Jan. 1, 1957 R. C. LUNDQUIST 2,776,127

CONTINUOUS MINER HAVING VERTICALLY ADJUSTABLE RIPPER HEAD

Filed Oct. 18, 1955 4 Sheets-Sheet 1

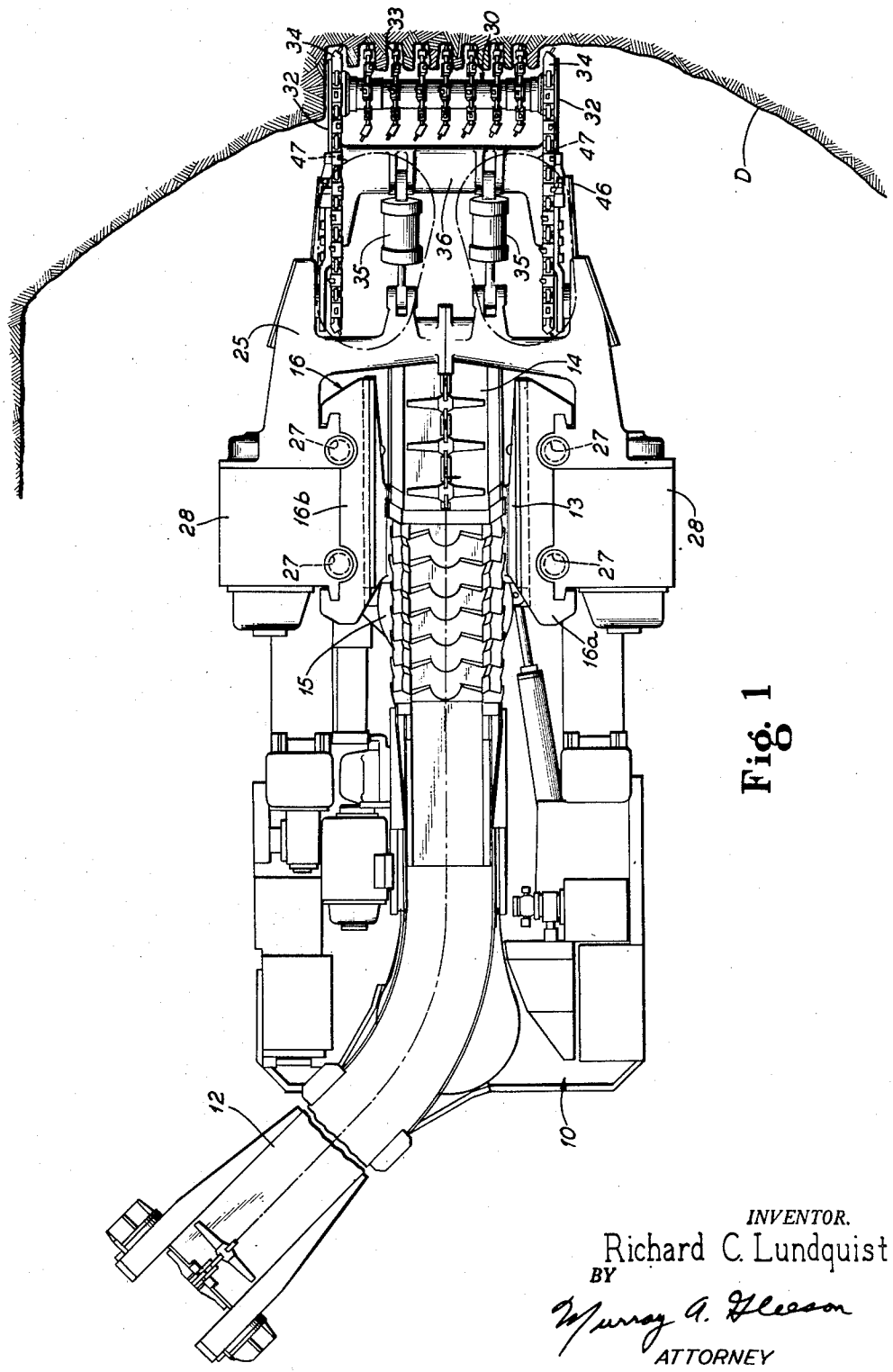


Fig. 1

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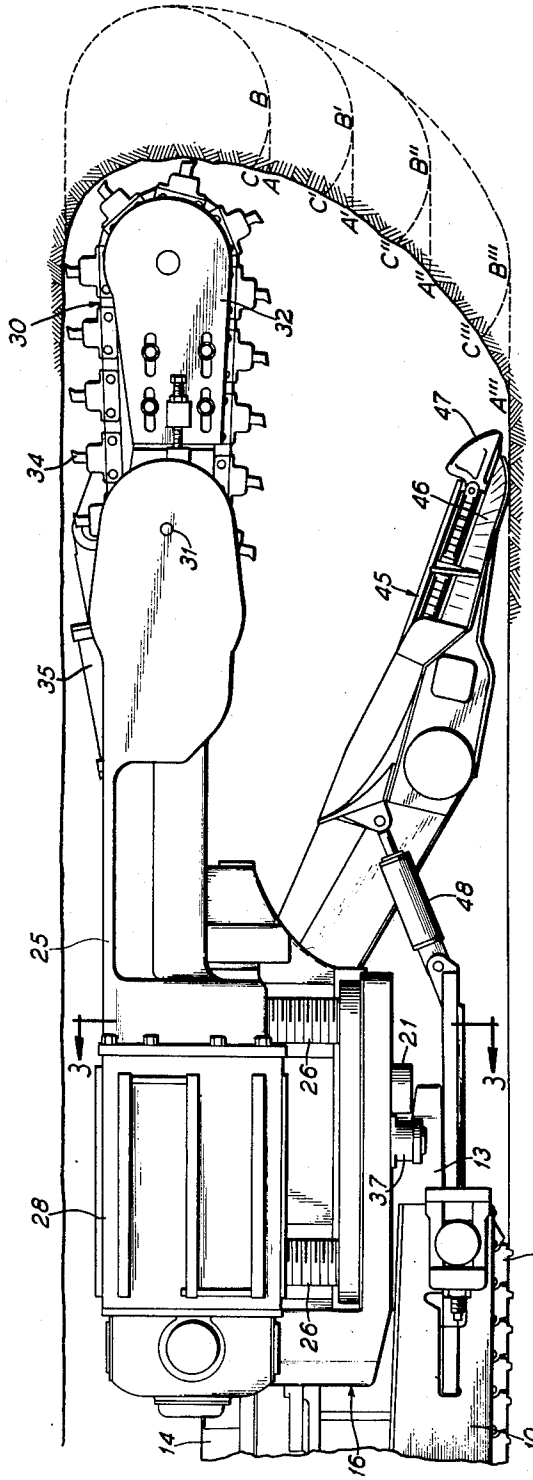


