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R. C. OSGOOD

2,049,172

MINING APPARATUS

Filed Dec. 22, 1933

Fig. 1.

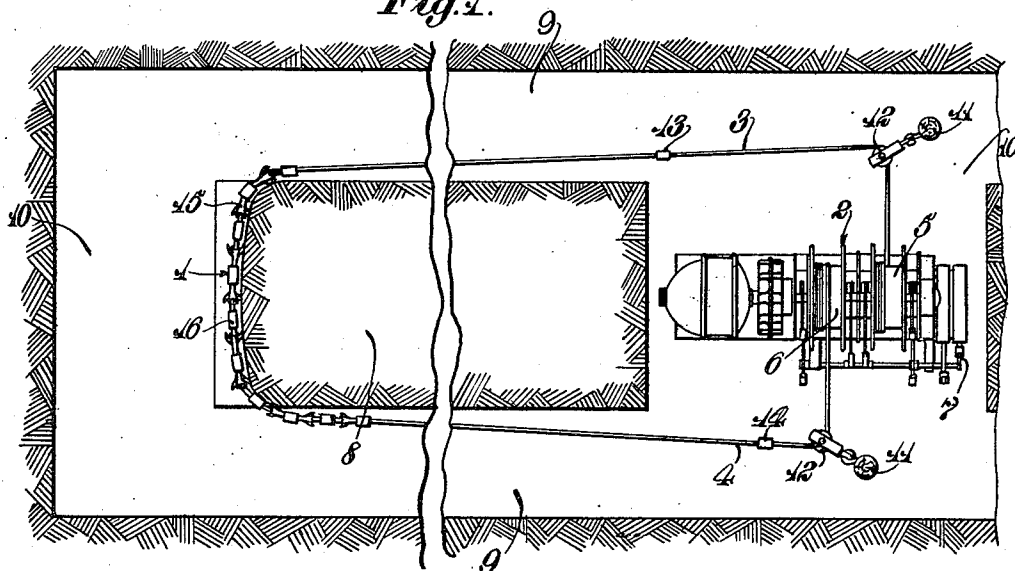


Fig. 2.

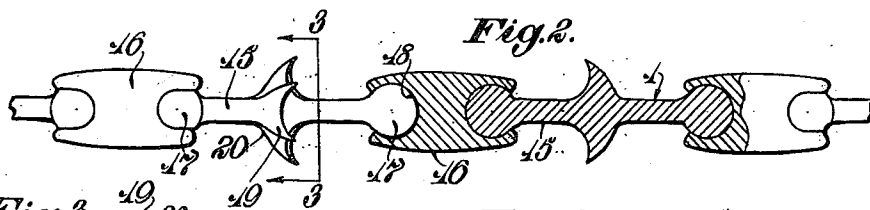


Fig. 3.

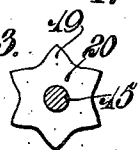


Fig. 4.

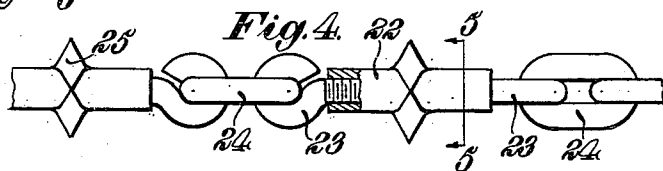


Fig. 5.



Fig. 6.

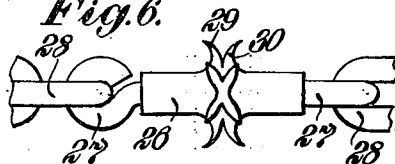
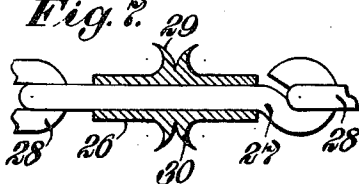


Fig. 7.



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MINING APPARATUS

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17 Claims. (Cl. 262—33)

This invention relates to mining apparatus, and more particularly to improved mining apparatus for cutting coal, or the like.

