

April 9, 1957

A. L. BARRETT

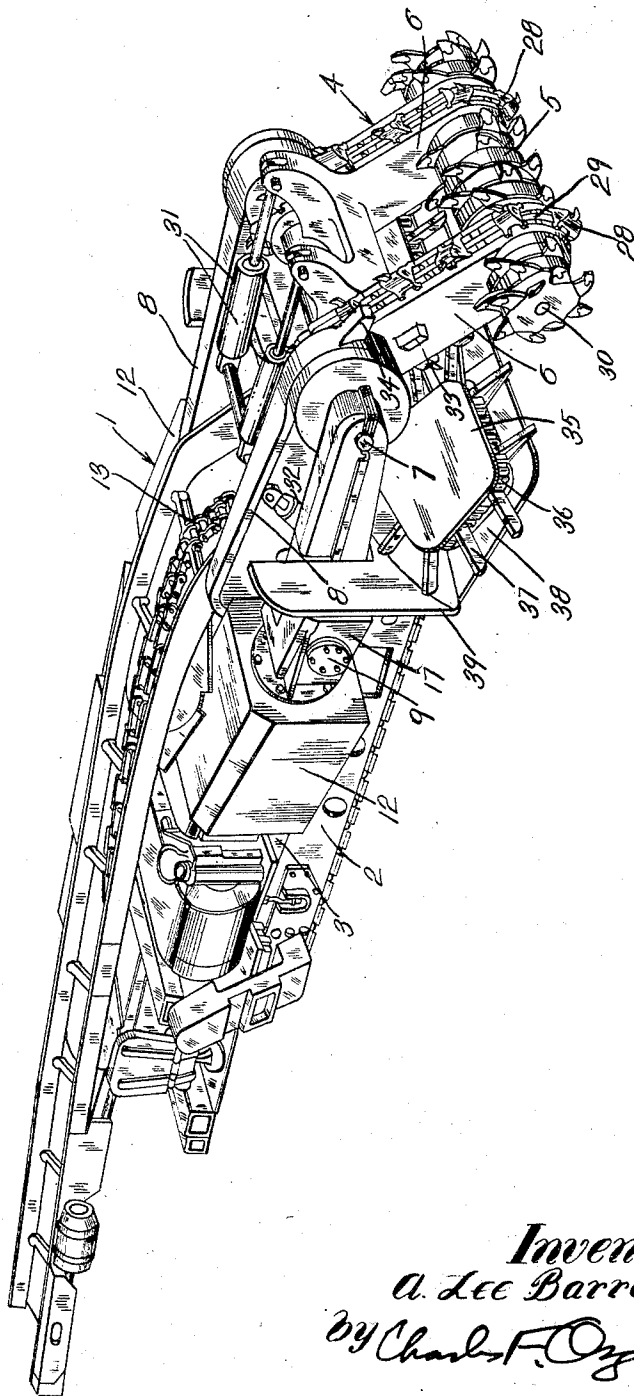
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DISINTEGRATING HEAD MECHANISM OF THE PLURALLY
ARTICULATED TYPE FOR A CONTINUOUS MINER

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3 Sheets-Sheet 1

Fig. 1.



Inventor:
A. Lee Barrett.
by Charles F. Ozyord,
Attorney.