Fig. 2

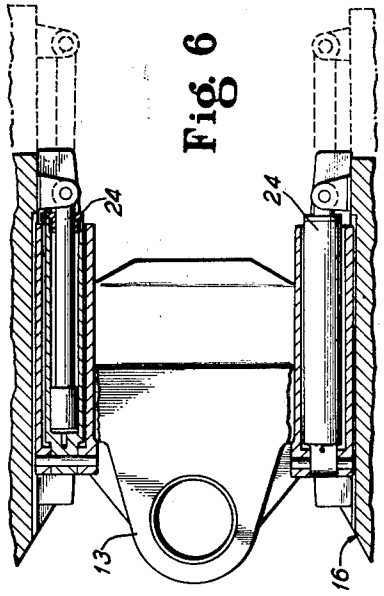


Fig. 6

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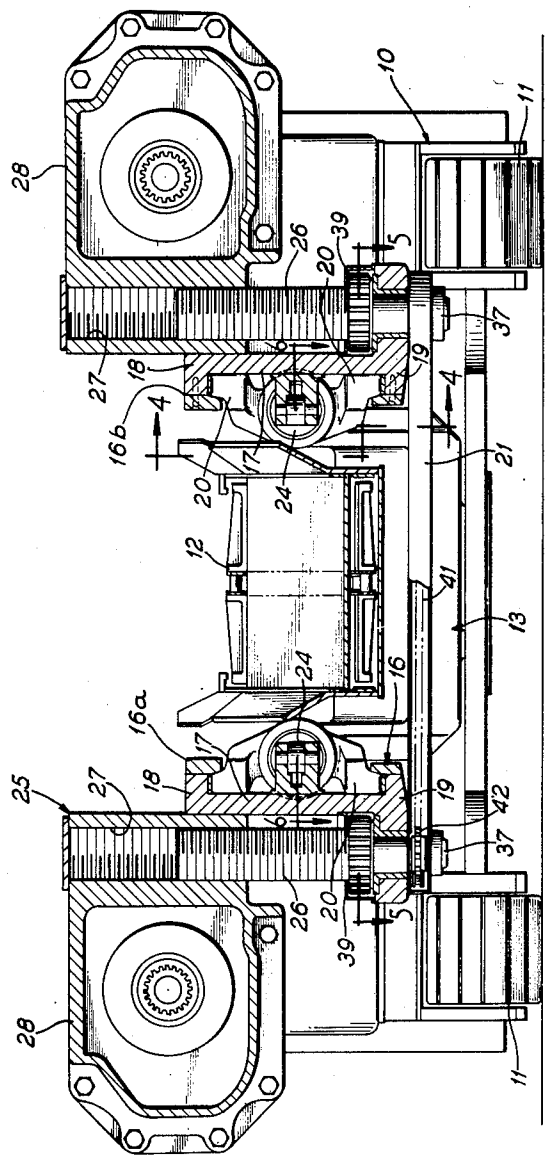


Fig. 3

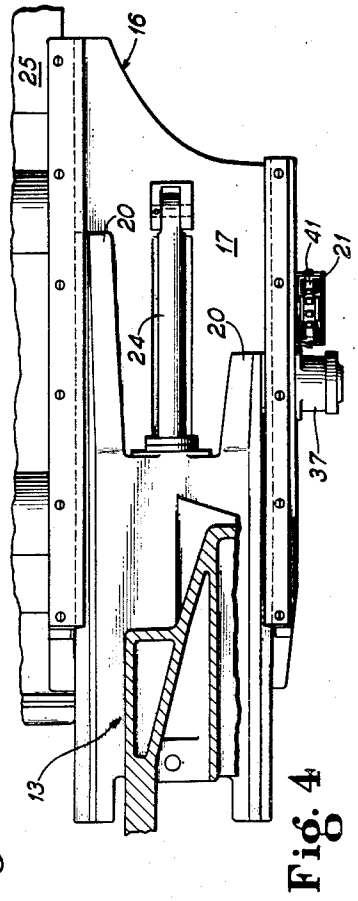


Fig. 4

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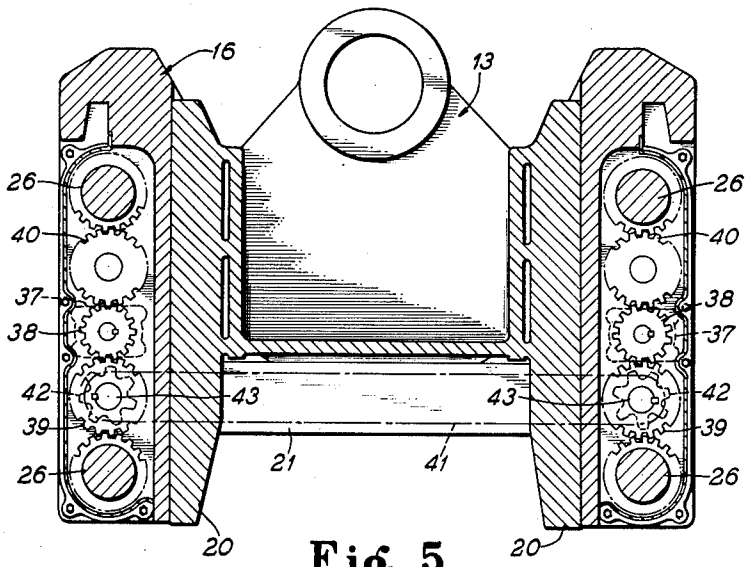


