Nov. 18, 1930. G. W. BORTON 1,781,891

HAMMER CRUSHER

Filed July 6, 1928

Fig. 1.

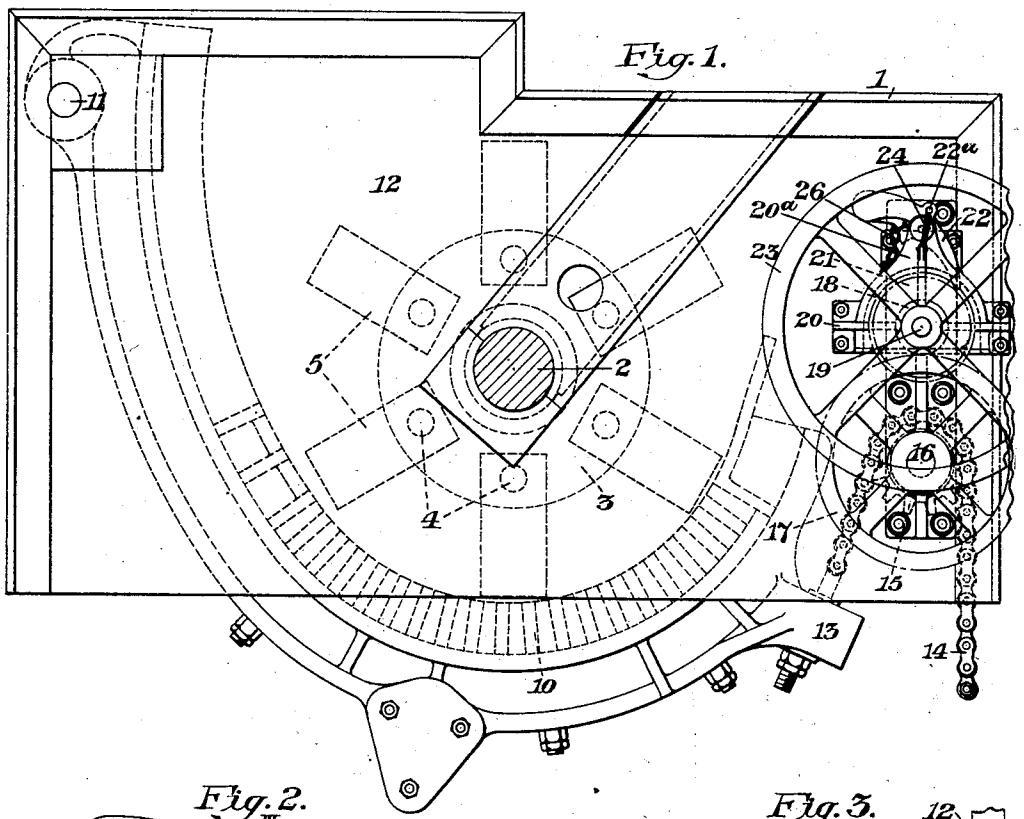


Fig. 2.

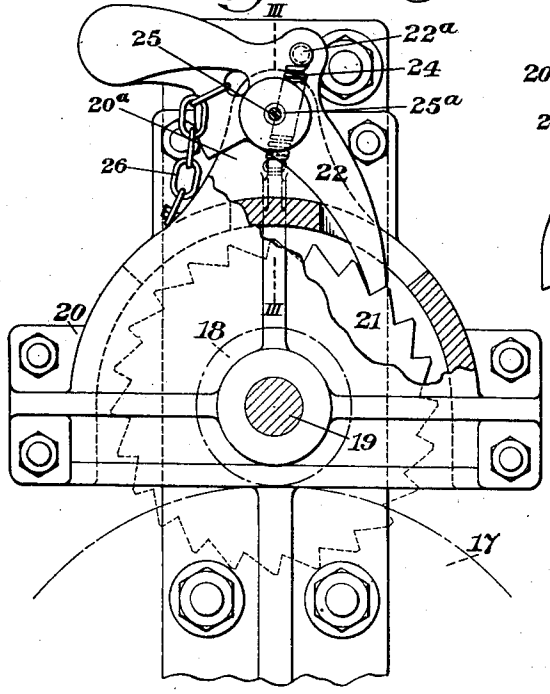
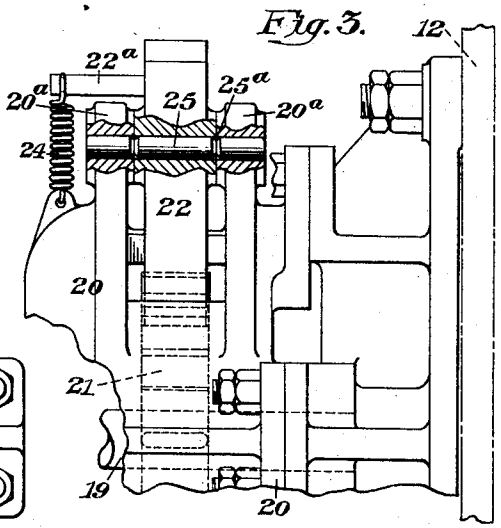


Fig. 3.



