July 6, 1937. J. F. JOY 2,085,756

MINING APPARATUS

Filed Nov. 12, 1934

Fig. 1.

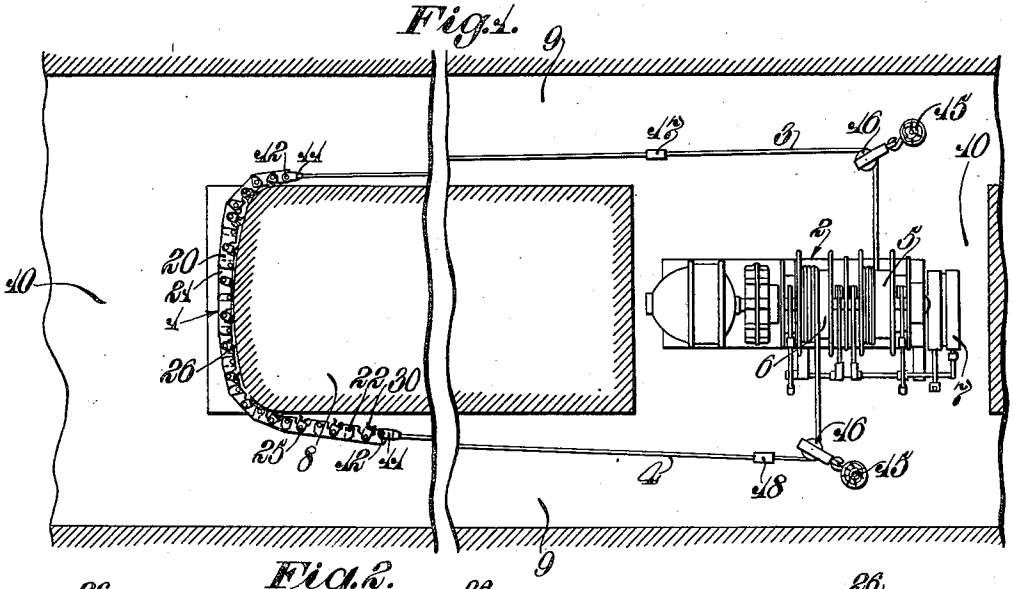


Fig. 2.

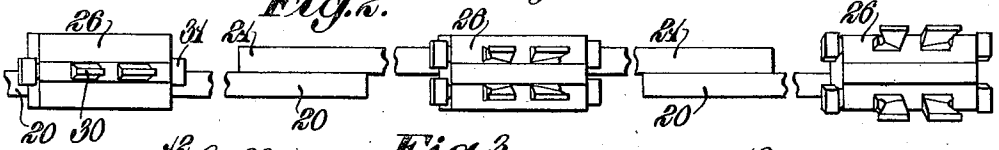


Fig. 3.

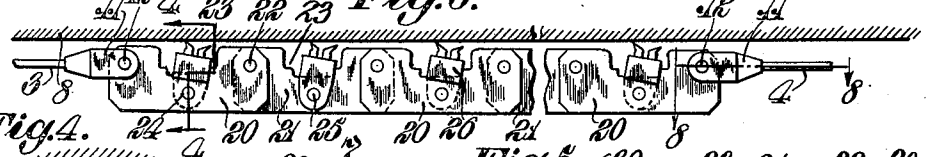


Fig. 4.

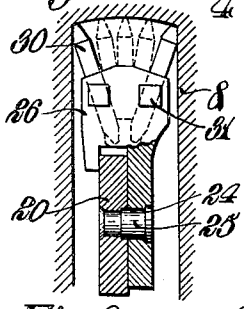


Fig. 5.

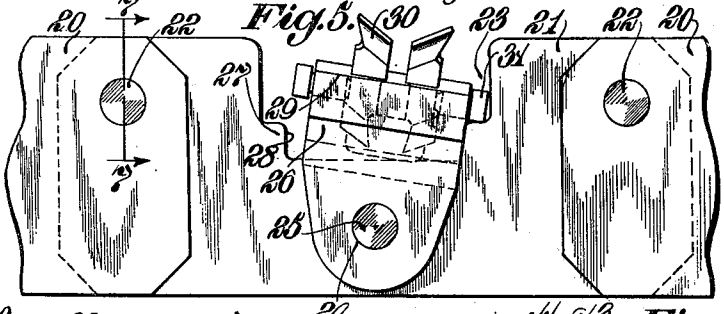


Fig. 6.