Fig. 5

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2,776,127

CONTINUOUS MINER HAVING VERTICALLY ADJUSTABLE RIPPER HEAD

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Application October 18, 1955, Serial No. 541,252

3 Claims. (Cl. 262—9)

This invention relates to improvements in coal mining machines of the ripper head type, and methods of mining with the same.

The principal object of the invention is to provide a novel machine and method of operating the same, to take advantage of the natural horizontal cleavage or bedding planes of a solid coal face, for obtaining relatively large lumps of coal.

As heretofore constructed and used, conventional mining machines of the ripper head type have usually been provided with a ripper head, pivoted on a transverse axis which is disposed approximately midway between the roof and floor of the coal seam being mined. In other words, the ripper head is swung either from an upwardly inclined angle to a substantially equal downwardly inclined angle relative to the horizontal in making its traversing vertical cut in the mine face, or in some instances the traversing cut is made by swinging the head upwardly. In either case, mining machines of this character recover a very small proportion of large lump coal from the face, the greater proportion of the cuttings being fines, which are usually of less commercial value.

Accordingly, considerable effort has been directed to the problem of producing larger proportions of lump coal with machines of the ripper head type.

In carrying out my invention, I provide a novel form of mining machine of the ripper head type, and method of operating the same, wherein means are provided for adjusting the axis of swinging movement of the ripper head closely adjacent the mine roof, so that the ripper head is initially sumped into the working face in a generally horizontal position and thereafter swung in a relatively sharp downwardly and rearwardly curved arc, so as to dislodge a considerably greater proportion of lump coal, due to the natural horizontal bedding planes of the coal in the working face.

The invention may best be understood by reference to the accompanying drawings, in which:

Figure 1 is a plan view of a mining machine especially adapted to carry out my invention;

Figure 2 is an enlarged fragmentary side view of the front end of the machine shown in Figure 1, and illustrating the principal of operation thereof at a mine face;

Figure 3 is a cross section of the machine taken on line 3—3 of Figure 2;

Figure 4 is a detail section taken on line 4—4 of Figure 3;

Figure 5 is a detail section taken on line 5—5 of Figure 3; and

Figure 6 is a detail section taken on line 6—6 of Figure 3.

Referring now to details of the machine shown in the drawings and method of operating the same, the machine has a mobile main frame 10, with conventional tractor treads 11, 11 and an endless conveyor 12 carried centrally therealong for discharge of cuttings to the rear of the machine. The main frame has a sub-frame 13 (see Figure 6) pivotally mounted adjacent its front

end for horizontal swinging adjustment. The front end 14 of the conveyor 12 is articulated at 15 to swing with the sub-frame 13, as is more or less conventional construction with machines of this type.

The sub-frame 13 has a sliding, auxiliary frame 16 comprising two separate parts 16*a*, 16*b* mounted thereon. This sliding frame includes two upright side members 17, 17 each having inwardly projecting upper and lower guide flanges 18 and 19 slidably engaging upright side plates 20, 20 on the sub-frame 13, as is best seen in Figure 3.

The sliding frame 16 is moved horizontally on the sub-frame 13 by a pair of hydraulic cylinder devices 24, 24 connecting the sub-frame and sliding frame along the inner sides of the side plates 20, 20, as seen in Figure 6.

