

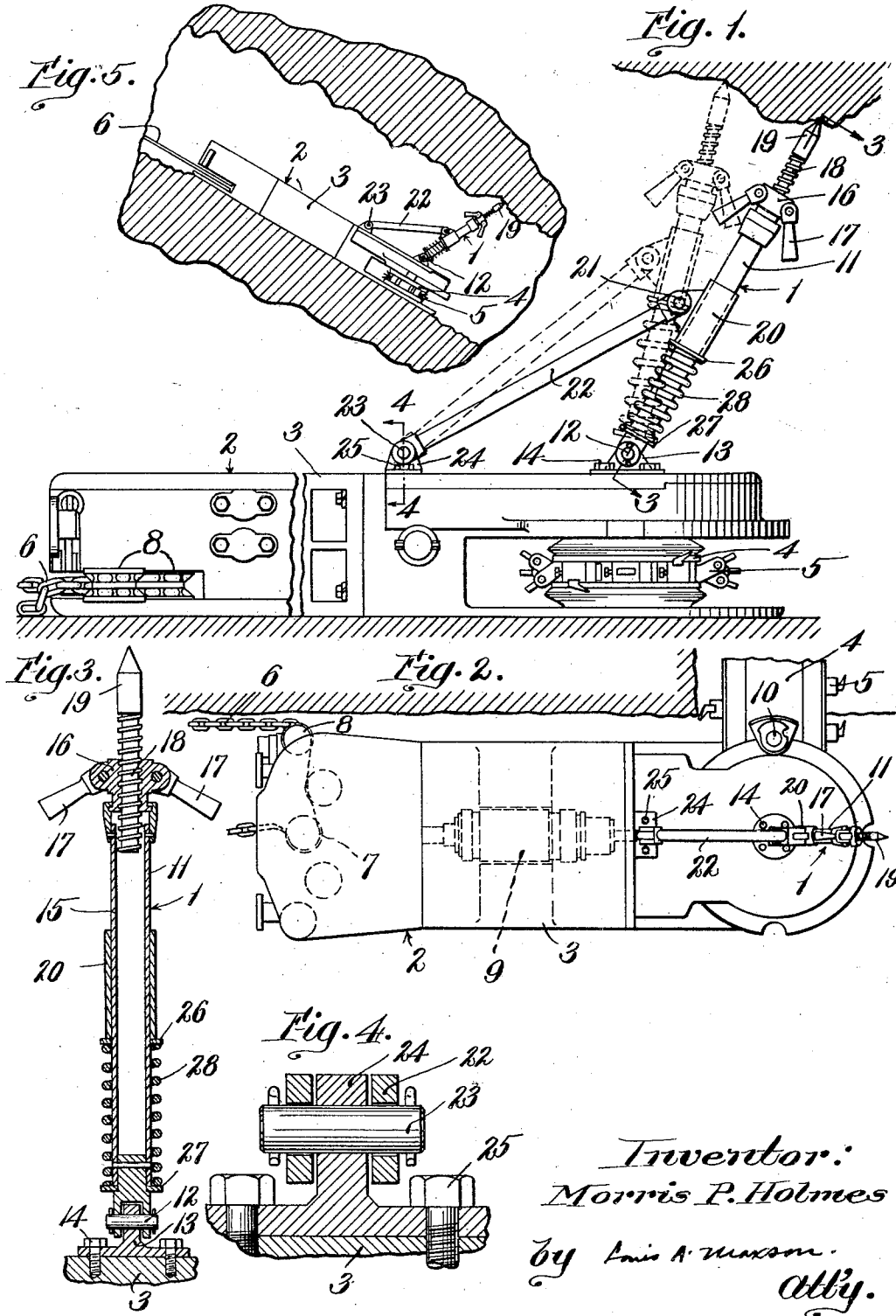
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MINING MACHINE

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## UNITED STATES PATENT OFFICE

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## MINING MACHINE

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This invention relates to mining machines, and more particularly to improved safety apparatus for such machines.