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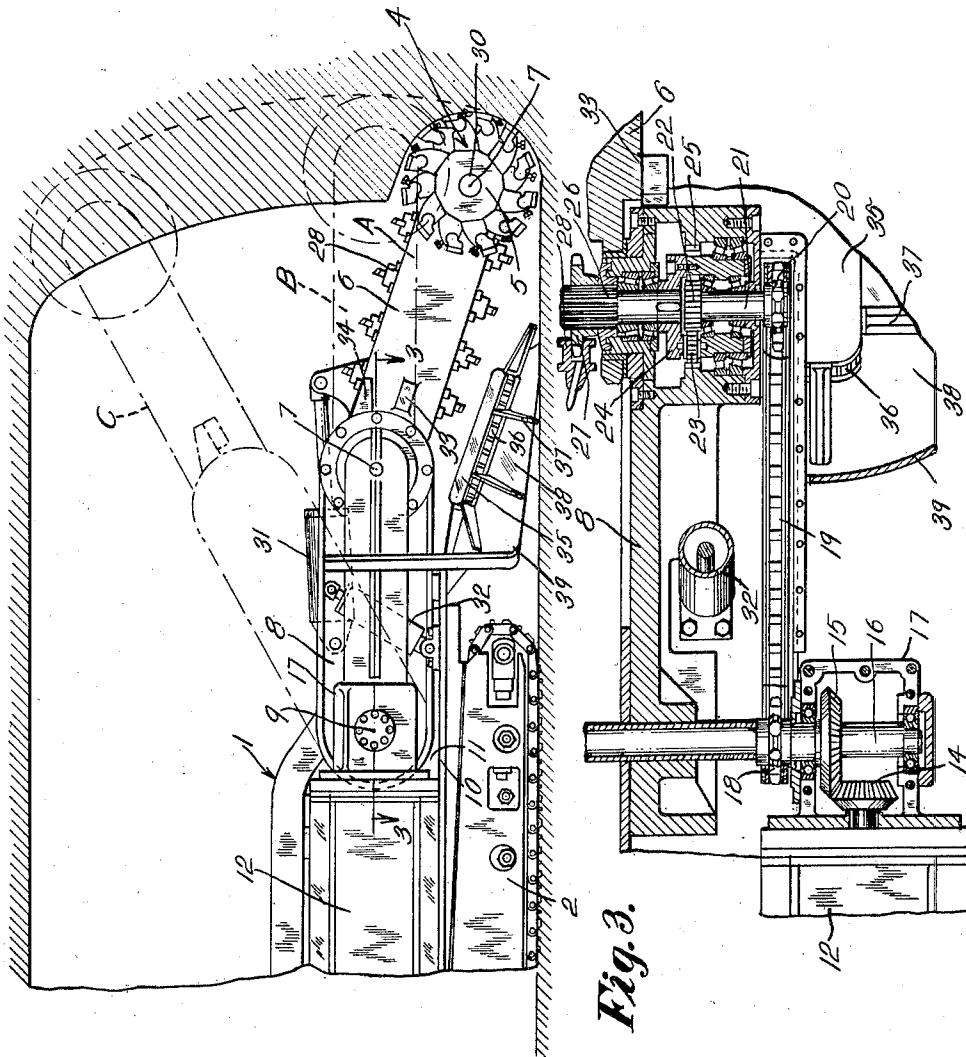


Fig. 2.

Fig. 3.

Inventor:
A. Lee Barrett.
by Charles F. Osgood,
Attorney.