More specifically this invention relates to a novel and improved cutting unit designed especially for use in cutting coal in seams existing in roof supporting pillars or "panels" disposed between rooms or entries in a coal mine, and is particularly adapted to use in accordance with the so-called "panel" system of mining coal. In coal mining operations it is customary to leave what are called pillars or "panels" to support the roof. These pillars are sometimes removed after the mining operation has largely been completed in a given area in order to save the coal which has been left unremoved previously. As the process of removing or "robbing" these roof supporting pillars is extremely dangerous, as the roof is liable to cave in or drop, it is particularly desirable to effect the cutting function by cutting means operated by mechanism located at a point remote from the cutting face rather than operating a coal cutter at the face of the pillar. One method of accomplishing this extremely dangerous cutting function is by means of wire ropes or cables of substantial lengths connected at their ends to a flexible cutting device and passing in the form of a loop around the pillar and connected at their ends to cable winding drums and by operating the drums in opposite directions at proper intervals alternately to wind in and pay out the cables so that the cutting device will be dragged rapidly back and forth, in the nature of a cross cutting saw, across the coal seam in the pillar.

An object of this invention is to provide an improved cutting device for a mining apparatus designed to operate in accordance with the above method of mining. Another object is to provide an improved coal cutting device whereby a relatively narrow kerf may be rapidly cut in the coal when aforesaid device is reciprocated rapidly back and forth across the coal seam in the manner of a saw. A further object is to provide an improved coal cutting device of a novel design operated by means located at a point remote from the cutting face whereby the coal may be easily and rapidly cut and which may be adjusted within certain limits to regulate the size of the kerf cut in the coal seam by varying the reciprocatory strokes thereof across the seam. These and other objects and advantages of the invention will however, hereinafter more fully appear.

In the accompanying drawing there are shown for purposes of illustration three forms which the invention may assume in practice.

In this drawing,—

Fig. 1 shows the manner in which the present method of removing coal seams from pillars located between rooms or entries is carried out, using the particular form of cutting device constituting the present invention.

Fig. 2 is a side elevational view, with parts shown in vertical section, showing one illustrative form of the improved cutting device.

Fig. 3 is a cross sectional view taken on line 3—3 of Fig. 2.

Fig. 4 is a view similar to Fig. 2 showing a modified form of construction.

Fig. 5 is a cross sectional view taken on line 5—5 of Fig. 4.

Fig. 6 is a view similar to Figs. 2 and 4 showing a further modified form of construction.

Fig. 7 is a view similar to Fig. 6 showing the cutting element in longitudinal section.

In this illustrative construction the improved coal cutting device is generally indicated 1, the cable winding mechanism 2 and the cutter actuating cables 3 and 4. The cable winding mechanism 2 includes a pair of relatively rotatable power operated winding drums 5 and 6 operated and controlled by a suitable reverse control mechanism 7, by means of which the drums may be oppositely rotated in unison so that as one drum is winding up its cable the other drum will be paying out its cable.

As above mentioned, the improved cutting apparatus is particularly adapted to use in pillar cutting in accordance with the "panel" system of mining, and is especially designed to use in cutting pillars between rooms or entries. In this instance the pillar or "panel" is indicated at 8 and the tunnels or galleries extending along the sides of the pillar are indicated at 9, while the cross connecting entries are indicated at 10.

The cables 3 and 4 are connected in any suitable manner to the ends of the improved cutting device 1, the latter being disposed across the pillar 8 and along the sides thereof in the manner shown in Fig. 1. Each of the cables 3, 4 is carried along the entry 9 in which it is located to the cross connecting entry 10 at the side of the pillar 8 remote from the side upon which the cutting device is located. Suitable temporary posts or columns 11 are disposed at said opposite sides of the entry 10 to which pulley blocks or sheaves 12 are attached and through which the cables 3, 4 run to make a right angled turn for connection with the winding drums 5, 6. By arranging the cable guiding pulleys at different locations and by changing the stroke and length of the cut-

ting device, it will be evident that pillars of different width may be cut.

So that the operator may determine the exact location of the cutting device within the cut, suitable markers 13 and 14 are adjustably attached as by suitable clamps to the cables 3, 4 at points spaced equally from the ends of the cutting device and located adjacent the cable winding mechanism within the sight of the operator.