An object of this invention is to provide an improved safety apparatus. A further object is to provide an improved safety apparatus especially adapted to use with a coal mining machine of the flexibly fed, bottom cutting type. Another object is to provide in a mining machine of the flexibly fed, bottom cutting type operating on a steeply inclined coal seam, an improved safety device operative to interrupt rearward movement of the machine down the pitch in the event of failure of the flexible feeding means. Yet another object is to provide an improved safety device adapted to cooperate with a mine roof to prevent rearward movement of a coal mining machine down a steeply inclined coal seam in case the machine feeding means fails for any reason. Another object is to provide improved means of the character set forth which, while automatically retained in operative position and automatically operative to arrest rearward movement of the coal cutting machine on which it is carried, enables the machine to be moved forward whenever desired. A further object is to provide an improved safety attachment for use in a coal cutting machine to prevent automatically movement of the machine down an inclined coal seam in the event of failure of the machine feeding means, including a pivoted sprag resiliently maintained in engagement with the mine roof and adapted to positively engage the mine roof upon rearward movement of the machine down the pitch. Another object of the invention is to provide an improved safety device including a pivoted sprag member, means for moving the sprag member automatically toward an upright position, and means cooperating with the last mentioned means to preclude movement of the sprag past the vertical. These and other objects and advantages of this invention will, however, hereinafter more fully appear.

In one aspect and in a preferred form, my invention comprises a pivoted sprag member, means for moving said sprag mem-

ber automatically toward an upright position, and means cooperating with said last mentioned means for precluding movement of the sprag past the vertical. In another aspect and in a preferred form, the invention may comprise a sprag member movable angularly, a link member movable angularly with and relative to said sprag member, a sliding member, an abutment engageable by said sliding member as said sprag member reaches the upper limit of its angular movement, and resilient means acting on said sliding member to move the same toward said abutment.

In the accompanying drawing there is shown one form which the invention may assume in practice.

In this drawing,—

Fig. 1 is a side elevational view of a coal mining machine equipped with the improved safety apparatus, the latter being shown in a plurality of positions.

Fig. 2 is a top plan view of the mining machine and safety apparatus shown in Fig. 1.

Fig. 3 is a detail sectional view taken substantially on line 3—3 of Fig. 1, with parts moved.

Fig. 4 is a detail sectional view taken on line 4—4 of Fig. 1.

Fig. 5 is a diagrammatic view showing the machine in side elevation and operating on a pitch.

In this illustrative embodiment of the invention the improved safety apparatus, generally designated 1, is shown associated with a coal mining machine 2 of the flexibly fed, continuous cutter, longwall type, although it will be understood that the improved safety apparatus may be used equally as well with various other types of coal mining machines. The illustrative form of the machine disclosed herein includes a machine frame 3 slidable on its bottom over the mine bottom. Pivotedly mounted on the machine 3 at the rear end thereof is a horizontal plane cutter bar 4 carrying on its margin a usual endless cutter chain 5. The flexible feeding means for the machine includes a flexible feeding element 6 engageable with a winding member 7 and

suitably guided by guiding members 8. As in a usual construction, the cutting and feeding mechanisms are driven from a motor 9 of the mining machine through usual connections. In the use of such a machine the cutter bar 4 is swingable beneath the coal to effect its sumping cut in a suitable manner as, for instance, by connecting the flexible feeding element 6 to a projection 10 on the cutter bar. It will be evident that as the flexible feeding element is drawn in by the winding member 7 the cutter bar 4 is swung horizontally about its pivot to cut a horizontal kerf beneath the coal. After the cutter bar is swung or sumped beneath the coal, the feeding element 6 is detached from the projection 10 and then extended along the coal face and anchored at its free end so that when the winding member 7 is operated the machine will be fed bodily along the feeding element relative to the coal face to cut a horizontal kerf in the coal in the manner clearly shown in Fig. 2 of the drawing.