A cutter support 25 is mounted for vertical adjustment on the sliding frame 16 by means of two pairs of vertically disposed screws 26, 26, rotatably mounted on opposite sides of the sliding frame, and having engagement in threaded bores 27, 27 in said cutter support. As will be seen in Figure 1, the cutter support is generally U-shaped as viewed from above, with cutter drive motors 28, 28, mounted on opposite sides of said U-shaped frame, and a ripper head 30 pivotally connected to the front end of said supporting frame for swinging movement on a transverse axis indicated at 31 in Figure 2.

The general structure and arrangement of the ripper head 30 may be the same as has been previously employed with machines of this general type, including side plates 32 supporting a cutter-carrying drum 33 rotatable on a transverse axis at the front end thereof, and driven from two cutter chains 34, 34 guided along the side plates 32. The cutter chains 34, 34 may be driven as usual from the motors 28, 28 on the cutter support, through suitable gearing (not shown). Excepting for the vertical swinging movement of the ripper head, the upper limits of the machine as a whole are defined by the supporting frame 25.

The ripper head is swung vertically as usual by a pair of hydraulic cylinder devices 35, 35 pivotally connected between the front end of the supporting frame 25 and a cross member 36 between the two side plates 32, 32.

It will now be understood that the general arrangement of many of the structural features just described, is substantially the same as previously employed in mining machines of the ripper head type, excepting that in the machine of the present invention, the supporting frame 25 is vertically adjustable on the sliding frame 16 so that it can be elevated to a position closely adjacent the roof of a room or area being mined, to position the ripper head 30 for initially sumping into the working face in a substantially horizontal position, as shown in Figure 2.

The screws 26, 26 for effecting vertical adjustment of the supporting frame 25 relative to the sliding frame 16 are driven from a pair of motors 37, 37 mounted on opposite sides, and beneath the sliding frame, and connected to gears 38, 38 rotatably supported near the bases of the side members 17 of the sliding frame (see Figure 5). Each of the gears 38 are connected through reach gears 39 and 40 to the front and rear screws 26 on their respective sides.

The two sets of gear trains just described are interconnected for simultaneous operation, as by a chain 41 encased by a chain guard 21 and extending transversely below the conveyor 12 and meshed with sprockets 42, 42 fixed on the lower ends of shafts 43 on which the opposed reach gears 39, 39 are fixed.

The extreme front end of the conveyor 12 terminates in a gathering mechanism 45 of conventional construction, including a widened apron 46 and a pair of orbitally movable laterally spaced gathering chains 47, 47. The gathering mechanism, may, as usual, be vertically adjust-

able as by hydraulic cylinder devices **48** seen in Figure 2, for following uneven bottom, and elevating the gathering mechanism above the floor level when the machine is being trammed from one working place to another.

The use and method of operation is as follows:

The mining machine is trammed into a working room or other working area with the ripper head supporting frame **25** usually lowered to an intermediate position and the sliding frame **16** is retracted on the subframe **13** so that the machine has maximum overhead and endwise clearance for moving from place to place. When the machine reaches its desired working station opposite a working face, the supporting frame **25** is elevated by screws **26, 26** to a level closely adjacent the mine roof as shown in Figure 2 and with the front end of the ripper head substantially perpendicular to and in close proximity to the working face. The ripper head is then pumped into the working face, preferably by advancing the sliding frame **16** on the subframe **13** by actuating the hydraulic cylinder devices **24, 24**. This sumps the ripper head directly into the face while the latter is held in a substantially horizontal position close to the roof so as to make its initial cut at the roof level, as indicated in dotted lines in Figure 2.

The ripper head is then swung downwardly by hydraulic devices **35**, to make a vertical ripping cut in the working face, describing an arc about the axis **31** on supporting frame **25**, which is held stationary during this ripping cut. It will be observed from the first sumped position of the ripper head indicated in dotted lines in Figure 2, that there is a small triangular section of the working face formed between the horizontal planes A—B and the lower reaches of the cutter head drum **33**, the cutter chains **34**, roughly indicated by the line C—B, which will be removed during the initial sumping operation. The horizontal line A—B may be taken to represent the normal horizontal cleavage or bedding of a typical coal seam.

