H. HURTER.

ROLL FOR CANE CRUSHING APPARATUS.

APPLICATION FILED MAY 10, 1920.

1,409,001. Patented Mar. 7, 1922.

Fig. I.

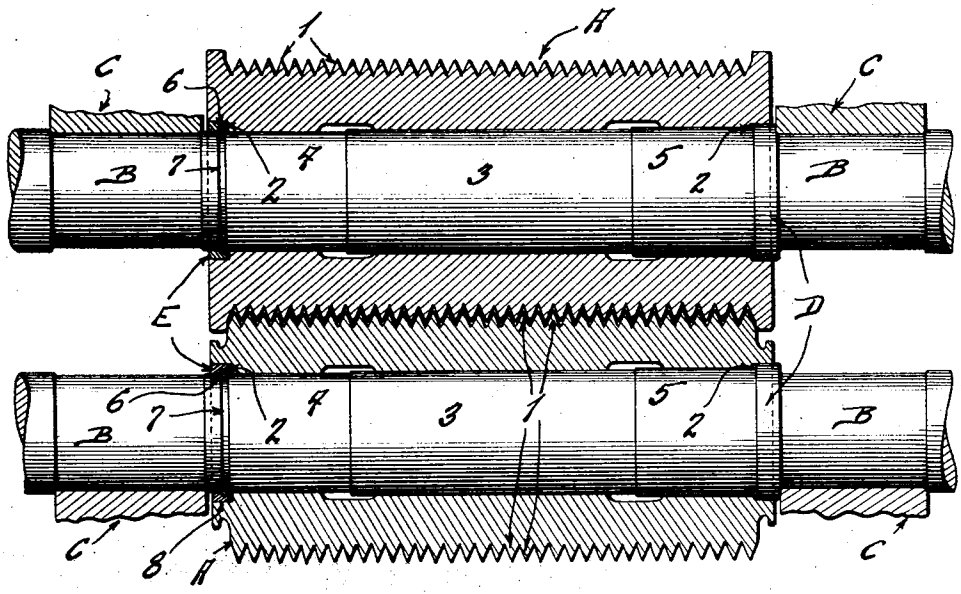


Fig. II.

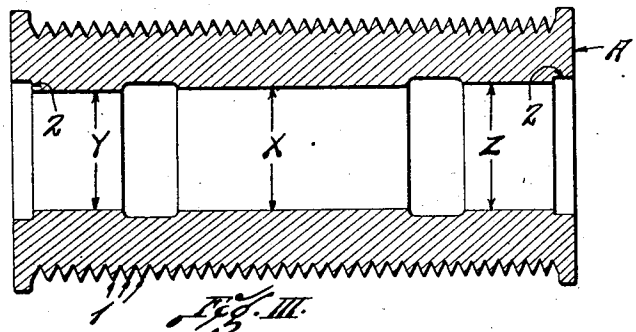


Fig. III.

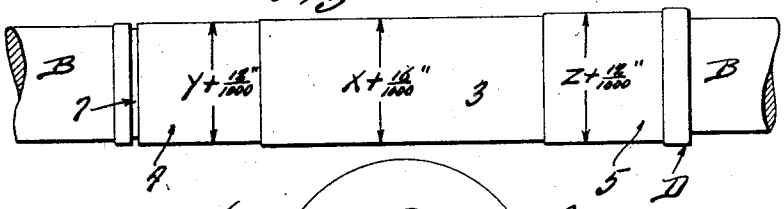
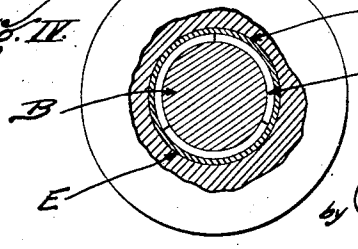


Fig. IV.



Inventor—
Henry Hurter
by Cook & McCauley Attys.

UNITED STATES PATENT OFFICE.

HENRY HURTER, OF ST. LOUIS, MISSOURI, ASSIGNOR TO FULTON IRON WORKS COMPANY, OF ST. LOUIS, MISSOURI, A CORPORATION OF DELAWARE.

ROLL FOR CANE-CRUSHING APPARATUS.

1,409,001. Specification of Letters Patent. Patented Mar. 7, 1922.

Application filed May 10, 1920. Serial No. 380,330.

