Feb. 23, 1926. 1,574,142.

W. S. WESTON

GYRATORY CRUSHING MACHINE

Filed March 15, 1923 2 Sheets-Sheet 1

Fig. 1.

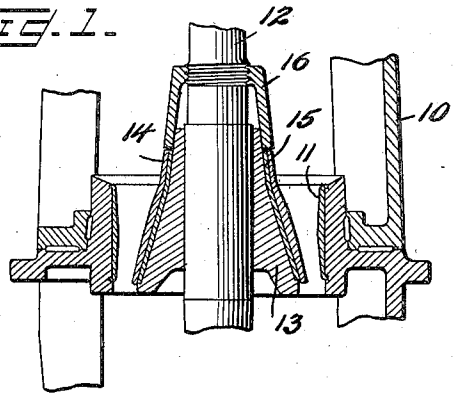


Fig. 2.

Inventor

W. S. Weston,

By Watson, Cole, Morse & Grindle

Attorney

Feb. 23, 1926. 1,574,142

W. S. WESTON

GYRATORY CRUSHING MACHINE

Filed March 15, 1923 2 Sheets-Sheet 2

FIG. 3.

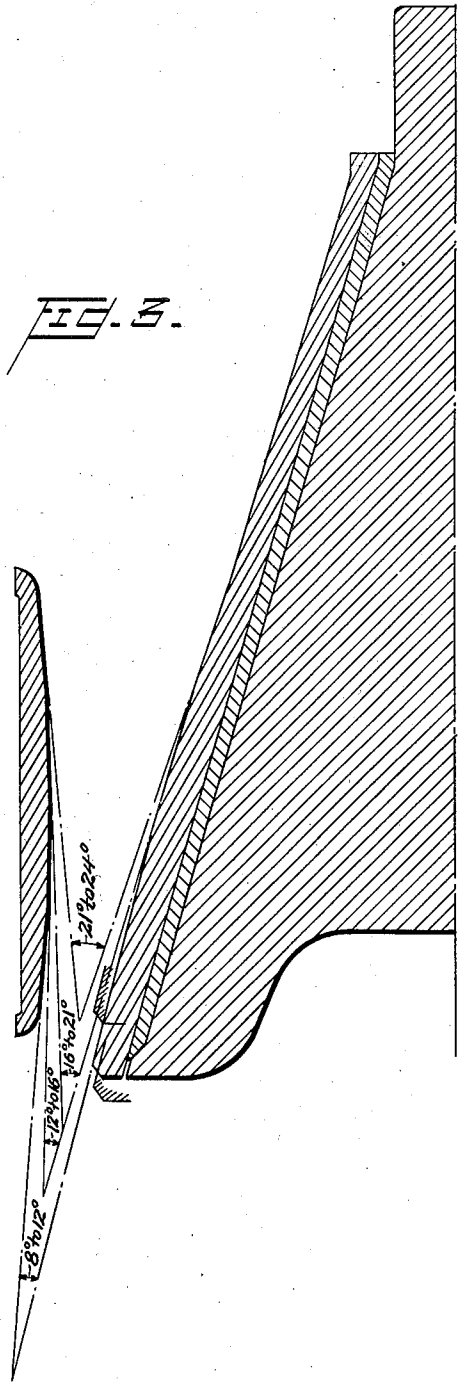
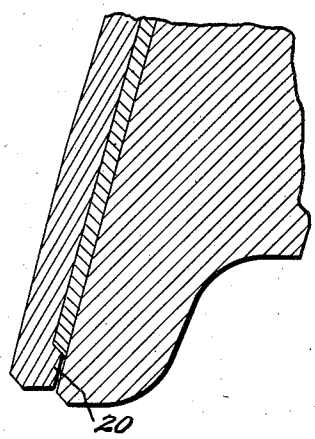


FIG. 4.



Inventor

W. S. Weston,

By Watson, Cole, Grindle & Watson

Attorney

Patented Feb. 23, 1926. 1,574,142

UNITED STATES PATENT OFFICE.

WILLIAM S. WESTON, OF COLUMBIA, SOUTH CAROLINA.

GYRATORY CRUSHING MACHINE.

Application filed March 15, 1923. Serial No. 625,357.

To all whom it may concern:

Be it known that I, WILLIAM S. WESTON, a citizen of the United States, and a resident of Columbia, Richland County, State of South Carolina, have invented certain new and useful Improvements in Gyratory Crushing Machines, of which the following is a specification.

The present invention relates to gyratory crushing machines and particularly to the design and construction of the crushing mantle and concaves. The word "concave" as used in the art defines the substantially cylindrical sleeve or hopper which is rigidly secured to the frame of the crusher and which cooperates with the gyratory member to effect the crushing of the stone passing through, and the word "mantle" is commonly used to indicate the hardened frustro-conical shell which fits closely around a frustro-conical core secured to the gyratory member and which cooperates with the concave in crushing the material passing therebetween.

Substantially cylindrical concave members and substantially frustro-conical mantles have been heretofore frequently employed in the art, the arrangement being such that an annular opening triangular or V-shaped in axial section is left between the concave and the crushing mantle, this annular opening being upwardly flaring. In the operation of such machines, the large rocks enter this hopper shaped opening at the top, are crushed as they pass downward, and fall through the annular gap between the bottom edges of the crushing members.