The mechanism 7 is of the proper character to effect reversal of the direction of rotation of the drums 5, 6 at the proper intervals so that the cutting device 1 will be dragged rapidly back and forth, in the nature of a cross cutting saw, across the coal seam in the pillar.

Now referring to the illustrative form of the improved cutting device shown in Figs. 2 and 3, it will be observed that cutter blocks 15 are swivelly connected in series by strap elements or links 16. The opposite ends of each cutter block 15 are provided with spherical heads 17 fitting in complementary sockets 18 formed in the straps, thereby providing a free swivel connection between the cutter block and straps so that the cutter block may be turned freely about the axial line of the cutting device. The straps 16 are formed by forging or otherwise, and are provided with the sockets 18 so that the spherical ends of the cutter block may be inserted therein and thereafter the end portions of the straps are pressed or peened inwardly to retain the spherical block ends within the strap sockets. The cutter blocks are also formed by forging or otherwise, and are provided with radially projecting barb-like teeth 19 extending completely about the periphery of a collar or flanged portion 20 formed integral with the bit block body. The teeth of one bit block are inclined in one direction, while the teeth on the next succeeding block will cut in the opposite direction. The cutting device is made up of any number of bit blocks and straps desired to obtain a cutting device of the necessary length.

In the form of the invention shown in Figs. 4 and 5, the cutter blocks 22 are provided with internally threaded ends which receive eye bolts 23. The adjacent eye bolts are connected together by a chain link 24. As in this form of the invention the cutter blocks are held against rotative movement relative to each other about the axial line of the cutting device, the cutter blocks are provided with radial teeth 25 which are designed to cut in either direction and in any position as the cutting device is reciprocated back and forth across the coal seam. In the modification shown in Figs. 6 and 7, the cutter blocks 26 are rotatably mounted on eye bolt elements 27 and connected together in series by chain links 28. In this form each cutter block is provided with a series of oppositely directed radially extending cutting teeth 29, 30, thereby forming a reversible cutting element.

The operation of the improved cutting apparatus will be readily understood from the foregoing description, and as the cut progresses and brings the front portions of the cutter actuating ropes too near to the guide pulleys, the temporary posts may be removed and the entire mechanism placed farther back in the entries.

As a result of this invention, it will be noted that an improved cutting apparatus is provided which is operated by means located at a point remote from the cutting face, thereby diminishing the possibility of injury to the operator and

damage to the machine upon falling of the roof. It will further be noted that an improved cutting device is provided having cutter blocks which are rotatable about the axial line of the cutting device so that as the latter is reciprocated back and forth across the coal face a number of cutting teeth are always effective to perform the cutting function. It will further be noted that the improved cutting device is composed of cutting elements which are of an extremely simple and rugged design and which may be manufactured at a minimum of expense. These and other uses and advantages of the improved cutting device will be clearly apparent to those skilled in the art.

While there are in this application specifically described three forms which the invention may assume in practice, it will be understood that these forms of the same are 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. In a reciprocating chain cutting device, a plurality of rotatable cutter blocks pivotally connected together in series by strap links and each having a hub, each cutter block hub having formed thereon a plurality of radially located cutting teeth spaced circumferentially completely thereabout.

2. In a reciprocating chain cutting device, a plurality of rotatable cutter blocks pivotally connected together in series by strap links and each having a hub, each cutter block hub having formed thereon a plurality of radially located cutting teeth spaced circumferentially completely thereabout, the teeth on one bit block hub extending in one direction and the teeth on the next succeeding bit block hub extending in the opposite direction.

3. In a reciprocating chain cutting device, a plurality of rotatable cutter blocks connected together in series by strap links, each rotatable cutter block having a hub, the connection between the cutter blocks and links being of a nature to permit free rotative movement of the cutter blocks about the axial line of the cutting device, and peripheral teeth extending radially from the hubs and spaced circumferentially completely about the hubs.

4. In a reciprocating chain cutting device, a plurality of rotatable cutter blocks connected together in series by strap links, each rotatable cutter block having a hub, the connection between the cutter blocks and links being in the form of a swivel joint so that the cutter blocks may rotate freely about the axial line of the cutting device, and peripheral teeth extending radially from the hubs and spaced circumferentially completely about the hubs.