To all whom it may concern:

Be it known that I, HENRY HURTER, a citizen of the United States of America, a resident of the city of St. Louis, in the State of Missouri, have invented certain new and useful Improvements in Rolls for Cane-Crushing Apparatus, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

This invention relates to improvements in cane crushers, or cane mills, having rolls adapted to crush or compress a mass of cane. Prior to this invention, rolls of this kind have been secured to shafts in such a manner that the shafts are liable to be broken when the rolls are in service. It has been customary to closely confine a cane roll between abutment collars secured to a shaft and engaging the ends of the roll for the purpose of preventing creepage of the roll on the shaft. In some instances, severe stresses resulting from longitudinal expansion of the rolls, have broken the abutment collars, and the shafts have also been broken at points near the abutment collars.

One of the objects of this invention is to produce a very strong roll and shaft capable of withstanding the service stresses without liability of the roll creeping along the shaft. A further object is to avoid the expense and danger of breakage at the shaft, and especially at a portion of the shaft near one end of the roll. Another object is to accomplish these and other desirable results, and at the same time permit longitudinal expansion and contraction of the roll.

Fig. I is a vertical section showing two cane crushing rolls and the shafts on which they are mounted.

Fig. II is a longitudinal section of one of the rolls.

Fig. III is a detail view showing the shaft portions which are forced into the roll.

Fig. IV is an end elevation, partly in section, showing the sectional abutment collar at one end of the roll.

To illustrate the invention I have shown cane crushing rolls A mounted on shafts B, the latter being closely fitted to suitable bearings C which may be supported in any suitable manner. The rolls A are provided with peripheral ribs or teeth 1 which overlap and interlock with each other at the meeting faces of the rolls, as shown in Fig. I. Rolls of this kind must be firmly secured to the shafts in such a manner that they cannot creep longitudinally of the shafts, but such rolls should also be free to expand and contract relative to the shafts. The expansion and contraction of the rolls is not only due to variations in atmospheric temperatures, but also due to changes in temperature resulting from friction of the cane at the cooperating peripheral faces of the rolls.

One end of each roll is preferably recessed to receive an abutment collar D, preferably formed integral with the shaft on which the roll is mounted. The other end of each roll may be recessed to receive an abutment collar E removably secured to the shaft, as will be hereinafter described. Abutment shoulders 2, formed in the ends of the rolls, are adapted to cooperate with the abutment collars D and E to prevent, or limit, creepage of the rolls on the shafts. By referring to Fig. I it will be seen that the abutment collars are separated a very slight distance from the shoulders 2 so as to allow the rolls to expand longitudinally. Prior to this invention, the rolls have been closely confined between collars engaging the ends of the rolls, and when the rolls expand independently of the shafts, such collars have been subjected to very severe stresses. It is to be understood that the rolls and shafts are very large members, made of metal, the rolls being usually over 30 inches in diameter and over 6 feet in length, so any rigid abutment tending to prevent longitudinal expansion of a roll, will be subjected to very severe stresses, and such stresses have resulted in breakage of the abutment collars. In the earlier structures, when an abutment collar was broken, the roll was permitted to creep longitudinally of the shaft, and this resulted in displacement of the crushing teeth 1, together with a liability of breakage of a shaft. My objects are to permit longitudinal expansion and contraction of the crushing roll and to positively prevent longitudinal creepage of the roll.

The spaces between the abutment shoulders 2 and the abutment collars D and E, permit longitudinal expansion of the roll, but the roll must be very securely held on its shaft.

Shafts B are forced into the rolls A by the

use of a hydraulic press, or the like, whereby a pressure of several hundred tons may be obtained to force the shafts into the rolls, the shafts being slightly larger in diameter than the openings in the rolls, so as to provide a very firm frictional contact between the peripheral faces of the shafts and the walls of the openings into which they are forced. To illustrate an important feature of the invention I have shown a shaft having an elongated middle portion, or intermediate portion 3, and end portions 4 and 5, all of which are secured by very firm frictional contact with the walls of the shaft receiving opening in the roll. The diameters of the shaft portions 3, 4 and 5 differ from each other, the intermediate portion 3 being smaller in diameter than the end portion 5 and larger than the end portion 4, so the shaft can be inserted into one end of the roll until its abutment collar D reaches the roll, and thereafter the abutment collar E can be applied to the shaft.