More specifically stated, the objects of the present invention are, first, to provide a gyratory crusher in which the crushing mantle and concaves are designed with exactness, with the end in view of producing more perfect crushing action and longer life to these members when in use, and second, to provide a crushing mantle of improved design and constructon.

The invention may be embodied in various forms, and in the accompanying drawings one form is illustrated, but it will be understood that modifications of design may be made without departing from the spirit of the invention.

In the drawings:

Figure 1 is a vertical axial section through a portion of a gyratory crushing machine showing the crushing members;

Figure 2 is an enlarged vertical section through one side of the concave and portion of the mantle and mantle-core;

Figure 3 is a similar view showing a concave of different size; and

Figure 4 is an axial section through a portion of the lower edge of an improved mantle.

The frame of the machine is indicated at 10 and the machine has preferably a general construction similar to that illustrated and described in my copending application Serial No. 456,663, filed March 29, 1921. The concave is illustrated at 11, and is rigidly secured to the frame. The gyratory shaft is indicated at 12, the mantle cone at 13, and the mantle at 14. The mantle 14 lies parallel to the frustro-conical core 13, but there is an intermediate lining of zinc 15 such as generally used in machines of this character. A mantle nut 16 has threaded relation with the shaft 12 and it is lower and bears down upon the annular upper end of the mantle 14 and the zinc lining 15 so that upward movement of the mantle is prevented, and also upward flow of the zinc.

Referring particularly to Figure 2 it will be seen that the inner surface of the concave is convex in axial section, and that the outer or wearing surface of the mantle is also convex. The slope of the inner surface of the concave changes at approximately its quarter points when measured vertically so that it is divided into four annular sections which are indicated at *a*, *b*, *c* and *d*. The slope of the outer surface of the mantle also changes along its vertical height and it may be said that there are three sections *e*, *f* and *g*, the mantle surface in each section being different in slope from that of the other sections. Hence the crushing angle between the concave and mantle varies from the top toward the bottom and it will be seen that while stone entering the crushing space from the top will be crushed by opposing surfaces which make a relatively large angle with each other, that as the stone is crushed and approaches the bottom of the crushing space, the crushing angle becomes smaller. The construction lines extending downwardly from the various sections of the crushing members indicate the angles which obtain between such sections. The annular space between section *a* of the concave and section *e* of the mantle constitutes what is termed the feeding zone, and the angle *k*

between these sections may vary from a minimum of 21° to a maximum of 24°. The angle M between sections *b* and *f* may vary from 16° to 21°. The angle between sections *c* and *g* will vary between 12° and 16°, and the angle R between the lower sections *d* and *g* will vary from 8° to 12°. As stated before the space between sections A and E may be termed the feeding zone and the space between sections B and C, F and G constitutes the crushing zone, while the space between sections D and C constitutes the finishing zone. The same angular relationships obtain with crushers of less capacity as can be seen from Figure 3. Here smaller stones are crushed and the product is finer but the same principles of construction are employed. The concave in this case however is considerably shorter than that illustrated in Figure 1.

The stone fed into the crusher disclosed will consist, where the crusher is a secondary crusher, of the product of a preceding reduction operation and will be more or less graded. The large pieces will be initially crushed in the first or feeding zone and in the succeeding zones the pieces will become smaller and smaller until finally falling from the machine. As the surfaces are worn, the operation above described will be carried on continuously lower and lower. The crushing head may be raised as wearing occurs from its original position indicated at 1, to its full line position 2, and finally to position 3. Due to the fact that the crushing angle becomes smaller and smaller toward the bottom of the crushing space the surfaces cannot wear in such manner that ultimately the crushing is all performed in the lowest zone, which frequently happens in machines of present design, with the result that a ring or pocket is formed in the concave in the crushing zone which allows stone to slip instead of being promptly crushed. This slippage results in slowing up of production and overloading of the crusher.

Referring to Figure 4 it will be seen that the lower end of the mantle is provided with a retaining lip 20 to prevent downward flow of the zinc lining. Heretofore the retaining flange or lip has been formed on the core, as shown in Figures 1, 2 and 3. The formation of the retaining flange on the mantle instead of the core is a change of great importance in that it permits the zinc lining to be poured in the shop with the mantle mounted on a dummy core and transported or shipped as an integral part of the mantle for ready assembly on a machine at any point. In prior constructions it was necessary to pour in the molten zinc after placing the mantle on the machine with which it is to be used, a difficult and comparatively expensive operation.

To one skilled in the art the advantages of the invention will be apparent and it will also be obvious that minor changes of design and construction may be made without departing from the spirit and scope of the invention.

Having thus described the invention what is claimed as new and desired to be secured by Letters Patent is:

1. In a gyratory crushing machine, in combination, a sleeve-like concave and a substantially frustro-conical crushing mantle within the concave, the crushing surfaces of the concave and mantle being convex in vertical section.

2. In a gyratory crushing machine, in combination, a sleeve-like concave and a substantially frustro-conical crushing mantle within the concave, the crushing angle between the concave and mantle becoming smaller toward the crushed stone outlet and this angle being smallest at the outlet.

3. In a gyratory crushing machine, in combination, a sleeve-like concave and a substantially frustro-conical crushing mantle within the concave, there being three zones between said members, a feeding, a crushing, and a finishing zone, the angle between the cooperating faces in the crushing zone being less than the angle between the faces in the feeding zone, and greater than the angle in the finishing zone.

In testimony whereof I hereunto affix my signature.

WILLIAM S. WESTON.