the adjacent ends and inner wall of the shell sections; a key to engage in a pair of mating recesses in the shell sections to lock the sections against rotative movement one relative to the other on the core; and pins projecting inward from the key to engage the core to maintain the shell in spaced relation to the core for the reception of a fused metal for the purpose specified.

8. A crushing member for gyratory crushers comprising tubular sections adapted to be mounted in axial abutting relation, there being recesses in the inner faces at the abutting ends of said sections with the upper and lower shoulders of said recesses adjacent the abutting line of the sections, and a key to engage in said recesses to lock said sections against rotative movement relative to each other, said key being held in place by the upper and lower shoulders of the recesses engaging the key.

9. In a gyratory crusher, a crushing member comprising a core, an axially separable mantle of wear resisting material to engage around said core and arranged with opposite recesses in the mating edges of the sections cut through the inner surface, keys fitting said recesses to hold the mantle sections against rotative movement one relative to the other, and the keys arranged with means to engage the core to maintain the mantle in spaced relation thereto and a metallic filler placed in the space between the core and mantle in the manner and for the purpose specified.

Signed at the city of New York, in the county of New York and State of New York, this 20th day of December, 1919.

JOSEPH E. KENNEDY.