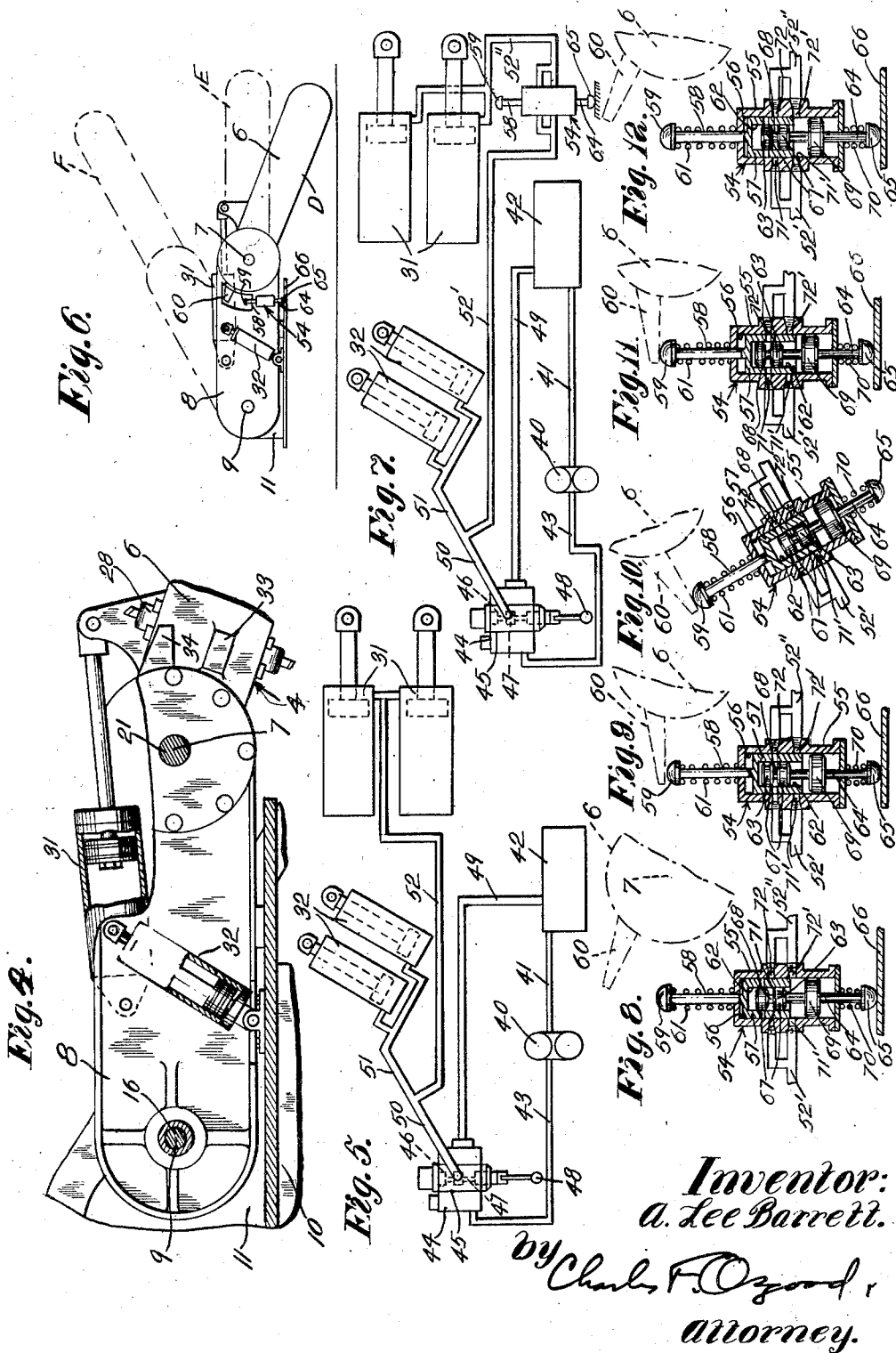
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Inventor:
a. lee Barrett.
by Charles F. O'zard,
attorney.

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DISINTEGRATING HEAD MECHANISM OF THE PLURALLY ARTICULATED TYPE FOR A CONTINUOUS MINER

Arthur Lee Barrett, Franklin, Pa., assignor to Joy Manufacturing Company, Pittsburgh, Pa., a corporation of Pennsylvania

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3 Claims. (Cl. 262—26)

This invention relates to continuous miners and more particularly to a disintegrating head mechanism for a continuous miner for dislodging mineral from a solid mine vein.

An object of this invention is to provide an improved disintegrating head mechanism for a continuous miner. Another object is to provide an improved disintegrating head mechanism of the plurally articulated type wherein the disintegrating means may first swing in vertical planes about one pivot and thereafter may continue to swing about a parallel pivot. A further object is to provide an improved power operated swinging means for the disintegrating head mechanism for effecting swing about the parallel pivots automatically in a definite sequence. These and other objects and advantages of the invention will, however hereinafter more fully appear.

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

In these drawings:

Fig. 1 is a side elevational view, looking angularly from the front left hand side, of a continuous miner in which one illustrative form of the invention is embodied.

Fig. 2 is a fragmentary side elevational view of the continuous miner shown in Fig. 1, illustrating different operating positions of the disintegrating head in a mine.

Fig. 3 is an enlarged horizontal section taken on line 3—3 of Fig. 2.

Fig. 4 is a fragmentary side view, with parts shown in vertical section, illustrating the power operated swinging means for the disintegrating head.

Fig. 5 is a diagrammatic view illustrating the hydraulic fluid system and the associated control means.