As the head is now swung downwardly to a second position, the head assumes a greater angle to the working face, so that a somewhat larger triangular section A′B′C′ will now tend to be produced between the horizontal bedding line A′B′ and the bottom reach C′B′ of the ripper head. Similar, but increasingly larger triangular sections such as A″B″C″ and A‴B‴C‴ will tend to be produced at each successive swinging position of the head.

These continuously existing triangular sections aid in producing a substantial increase in lump coal since it has been demonstrated in practice that the cutter bits carried by the head, when rotating in their normal clockwise direction as seen in Figure 2, tend to rip out and dislodge the solid coal from the face to a certain degree in advance of the cutter bits, and that this dislodging action is especially effective along the natural horizontal bedding or cleavage lines of the coal. Consequently, when the ripper head is being swung downwardly from an initial horizontal position of Figure 2, the constantly increasing size of the triangular sections ABC, A′B′C′, etc. aid materially in effecting dislodgment of a considerable amount of coal in larger lumps than with ripper head machines previously used wherein the axis of swinging movement of the ripper head is initially positioned substantially midway between the roof and floor of the working face, so that the head is initially inclined upwardly at a substantial angle from the horizontal.

With my novel form of machine and method of operation, it will now be understood that the ripper head, starting from a generally horizontal position, is swung downwardly through a constantly retreating arc, so as to take full advantage of the readily severable bedding planes of the coal so as to aid in dislodging a much larger proportion of lump coal than has heretofore been deemed possible with machines of the ripper head type.

It will be further understood that in practice, the main body of the mining machine may, as usual, be maintained stationary while the front part of the machine is swung horizontally on the pivoted subframe **13** to present the ripper head at a plurality of successive angles to the working face. Thus, Figure 1 shows the mining machine after two or more angular cuts have been made along the right side of the working face D, and the ripper head is now positioned to make a cut directly in front of the main body of the mining machine.

Although I have shown and described a certain embodiment of my invention and novel method of mining with the same, it will be understood that various modifications in structure and method may be made within the spirit and scope of my invention, as defined in the appended claims.

I claim:

1. In a mining machine of the ripper head type, a mobile base frame, a subframe pivotally mounted on said base frame adjacent the front end thereof for lateral swinging adjustment, an auxiliary frame slidably mounted on said subframe for limited horizontal adjustment relative thereto, a supporting frame slidably mounted on said auxiliary frame for vertical adjustment to various levels defining the upper limit of the machine, an elongated ripper head having rotary cutting devices thereon and pivotally connected to the front end of said supporting frame on a transverse axis for attacking a standing face of coal in advance of the machine, and drive means for said cutting devices mounted on and carried with said supporting frame.

2. The structure of claim 1, wherein means for vertically adjusting the supporting frame relative to the auxiliary frame consists of a plurality of laterally spaced, vertically disposed screws mounted on the auxiliary frame, and threadedly engaged with said supporting frame, and power means is also mounted on said auxiliary frame for simultaneously actuating said screws.

3. The method of mining with a machine of the ripper head type including a mobile base frame, a horizontally adjustable intermediate frame on said base frame, a vertically adjustable supporting frame on said intermediate frame, and an elongated ripper head pivoted transversely on said supporting frame for attacking a standing face of coal, the steps of positioning the mobile base adjacent a working face with the intermediate frame in retracted position on the base frame, and the supporting frame in lowered position relative to the intermediate frame, then elevating the supporting frame to a level closely adjacent the roof of the face area to be mined, with the ripper head extending forwardly toward the mine face substantially in a horizontal position lengthwise thereof, then sumping the ripper head in said horizontal position, and thereafter swinging the ripper head downwardly while maintaining its transverse axis on the supporting frame, to dislodge substantially the entire height of the face along a retreating arc.

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