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UNITED STATES PATENT OFFICE

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HAMMER CRUSHER

Application filed July 6, 1928. Serial No. 290,801.

My invention relates to the adjusting means for the cages or screens of hammer crushers, wherein such cages or screens are pivotally mounted at one end and are supported at the opposite end by flexible or pivotally connected means, such as chains passing over toothed wheels, or the rack bar construction illustrated in the patent of Hartman and Borton, No. 1,361,054; the shaft carrying said toothed wheel also having a gear wheel adapted to mesh with a pinion suitably mounted in proper relation thereto, whereby motion imparted to said pinion effects movement of said chains, rack bars, or other elements to raise or lower the cage or screen. The pinion-carrying shaft is provided with a hand wheel whereby it may be turned and said shaft also carries a ratchet wheel with which a pawl engages. The screen or cage is adjusted relatively to the path of the hammers by turning the hand wheel whose motion is imparted to the chains or other supports for the cage by the gearing indicated and when in the desired position it is held by the pawl engaging said ratchet wheel.

In all crushers of this type there is great liability of foreign bodies accompanying the material undergoing crushing; coal, ore, stone, or the like, and unless provision is made for relief there is great danger of damage to the machine from such foreign bodies that can not be crushed by the hammers. The object of my invention is to reduce the danger of damage and to provide readily breakable means which will release the cage-supporting means at one end of the same and permit the cage to drop away from the rotor structure carrying the hammers should uncrushable material be present with the material undergoing treatment.

To this end the pawl arranged to engage the ratchet wheel is mounted upon a shear pin resting in suitable bearings; such shear pin being so dimensioned that its section at certain points where it may or may not be reduced in diameter, is weaker in relation to the sustained stresses than any part of the cage or screen or its supporting or adjusting means, whereby such pin may break or shear under excessive load before the other operating parts reach their breaking stresses. This arrangement permits adjustment of the cage or screen in a simple and direct manner without detaching any machinery part or the shear pin itself except when lowering the cage or screen at which time the pawl must be displaced from its engagement with the ratchet wheel.

These and other features of my invention are more fully described hereinafter; reference being had to the accompanying drawings, in which:

Figure 1 is a view in elevation, more or less diagrammatic, of one form of crushing structure to which my invention may be applied.

Fig. 2 is an enlarged view in elevation of a portion of the structure shown in Fig. 1, and

Fig. 3 is a view looking in the direction of the arrow, Fig. 2, and partly in section on the line III—III.

Hammer crushers of this type comprise a suitable frame or casing indicated generally at 1, in which is mounted a rotor structure comprising a shaft 2, disks 3, supporting rods 4 upon which are hung hammers 5; suitable means being provided to rotate the shaft so that the hammers driven thereby may act upon the material to be crushed which is introduced into a suitable hopper for passage to the path of the hammers whereby it may be crushed against the bars of the cage or the screen for discharge through the spaces or apertures thereof.

The cage or screen, which may be made up of a series of bars or other foramina supported by suitable side frames, is indicated diagrammatically at 10, and may be pivotally mounted at one end of the crusher structure upon a cross-bar 11, supported by the side walls 12 of the same, while the opposite end of such cage or screen may be connected at 13, to chains 14, passing around chain wheels 15, mounted upon a cross-bar or shaft 16, supported by said side walls 12 at the opposite end of the machine, or supported by the rack bars illustrated in the Hartman and Borton patent referred to. The shaft 16 car-

ries a gear wheel 17, meshing with a pinion 18, carried by a short shaft 19, which may be disposed directly above the shaft 16. The short shaft 19, which is preferably mounted in suitable bearings provided by a bracket 20 supported on the side wall of the frame of the crusher structure, carries a ratchet wheel 21 and a pawl 22, pivotally mounted in said bracket 20, is provided for engagement with this ratchet wheel. In order that the shaft 19 may be turned, and with it the ratchet wheel 21 and pinion 18, such shaft is provided with a hand wheel 23.