In the improved construction the safety apparatus 1 is mounted in a suitable manner on the machine in position to engage the mine roof to arrest the downward movement of the machine automatically when the machine for any reason starts backward down the pitch. The improved automatic safety device may obviously assume various forms, but in the illustrative form shown, includes a sprag 11 pivotally connected at 12 at its lower end to a bracket 13 secured as by screws 14 to the upper surface of the machine frame 3 in a position directly above the cutter bar, as clearly shown in Fig. 1. This sprag includes a tubular member 15 carrying at its outer end a rotatable nut 16 having suitable pivoted operating handles 17. Threadedly connected to this nut is a screw 18 having formed thereon at its outer end an abutment engaging point 19. Slidably mounted on the tubular member 15 is a sleeve 20 pivotally connected at 21 to a link 22, and this link 22 is in turn pivotally connected at 23 to a bracket 24 secured as by screws 25 to the upper surface of the machine frame at a point spaced forward from the sprag pivot. Interposed between a washer 26 engaging the lower surface of the sleeve 20 and a washer 27 secured to the lower end of the sprag and encircling the tubular member 15 is a coiled spring 28. This spring acting on the lower end of the sleeve 20 normally urges the sleeve into its uppermost position, thereby causing the sprag 11 to move towards the vertical, as indicated by the dotted line position shown in Fig. 1; movement of the sprag being limited by engagement of sleeve 20 with the mounting of the nut 16. As the sprag swings downwardly to clear some obstruction as the machine moves forwardly up the incline, the sleeve slides downwardly relative to the tubular portion of the sprag, thereby compressing the

coiled spring. When the obstruction is cleared the spring automatically moves the sprag upwardly so that the sprag automatically follows the contour of the mine roof as the machine moves up the pitch.

In the operation of the improved safety apparatus, when through the cooperation of the winding member 7 and the flexible feeding element 6 the machine is cutting a coal seam up a steep pitch as shown in Fig. 5, the sprag 11 will always tend to occupy the dotted line position shown in Fig. 1, its upper end following the roof surface and the sprag, through the action of the spring and the link connection 22 will freely yield to enable the same to pass over the obstructions and yet permit the same to instantly swing back into its operative position. The over-all length of the sprag may be readily adjusted simply by rotating the nut 16, while rotation of the screw 18 is prevented, to move the abutment engaging screw 18 inwardly or outwardly as required. When, however, for any reason the machine starts down the pitch, for instance in the event of breakage of the flexible feeding element 6, the rearward movement of the machine moves the sprag pivot bodily rearwardly in such manner as to drive the upper end of the sprag into the roof and act as a toggle which, at the same time that it drives the sprag deeper into the roof, presses the machine against the mine bottom and thereby promptly and effectually prevents further uncontrolled movement of the machine down the pitch, thereby preventing injury to the men and damage to the equipment which would otherwise result. It will be evident that although the sprag positively engages the mine roof to prevent rearward movement of the machine down the pitch, it yields freely as the machine moves forwardly up the pitch.

As a result of the improved construction it will be observed that it is possible to arrest the rearward movement of a coal cutting machine without damage to the mine bottom over which the machine slides and that it is further possible to permit the machine to move forward at any time without damage to the mine roof, the safety sprag being yieldably mounted on the machine, whereby enabling the sprag to spring over obstructions as the machine moves forwardly up the incline. It will also be evident that whenever it is desired to permit free rearward movement of the coal cutting machine down the pitch, the sprag may be readily rendered inoperative by simply disconnecting the link connection to permit the sprag to be swung down against the top surface of the machine frame. It will also be noted that the improved safety apparatus is in the form of an attachment and may be readily attached without change to any standard coal mining machine. These and other uses and advantages

of the improved safety apparatus will be clearly apparent to those skilled in the art.

While there is in this application specifically described one form which this invention may assume in practice, it will be understood that this form of the same is shown for purposes of illustration and that the invention may be modified and embodied in various other forms without departing from its spirit or the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. A safety attachment for a flexibly fed mining machine including a pivoted abutment engaging element adapted for connection to the frame of a mining machine, an element adjustably connected to said pivoted element, a link connection between said element and the frame of the mining machine, and resilient means acting on said adjustable element for urging said pivoted element into its operative position.

2. A safety attachment for a flexibly fed mining machine including a pivoted roof engaging sprag adapted for connection to the frame of a mining machine, an element adjustably connected to said sprag, a link connection between said element and the frame of the mining machine, and resilient means acting on said adjustable element for urging said sprag into its operative roof engaging position.

3. A safety attachment for a flexibly fed mining machine including a pivoted roof engaging sprag adapted for connection to the frame of a mining machine and including a tubular member, a sleeve slidably mounted on said tubular member, a link connected to said sleeve and to the machine frame, and resilient means acting on said sleeve for urging said sprag into its operative roof engaging position.