Fig. 6 is a fragmentary side view, on a reduced scale, of the disintegrating head of a continuous miner like that shown in Fig. 1 in which a modified form of control means is incorporated.

Fig. 7 is a diagrammatic view illustrating the hydraulic fluid system and control valve means of the modified embodiment.

Figs. 8 to 12 inclusive are diagrammatic sectional views showing the different positions of the control valve means of the modified embodiment.

The continuous miner, with which both forms of the invention are associated, is generally designated 1 and generally comprises a crawler base 2 carrying a frame 3 on which a disintegrating head mechanism, generally designated 4, is pivotally mounted. The head mechanism comprises a toothed disintegrating drum 5 arranged transversely of and carried by an arm structure including front parallel arms 6 which are pivotally mounted at 7 to swing in vertical planes on a swingable rear arm frame 8, the latter in turn being pivotally mounted at 9 on the base frame. The base frame carries a usual horizontal turntable 10 on which a sliding support 11 is guided for horizontal rectilinear movement in a direction extending radially of the turntable axis, and the rear arm frame 8 of the head mechanism is pivotally

mounted on this sliding support. Motors 12 are mounted on the turntable at the sides of an endless front elevating conveyor 13 and these motors have bevel pinions 14 (Fig. 3) secured to their power shafts and meshing with bevel gears 15 respectively secured to aligned transverse shafts 16 suitably journaled in gear housings 17 carried at the opposite sides of the sliding support 11. Chain sprockets 18 secured to the shafts 16 respectively are connected by endless drive chains 19 to chain sprockets 20 secured to transverse shafts 21 aligned with the head pivot 7 and suitably journaled within the swingable rear frame 8. The drive chains 19 are suitably housed within the arm frame 8. Gears 22 secured to the shafts 21 mesh with planet gears 23 carried by rotary carriers 24 and these planet gears mesh with internal gears 25 secured to similar gear housings formed on the frame 8. These planet carriers 24 are keyed to the ends of a cross shaft 26 aligned with the shafts 21 in coincidence with the forwardly located pivot 7. Sprockets 27 secured to the cross shaft 26 are connected by endless disintegrating chains 28 to suitable sprockets 29 secured to the drum shaft 30. The parallel arms 6 which carry the disintegrating drum 5 may swing in vertical planes about the front pivot 7 and conventional hydraulic jacks 31 are connected between the swingable rear arm frame 8 and the front parallel arm 6 for swinging the disintegrating drum about its pivotal axis 7. Similar hydraulic jacks 32 are connected between the sliding support 11 and the rear arm frame 8 for swinging the latter about the parallel rear arm pivot 9. The jacks 31 have a greater ratio of power to load as they perform their working stroke than the jacks 32 as the latter perform their working stroke, so that the jacks 31 first operate and thereafter the jacks 32 operate, in a definite sequence, first to swing the front arms 6 and thereafter to swing the frame 8 and arms 6 in unison. When liquid is trapped within the cylinders of these jacks the arms parts may be locked in adjusted positions.

In the form of the invention shown in Figs. 1 to 5 inclusive the parallel front arms 6 of the disintegrating head mechanism have lateral abutment lugs 33 which are engageable with abutment lugs 34 on the rear arm frame whenever the parallel arms 6 assume a position in longitudinal parallelism with the rear arm frame 8. Arranged beneath the disintegrating head mechanism is a conventional floor cleanup device 35 which comprises endless gathering chains 36 having lateral flights 37 which move along relatively inclined surfaces 38 of a frame 39 carried by the sliding support 11. The disintegrated mineral dislodged from the working face by the disintegrating head mechanism may be gathered by these endless gathering chains and the mineral so gathered may be moved rearwardly onto the elevating conveyor 13.