When it is desired to change the position of the screen or cage with reference to the path of the hammers for fine or coarse crushing, or when, due to the wear on the ends of the hammers it is necessary to adjust the screen relatively thereto, motion is imparted to the shaft 19 by the hand wheel 23, and the pawl is reset in engagement with the ratchet wheel when the desired adjustment has been effected. In order to prevent the pawl accidentally releasing the ratchet wheel, it is preferably connected to the bracket by a spring 24, which may be connected at one end to the bracket 20 and at the opposite end to a pin 22^a projecting from the face of the pawl.

As may be readily understood, the whole weight of the screen is dependent for its support upon the pin supporting the pawl 22, since if this gives way the ratchet wheel is released; permitting the shaft 19 with the pinion 18 to run free thus releasing the gear wheel on the shaft 16 which also runs free by reason of the weight of the screen or cage causing the chains to react upon the chain wheels 15 (or the rack bars to react upon pinions meshing therewith).

Unless some provision is made for releasing the screen, there is great danger of damage to the machine should uncrushable material accompany the material undergoing treatment, and in order that the cage or screen may be released under such circumstances, I provide a shear pin as the support for the pawl 22. This pin is clearly shown at 25, Fig. 3; being supported in the arms 20^a of the bracket 20. Intermediate the ends of the shear pin I may provide the same with weakened portions; the grooves 25^a for instance, preferably V-shaped as indicated, and these grooves are preferably disposed in line with the side faces of the pawl. This shear pin is so dimensioned that its section at the point 25^a, where such pin may or may not be reduced in diameter, is weaker in relation to the sustained stresses than any other part of the cage or screen or its adjusting means, whereby such pin may break or shear under excessive load before the other operating parts reach their breaking stresses.

This arrangement permits adjustment of the cage or screen in a simple and direct manner without detaching any machinery part or the shear pin itself. When lowering the cage or screen, the pawl will be disengaged from the ratchet wheel in the usual manner. The spring 24 may be employed to hold the pawl in either of two positions; in mesh with the ratchet wheel or disengaged therefrom. To prevent dislodgement of the pawl should it be released by rupture of the shear pin, I provide a small chain 26 which may be connected at one end to the pawl and at the opposite end to the bracket 20.

I claim:

1. The combination with a crushing machine having a frame, an adjustable screen mounted therein, adjustable supporting means for one end of said screen, gearing including a driving and a driven element for actuating said adjustable supporting means, and mechanism for holding the driving element of said gearing against movement including a ratchet wheel and a pawl in engagement with said ratchet wheel, of a shear pin support for said pawl, and a bracket support carried externally of the wall of the crushing machine frame in which the ends of said shear pin are mounted.

2. The combination with a crushing machine having a frame, an adjustable screen mounted therein, chains and chain wheels supporting one end of said screen, gearing including a driving and a driven element for actuating said chain wheels, and mechanism for holding the driving element of said gearing against movement including a ratchet wheel and a pawl in engagement with said ratchet wheel, of a shear pin support for said pawl, and a yoked bracket mounted externally of the wall of the crushing machine frame in which the ends of said shear pin are supported.

3. The combination, in a crushing machine of the hammer mill type having a frame, an adjustable screen pivotally mounted therein, and means for raising and lowering the opposite end of said screen including a gear train having a driving and a driven element operatively connected to said raising and lowering means, of a bracket carried externally of the wall of said crushing machine frame, a shaft mounted in said bracket and carrying the driving member of said gear train, a ratchet wheel also secured to said shaft, a pawl in engagement with said ratchet wheel, a yoked extension carried by said bracket and projecting above said ratchet wheel in which said pawl is mounted, and a breakable pin support for said pawl mounted in said yoked extension.

4. The combination, in a crushing machine of the hammer mill type having a frame, an adjustable screen pivotally mounted therein, and means for raising and lowering the opposite end of said screen including chains con-

nected thereto, chain wheels over which said chains pass and a gear train having a driving and a driven element operatively connected to said chain wheels, of a bracket carried externally of the wall of said crushing machine frame, a shaft mounted in said bracket and carrying the driving member of said gear train, a ratchet wheel also secured to said shaft, a pawl in engagement with said ratchet wheel, an integral yoked extension carried by said bracket and projecting above said ratchet wheel, and a breakable pin support for said pawl mounted in said yoked extension.

5. In a structure such as set forth in claim 3, a shear pin supported at each end in the yoked extension and upon which said pawl is journaled; said shear pin being weakened by annularly grooving the body of the same intermediate its ends and adjacent their support in said yoked extension.

In witness whereof I have signed this specification.

GEORGE W. BORTON.