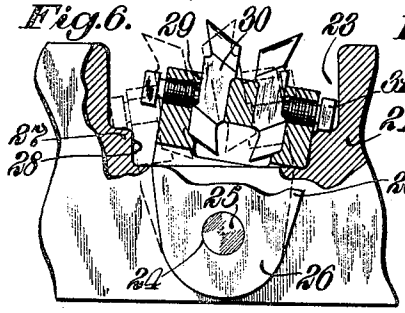


Fig. 7.

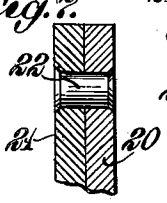


Fig. 8.



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2,085,756

MINING APPARATUS

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Application November 12, 1934, Serial No. 752,672

17 Claims. (Cl. 262—33)

This invention relates to mining apparatus, and more particularly to improvements in cutting devices for cutting coal or the like in mines.

An object of this invention is to provide an improved mining apparatus having improved cutting devices. Another object is to provide an improved coal cutting device whereby a relatively narrow kerf may be rapidly cut in the coal when the aforesaid device is reciprocated rapidly back and forth across the coal seam in the manner of a cross cut 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 adapted within certain limits to cut pillars of different dimensions by varying the reciprocatory strokes thereof across the seam. Yet another object is to provide an improved cable operated coal cutting device operatively connected to the cables of a hoisting mechanism whereby the hoisting mechanism may operate the cutting device with a reciprocatory motion across the coal seam. These and other objects and advantages of the invention will, however, hereinafter more fully appear.

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

In this drawing,—

Fig. 1 shows the manner in which the present method of removing pillars located between rooms or entries may be performed, using the particular form of cutting device constituting the present invention.

Fig. 2 is a side elevational view of a section of the improved cutting device.

Fig. 3 is a plan view showing the relation of the cutting device with respect to the coal seam.

Fig. 4 is an enlarged cross sectional view taken substantially on line 4—4 of Fig. 3.

Fig. 5 is an enlarged plan view of a portion of the improved cutting device.

Fig. 6 is a view similar to Fig. 5 with parts in horizontal section to illustrate structural details.

Fig. 7 is a detail sectional view taken on line 7—7 of Fig. 5.

Fig. 8 is a detail sectional view taken on line 8—8 of Fig. 3.

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, cable 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.

The improved cutting device 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 herein as by suitable eye members 11 pivotally connected to the ends of the cutting device as by rivets 12 and each having a suitable tapered socket 13 for receiving an enlarged tapered portion 14 of the cable. The cutting device 1 is herein disposed across the pillar 8 and along the sides thereof in the manner shown in Fig. 1, and each of the cables 3 an 4 is carried along the entry 9 in which it is located to the cross connecting entry 10 at the end of the pillar 8 remote from the end upon which the cutting device is operating. Suitable temporary posts or columns 15 are located at the opposite sides of the entry 10 to which pulley blocks or sheaves 16 are attached and through which the cables 3 and 4 run to make a right angled turn for connection with the winding drums 5 and 6. By arranging the cable guiding pulleys 16 at different locations and by changing the stroke and length of the cutting device, it will be evident that pillars of varying width may be expeditiously cut.

So that the operator may determine the exact locus of the cutting device 1 within the cut, suitable markers 17 and 18 are adjustably attached as by suitable clamps to the cables 3 and 4 at points spaced equally from the ends of the cutting device, and these markers are located adjacent the cable winding mechanism 2 within the sight of the operator so that the operator may readily ascertain the exact position of the cutting device with respect to the coal seam.