As shown diagrammatically in Fig. 5, a conventional motor driven pump 40 has its suction side connected by a conduit 41 to a liquid storage tank 42 and the discharge side of this pump is connected by a conduit 43 to the pressure passage of a conventional control valve mechanism 44. This control valve mechanism comprises a casing 45 having a bore 46 containing a reciprocable slide valve 47 provided with an operating handle 48. The discharge passage of this valve mechanism is connected by conduit 49 back to the tank. A conduit 50 communicating with the valve receiving bore is connected through branch conduits 51 and 52 to the cylinders of the swing jacks 32 and 31. When liquid under pressure is supplied through the conduits 51 and 52 to the jack cylinders the pressure within the cylinders of the front jacks 31, which are of substantially greater cross sectional area than the cylinders of the rear jacks 32, is substantially greater than in the jacks 32 so that the parallel arms 6 of the disintegrating head mechanism may be

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swung upwardly from the lowered sumped position indicated in full lines at A in Fig. 2 to an elevated position in longitudinal parallelism with the swingable arm frame 8 as indicated in dotted lines at B in Fig. 2. When the parallel arms 6 are brought into longitudinal alignment with the swingable arm frame 8 the abutment lugs 33 on the arms engage the abutment lugs 34 on the rear arm frame so that swinging movement of the parallel arms relative to the rear arm frame is interrupted and thereafter the pressure builds up within the cylinders of the rear jacks 32 to effect swinging of the rear arm frame 8 together with the parallel arms 6 upwardly in vertical planes about the rear pivot 9 to complete the disintegration of a vertical segment of mineral between the floor and roof. When the disintegrating head assumes the position indicated at C at the roof level the sliding frame 11 may be retracted to withdraw the disintegrating head mechanism from the working face of the mine vein. The control valve 47 may then be shifted into a position to effect venting of the jack cylinders to effect swinging of the head mechanism downwardly to its initial position at the floor level.

In the modified construction shown in Figs. 6, 7 and 8 the abutment lugs 33 and 34 on the front arms 6 and the swingable rear arm frame 8 are omitted, and movement of the parallel arms with the swingable arm frame is controlled by a valve mechanism generally designated 54, which serves to effect trapping of liquid in the cylinders of the front swing jacks 31 when the arms 6 assume a position in longitudinal parallelism with the swingable rear arm frame 8. This control valve mechanism may assume various forms and is desirably mounted on the swingable rear arm frame and comprises a valve casing 55 having a bore 56 containing a plunger valve 57 having an upwardly extending valve stem 58 provided with a buttonlike upper portion 59 engageable with a projecting lug 60 on one of the swingable arms 6. A coil spring 61 surrounding the valve stem 58 constantly urges the valve 57 in an upward direction. The valve 57 has an axial bore 62 containing a shiftable spool valve 63 provided with a downwardly extending valve stem 64. This valve stem has a button-like lower portion 65 engageable with an abutment plate 66 carried by the sliding support 11. This slide valve has spaced spools 67 separated by an annular groove 68 and these spools slidably fit the bore 62, and a third guiding spool 69 slidably fits the lower portion of the valve casing bore 56. A coil spring 70 surrounding the valve stem 64 constantly urges the valve 63 in a downward direction. A conduit 52' leads from the conduit 50 to the valve casing 55 and has branches connected through spaced ports 71 and 71' within the casing-bore 56. Diametrically opposite ports 72 and 72' communicating with the valve receiving bore 56 are connected by branches of a conduit 52'' leading to the cylinders of the front swing jacks 31.

When the disintegrating head mechanism of the modified embodiment is in its lowered position shown in full lines at D in Fig. 6, the control valves 57 and 63 assume the position shown in Fig. 8 and liquid under pressure may flow from the valve-receiving bore containing the slide valve 47 through conduits 50, 52' and 52'' to the front swing jacks 31 to effect swinging of the front arms 6 upwardly about their pivots 7. When the arms 6 assume positions in longitudinal parallelism with the rear arm frame 8, as indicated in dotted lines at E in Fig. 6, the lug 60 depresses the stem of the valve 57, as shown in Fig. 9, to effect trapping of the liquid in the cylinders of the front jacks 31 and to effect fluid supply to the rear swing jacks 32 to effect swinging of the front arms 6 and the rear arm frame 8 upwardly in unison about the rear pivot 9. When the disintegrating drum 5 reaches the position indicated in dotted lines at F in Fig. 6 swing of the arms may be interrupted by the manual slide valve 47 and the sliding support 11

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may be moved rearwardly to retract the disintegrating drum from the working face of the mine vein. The liquid may then be vented from the cylinders of the rear swing jacks 32 under the control of the manual slide valve 47 to cause the arms 6 and 8 to swing downwardly in unison about the rear pivot 9 until the dotted line position indicated at E in Fig. 6 is again reached, and the valve stem 64 then engages the abutment plate 66 to shift the valve 63 to the position shown in Fig. 11, thereby to effect venting of liquid from the cylinders of the front swing jacks 31 to cause the front arms 6 to swing downwardly about the front pivot 7 until the initial lowered position indicated at D is again reached with the disintegrating drum located at the floor level.