5. In a reciprocating chain cutting device, a plurality of rotatable cutter blocks pivotally connected together in series by strap links, the cutter blocks being provided with spherical ends fitting within spherical sockets formed within the strap links, said pivotal connections between the cutter blocks permitting free relative rotation of the blocks and each cutter block having a hub portion formed with peripheral teeth extending radially thereabout and spaced circumferentially completely about the hub portion.

6. In a reciprocating chain cutting device, a plurality of rotatable cutter blocks pivotally con-

5 nected together in series by strap links to provide for free axial relative rotation of the blocks, the cutter blocks being provided with spherical portions fitting within sockets formed within the strap links and each cutter block having formed thereon a series of integral radially projecting cutting teeth spaced circumferentially completely thereabout thereby to present cutters to the work irrespective of the angular position of the cutter block about its axis.

10 7. In a reciprocating chain cutting device, a series of rotatable cutter blocks pivotally connected together for free axial rotation by strap links, each cutter block having a plurality of series of radially projecting oppositely directed teeth, the teeth of each series spaced circumferentially completely about the cutter blocks.

20 8. In a reciprocating chain cutting device, a series of rotatable cutter blocks pivotally connected together for free axial rotation by strap links, each cutter block having a plurality of series of radially projecting oppositely directed teeth and each cutter block mounted for rotative movement about the axial line of the cutting device, the teeth of each series spaced circumferentially completely about each cutter block.

30 9. In a reciprocating chain cutter, a freely rotatable cutter block having a hub terminating in spherical end portions and an intermediate toothed cutting flange having peripheral cutters extending radially from the hub and spaced circumferentially completely about the hub.

35 10. In a reciprocating chain cutter, a series of articulated cutter blocks each having a central hub portion and peripheral teeth extending radially from the hub portion and spaced circumferentially completely about the hub portion, and means for pivotally connecting the blocks together while permitting free relative rotation of the blocks about their hub portion axes.

40 11. In a reciprocating chain cutter, a series of articulated cutter blocks each having a central hub portion and peripheral teeth extending radially from the hub portion and spaced circumferentially completely about the hub portion, and means for pivotally connecting the blocks together while permitting free relative rotation of the blocks about their hub portion axes, said hub portions having formed thereon swivel portions to which strap elements are pivotally connected.

50 12. In a reciprocating chain cutter, a series of articulated cutter blocks pivotally connected together by strap links, each block element hav-

ing peripheral teeth extending radially from the hub thereof and spaced circumferentially completely about the hub, each cutter block having formed on its ends spherical portions for reception in spherical sockets in said strap links, each cutter block being free to rotate about its hub axis with respect to adjacent blocks.

13. In a reciprocating chain cutter, a flexible actuating element including a series of articulated rod-like cutter supporting elements, and a cutter freely rotatably mounted on each rod-like element, and each having a sleeve-like hub portion, and peripheral teeth extending radially from the hub portion and spaced circumferentially completely about the hub portion.

14. In a reciprocating chain cutter, a flexible actuating element including a series of articulated rod-like cutter supporting elements and links pivotally connecting said rod-like elements together, and a cutter freely rotatably mounted on each rod-like element, and each having a sleeve-like hub portion, and peripheral teeth extending radially from the hub portion and spaced circumferentially completely about the hub portion.

15. In a reciprocating chain cutter, a series of articulated cutter blocks each having a hub and peripheral cutters extending radially from the hub and spaced circumferentially completely about the hub, and eyebolt connecting elements secured within the ends of said cutter block hubs, the eyebolt elements on the ends of adjacent cutter blocks being pivotally connected together by a pivoted strap link.

16. In a reciprocating chain cutter, a flexible actuating element including a series of articulated rod-like supporting elements and a plurality of rotatable cutter blocks, one freely rotatably mounted on each rod-like element, and each block having a hub and peripheral cutters extending radially from the hub and spaced circumferentially completely about the hub.

17. In a reciprocating flexible cutter, a series of rotatable cutter blocks pivotally connected together and adapted for connection to reciprocating means, each rotatable cutter block having a plurality of radially located cutting teeth spaced circumferentially completely thereabout so that as the cutter reciprocates a cutting tooth of each cutter block is always presented to the work irrespective of the position of the cutter blocks about their axes of rotation.

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