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

Now referring to the illustrative form of the

improved cutting device 1, as shown in Figs. 2 to 7, inclusive, it will be observed that the same is in the form of a chain consisting of a series of articulated links or plates 20 and 21 pivotally connected together as by rivets 22, the plates having bores through which the rivets pass by which the pivot-forming portion of one plate is joined to the pivot-forming portion of another plate. The pivotal connections of the articulated plate elements and the connection of the cables with the ends of the series of articulated plates are located a substantial distance nearer the inner edge of the plates than to the outer edges thereof, this arrangement of the pivotal connections tending to maintain the elongated cutting device in proper cutting position and substantially diminishing the possibility of the cutting device's rotating about the axis of its length in the kerf. The links or plates 20, 21 are arranged in overlapping contiguous relation so that alternate plates are arranged in different, closely adjacent planes. Each of the plates 20, 21 is recessed inwardly with respect to the plate per se but outwardly with respect to its working action, at 23 from its inner edge, and arranged to swing in this recess in each plate and pivotally connected to each plate at 24, as by a pivot pin 25, is a swingable cutter block 26. Each recess is provided with projections 27 presenting inner abutment surfaces 28 with which the end abutment surfaces of the cutter block are engageable in the opposite portions of the block, as hereinafter described. Each cutter block is traversed by a number of parallel cutter sockets 29 for receiving a double ended cutter bit 30 to form the reversible cutter, each bit being held within its socket as by a set screw 31. As above mentioned, the cutter blocks are swingable about their pivots with respect to the series of articulated plates so that when the cutting device is moving in one direction the cutter blocks swing about their pivots against the rear abutment surfaces 28 at the sides of the plate recesses and when the movement of the cutting device is reversed, the cutter blocks swing about their pivots in the opposite direction into engagement with the opposite abutment surfaces of the plate recesses, one set of cutter bits 30 operating when the cutting device is moving in one direction, and the other set of cutter bits operating when the cutting device is moving in the opposite direction. It will thus be seen that as the cutting device is moved longitudinally the cutters tilt with respect to the series of articulated plates in each opposite direction of movement of the cutting device, thus enabling the cutter bits best to cut a kerf in the coal. As the cutting device is moved by the cables the pivotal connection of the cutter blocks with the series of articulated cutter plates enables the cutters to tilt on both opposite directions of movement.

The operation of the improved cutting device will be readily understood from the foregoing description, and as the cut progresses and brings the front portions of the cutter actuating cables too near the guide pulleys the posts may be moved and the entire mechanism placed further back in the entry.

As a result of this invention, it will be noted that an improved cutting device 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 furthe~ be noted that an improved cutting device is provided consisting of a series of articulated plates on which there are pivotally mounted cutter blocks carrying reversible cutter teeth so that when the cutting device is moved in one direction one set of cutting teeth act to cut the kerf, while when the cutting device is moved in the opposite direction another set of cutting teeth act to cut the kerf, so that as the cutting device 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 elements which are extremely simple and rugged in design and which may be manufactured at a minimum of expense. Other uses and advantages of the improved cutting device will be clearly apparent to those skilled in the art.

While there is in this application specifically described one form which the 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. In a reciprocatory cutting device, a series of articulated plates, each having pivotally mounted thereon a cutter block carrying reversible cutting teeth, and means on the end plates of said cutting device adapted for connection with actuating means, said latter means being connected to said device at points nearer the inner sides of said plates than the pivotal axes of said pivoted cutter blocks.

2. In a reciprocatory cutting device, a series of articulated plates arranged in contiguous overlapping relation and pivotally connected together at points nearer the inner edges thereof and each carrying reversible cutting teeth, and pivotal mounting means for said cutting teeth pivotally connected to said plates at points nearer the outer edges thereof remote from the cutting portion of the cutting device.

3. In a reciprocatory cutting device, a series of articulated plates arranged in contiguous overlapping relation, a cutter block pivotally mounted on each plate with its pivot nearer the outer edge of the latter, and oppositely acting cutting teeth carried by each cutter block.

4. In a cutting device, a series of articulated plates arranged in contiguous overlapping relation each having a recess extending outwardly from its inner side, a cutter block pivotally mounted on each plate and arranged within the recess thereof, said blocks arranged in said recesses entirely inside the outer edges of said plates, abutment means on the end walls of said recesses for limiting swinging movement of the cutter blocks in opposite directions, and oppositely acting cutting teeth carried by each cutter block.