4. A safety attachment for a flexibly fed mining machine including a pivoted roof engaging sprag adapted for connection to the frame of a mining machine and including a tubular member, a sleeve slidably mounted on said tubular member, a link connected to said sleeve and to the machine frame, and a spring encircling said tubular member and acting on said sleeve for swinging said sprag into its uppermost position.

5. A safety attachment for flexibly fed mining machines including a roof engaging sprag adapted for pivotal connection to the frame of a mining machine and provided with an abutment engaging point, a link connection pivotally connected to the machine frame, and a resilient connection between said link and said sprag.

6. A safety attachment for flexibly fed mining machines including a sprag adapted for pivotal connection to the frame of a mining machine and provided with an abutment

engaging point, and a connection between the machine frame and said sprag slidably connected to the latter, said connection adapted to slide relative to said sprag as said sprag swings about its pivot.

7. A safety attachment for flexibly fed mining machines including a sprag adapted for pivotal connection to the frame of a mining machine and provided with an adjustable abutment engaging point, means for adjusting said point relative to the sprag body, a link connection pivotally connected to the machine frame, and a resilient connection between said link and said sprag.

8. A safety attachment for flexibly fed mining machines including a sprag adapted for pivotal connection to the frame of a mining machine and provided with an adjustable abutment engaging point, a screw and nut connection for adjusting said point relative to the sprag body, and a connection between said machine frame and said sprag and slidably connected to the latter for swinging said sprag into its uppermost roof engaging position.

9. A safety attachment for use in a mining machine comprising a support including an element adapted to engage the frame of a mining machine, a sprag pivoted on said support and provided with an abutment engaging point, an adjustable sleeve slidably mounted on said sprag, a spring acting on said sleeve, and connections between said sleeve and the machine frame.

10. The combination with a self-propelled mining machine bodily slidable on its bottom on the mine bottom during cutting and means for continuously feeding the machine during cutting, of safety means carried by and movable at a uniform rate with said machine normally adapted to yieldably engage a mine roof during forward feeding movement and to positively engage the mine roof during reverse movement to arrest said machine, said safety means including a roof engaging sprag pivotally mounted on the machine and having means for adjusting its length.

11. A safety attachment for a mining machine including a sprag adapted for pivotal connection with the frame of a mining machine, a link adapted for pivotal connection with the machine frame, and a yieldable connection between said link and said sprag.

12. A safety attachment for a mining machine including a sprag adapted for pivotal connection with a frame of a mining machine, a link connection adapted for pivotal connection with the machine frame, and adjustable connections between said link and sprag and automatically adjustable relative to said sprag as the latter swings about its pivot.

13. In an apparatus of the character described, a pivoted sprag member, means for moving said sprag member automatically to-

wards an upright operative position, and means cooperating directly with an element of said last mentioned means to preclude movement of said sprag member past the vertical.

5 14. In an apparatus of the character set forth, a sprag member movable angularly, a link member movable angularly with and relative to said sprag member, a sliding member, an abutment engageable by said sliding member as said sprag member reaches the upper limit of its angular movement, and a spring acting on said sliding member to move the same towards said abutment.

10 15. In an apparatus of the character described, a sprag member, a stationary pivotal mounting for said sprag member, a member in fixed space relation to said mounting, a link, said link having a pivotal connection with one of said members and a sliding connection with the other, and resilient means acting to increase the distance between said sliding connection and said pivotal mounting.

15 16. In an apparatus of the character described, a support, a sprag mounted thereon for angular movement relative thereto, and connections between said support and said sprag for urging the latter upward towards its operative position and automatically adjustable relative to said sprag between the ends of the latter as the sprag moves angularly.

20 17. In an apparatus of the character set forth, a sprag member movable angularly, a cooperating sliding member, an abutment engageable by said sliding member as said sprag reaches the upper limit of its angular movement, and a spring for moving said sliding member towards said abutment.

25 18. In an apparatus of the character set forth, a support, a sprag member mounted thereon for angular movement relative thereto, connections between said sprag member and said support including a sliding member, an abutment engageable by said sliding member as said sprag reaches the upper limit of its angular movement, and means for urging said sliding member towards said abutment.

30 In testimony whereof I affix my signature.  
MORRIS P. HOLMES.

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