As an illustration of important variations in diameters, the diameter of the middle portion of the shaft receiving opening may be considered as a measurement represented by X in Fig. II, while the diameters of the end portions of this opening may be considered as measurements represented by Y and Z. The intermediate and end portions 3, 4 and 5 of the shaft are primarily larger in diameter than the corresponding portions of the walls of the opening which they are to engage. For example, the diameter of the middle portion 3 of the shaft may be 16/1000 of an inch larger than the diameter of the opening in which it is to be finally seated, this excess diameter being indicated in Fig. III, while the diameters of the shaft portions 4 and 5 may be only 12/1000 larger than the dimensions Y and Z. When the shaft is forced into the relatively small opening in the roll the middle portion of the shaft, being 16/1000 of an inch larger than the measurement X, will be forced into very firm frictional contact with the middle portion of the roll, while the end portions of the roll contacting with the shaft portions 4 and 5 will be comparatively free to yield in response to the expansion and contraction of the roll. The middle portion of the roll is thus very firmly secured to the middle portion 3 of the shaft to prevent accidental creepage of the roll, while the comparatively free end portions of the roll can be forced along the end portions 4 and 5 of the shaft to permit longitudinal expansion and contraction. The abutment collars D and E cooperate with the firmly secured middle portion of the roll to positively prevent undue longitudinal creepage of the roll.

When the shaft is forced into the roll, under several hundred tons pressure, there is a tendency to expand the roll, and the resultant stresses are greatest at the middle portion of the roll. However, an important advantage is gained by very firmly securing the shaft, and since this must result in severe stresses it is an advantage to transmit the maximum stress to the comparatively strong middle portion of the roll, instead of to the relatively weak end portions.

The removable abutment collar E may be a sectional device comprising segmental sections 6 (Figs. I and IV) located in a groove 7 in the periphery of the shaft and combined with each other to form a segmental ring. These segments 6 are confined by a ring 8 forced onto the shaft and into one end of the roll so as to surround and engage said segments 6.

I claim:

1. The combination of a cane crushing roll having a shaft receiving opening at its axis, and a shaft forced into said opening, said shaft having different portions secured by frictional contact with walls of said opening, one of said portions being more firmly secured than the other, said portions of the shaft being primarily larger in diameter than the walls of the opening with which they are in frictional contact, and the excess in diameter of one of said portions being greater than the excess in diameter of the other portion.

2. The combination of a cane crushing roll having a shaft receiving opening at its axis, and a shaft forced into said opening, said shaft having end and intermediate portions secured by frictional contact with walls of said opening, said end and intermediate portions of the shaft being primarily larger in diameter than the walls of the opening with which they are in frictional contact, and the excess in diameter of the intermediate portion being greater than the excess in diameter of the end portions.

3. The combination of a cane crushing roll having a shaft receiving opening at its axis, and a shaft forced into said opening, said shaft having portions of different diameters secured by frictional contact with walls of said shaft receiving opening, said shaft diameters being primarily larger than the diameters of the walls with which the shaft portions are in frictional contact, and the excess diameter of one of said portions being greater than the excess diameter of the other portion.

4. The combination of a cane crushing roll having a shaft receiving opening at its axis, and a shaft forced into said opening, said shaft having end and intermediate portions secured by frictional contact with walls of the shaft receiving opening, the diameter of said intermediate portion being larger than the diameter of one of the end portions and smaller than the diameter of the other end portion of the shaft, said

shaft diameters being primarily larger than the diameters of the walls with which the shaft portions are in frictional contact, and the excess in diameter of said intermediate portion being greater than the excess in diameter of the end portions.

5. The combination of a cane crushing roll having a shaft receiving opening at its axis, and a shaft forced into said opening, said shaft having end and intermediate portions secured by frictional contact with walls of said opening, said end and intermediate portions of the shaft being primarily larger in diameter than the walls of the opening with which they are in frictional contact, the excess in diameter of the intermediate portion being greater than the excess in diameter of the end portions and said intermediate portion of the shaft being located midway between the ends of the roll so as to provide relatively firm contact between the shaft and the middle portion of the roll.

6. The combination of a cane crushing roll and a shaft on which said roll is mounted, a portion of the internal wall of said roll being firmly secured to the shaft to prevent creepage of the roll on the shaft, and another portion of said wall of the roll being less firmly secured to the shaft to permit longitudinal expansion and contraction of the roll.

7. The combination of a cane crushing roll and a shaft on which said roll is mounted, the end portions of the internal wall of said roll being frictionally engaged with and movable relative to the shaft to permit longitudinal expansion and contraction of the roll, and an intermediate portion of said wall of the roll being more firmly secured to the shaft to prevent creepage of the roll on the shaft.

8. The combination of a cane crushing roll and a shaft on which said roll is mounted, the end portions of the internal wall of said roll being movable relative to the shaft to permit longitudinal expansion and contraction of the roll, an intermediate portion of said wall of the roll being more firmly secured to the shaft to prevent creepage of the roll on the shaft, and abutment collars cooperating with the firmly secured intermediate portion of the shaft to positively prevent creepage, said abutment collars being normally separated from end portions of the roll to permit longitudinal expansion of the roll.

In testimony that I claim the foregoing I hereunto affix my signature.

HENRY HURTER.