5. In a cutting device, a flexible cutter chain comprising a series of articulated chain elements, and sets of reversible cutting devices pivotally mounted on said chain elements at the side edges of the latter remote from the cutting portions of the cutting devices, one set of cutting devices being active upon movement of the chain element in one direction and the other set of cutting devices being active upon movement of the cutter chain in the opposite direction.

6. A reciprocatory flexible cutter chain comprising a series of articulated chain elements, a

cutter block pivotally mounted for swinging movement on each of said chain elements with its pivot near the outer side edge of the latter, and cutting devices carried by said cutter blocks.

7. A flexible cutter chain comprising a series of articulated chain elements, a cutter block pivotally mounted on each of said chain elements with its pivot near the outer side edge of the latter, and cutting devices carried by said cutter blocks, said cutter blocks assuming automatically one position with respect to said chain elements upon movement of the chain in one direction and another position with respect to said chain elements upon movement of the cutter chain in the opposite direction.

8. A flexible cutter chain comprising a series of articulated chain elements each having a recess extending outwardly from its inner side, and cutting devices arranged to swing in the recess of each chain element on an axis located nearer the outer edge thereof and each having guiding and supporting surfaces engaging the opposite sides of its chain element, the end walls of said recesses limiting swinging movement of said cutting devices in opposite directions.

9. In a reciprocatory cutting device, a series of articulated plates, each having pivotally mounted thereon a cutter block carrying reversible cutting teeth, said cutter blocks pivotally mounted on said plates nearer the outer side edges thereof, the end plates of said series having means located nearer the inner, cutting side of the cutting device adapted for attachment to actuating means.

10. A reciprocatory flexible cutter chain comprising a series of articulated chain elements, a cutter block pivotally mounted on each of said chain elements, the cutter blocks pivotally mounted on said chain elements nearer the outer sides thereof, and cutting devices carried by said cutter blocks, the end elements of said series having means located nearer the inner, cutting side of the cutter chain adapted for attachment to actuating means.

11. In a reciprocating cutter chain, a series of articulated plates arranged in contiguous overlapping relation, and cutter blocks pivotally mounted only on the opposite sides of alternate plates and each carrying reversible cutting teeth.

12. In a reciprocating cutter chain, a series of articulated plates arranged in contiguous overlapping relation, and cutter blocks pivotally mounted only on opposite sides of alternate plates, the cutter blocks being pivotally mounted on said plates nearer the outer side edges of the latter and each cutter block carrying reversible cutting teeth.

13. In a reciprocating cutter, a series of articulated plates arranged in contiguous overlapping relation, cutter blocks pivotally mounted alternately on opposite sides of said plates and each having a lateral guide projection engaging the inner edge of the plate on which it is mounted, each block having reversely acting cutting teeth.

14. In a reciprocating cutter, a series of articulated plates arranged in contiguous overlapping relation, and cutter blocks pivotally mounted alternately on opposite sides of said plates, each cutter block having an arm pivoted on one side of a plate, and a projection extending laterally from the opposite side thereof and engaging the opposite side of said plate, each block having reversely acting cutting teeth.

15. A flexible reciprocatory chain cutter comprising a series of chain elements pivotally connected together on axes located nearer the inner sides thereof, and cutting elements pivotally mounted on said chain elements on axes located nearer the outer sides of the chain elements and parallel with the axes of pivotal connection of the chain elements.

16. A flexible reciprocatory chain cutter comprising a series of chain elements pivotally connected together on axes located nearer the inner sides thereof, cutting elements pivotally mounted on said chain elements on axes located nearer the outer sides of the chain elements and parallel with the axes of pivotal connection of the chain elements, and means on the end chain elements of the cutter adapted for connection with actuating means, said latter means being connected to the end chain elements nearer the inner sides thereof than the pivotal axes of the cutting elements.

17. A flexible reciprocatory cutter comprising a series of chain elements pivotally connected together, each chain element having a recess extending outwardly from its inner side, and cutting elements pivotally mounted one on each chain element and alternately on opposite sides of the chain elements and arranged in said recesses, the end walls of the recesses limiting swinging movement of the cutting elements in opposite directions and each cutting element having a guiding surface engaging the side of the chain element opposite the side thereof on which such cutting element is pivotally mounted.

JOSEPH F. JOY.