From the foregoing it is evident that in both forms of the invention the front arms 6 are both swung upwardly about the front pivot 7 and thereafter the front arms swing automatically in unison with the rear arm frame 8 about the rear pivot 9. Downward swing of the front arms and rear arm frame first occurs in unison about the rear pivot 9 and thereafter the front arms automatically swing downwardly relative to the rear frame about the front pivot 7. Evidently, the parts may be arranged in a reverse manner, first to effect swing in unison of the front arms and rear frame about the rear pivot and thereafter to effect swing of the front arms relative to the rear frame about the front pivot.

As a result of this invention an improved disintegrating head mechanism for a continuous miner is provided wherein the power operated means for swinging the head mechanism is simplified both in operation and control. By the provision of the power jacks for swinging the arm parts of the plurally articulated disintegrating head mechanism and the improved control valve mechanism for the jacks, swing of one arm part about one pivot is first effected and thereafter swing of the arm parts in unison about the other pivot is effected so that swing of the parts occurs automatically in a definite sequence. The control structure is not only relatively simple in design but is also efficient in operation and may be readily applied to a continuous miner of an existing design with a minimum of change. These and other advantages of the invention will be clearly apparent to those skilled in the art.

While there are in this application specifically described two 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 further 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 disintegrating head mechanism, a plurally articulated arm structure swingable in vertical planes comprising a front arm part swingable about a forwardly located pivot and a rear arm part swingable about a parallel pivot, disintegrating means carried by said front arm part, power devices for swinging said front and rear arm parts about their respective pivots, and control means responsive to a predetermined swinging movement of one arm part relative to the other and operatively associated with said power devices for first effecting swing of one arm part about one pivot and thereafter swing of the other arm part about the other pivot automatically in a definite sequence thereby to swing said disintegrating means in vertical planes along an arcuate path between the floor and roof of a mine, said power devices comprising extensible fluid cylinder devices one of which has a greater ratio of power to load as it performs its working stroke than the other as the latter performs its working stroke to effect swing of the other part about its pivot, with said events occurring automatically in a definite sequence as aforesaid.

2. In a disintegrating head mechanism, a plurally articulated

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ulated arm structure swingable in vertical planes comprising a front arm part swingable about a forwardly located pivot and a rear arm part swingable about a parallel pivot, disintegrating means carried by said front arm part, power devices for swinging said front and rear arm parts about their respective pivots, said power devices comprising extensible fluid cylinder devices one of which has a greater ratio of power to load as it performs its working stroke than the other as the latter performs its working stroke to effect swing of the other part about its pivot, with said events occurring automatically in a definite sequence, and control means operatively associated with said power device for first effecting swing of one arm part about one pivot and thereafter swing of the other arm part about the other arm pivot automatically in a definite sequence thereby to swing said disintegrating means in vertical planes along an arcuate path between the floor and roof of a mine, said control means including a control valve means carried by one arm part and actuated by an element on the other arm part for trapping fluid in said fluid cylinder device having the greater ratio of power to load to effect locking of said arm parts for movement in unison when said parts assume a position in longitudinal alignment.

3. In a disintegrating head mechanism, disintegrating means, a plurally articulated arm structure for supporting said disintegrating means for swinging movement in vertical planes along an arcuate path between the floor and roof of a mine, said arm structure comprising a rear

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arm part swingable about a rearwardly located pivot and a front arm part swingable about a forwardly located pivot, a fluid jack for swinging said outer arm part about the forwardly located pivot, a floor jack for swinging the rear arm part about the rearwardly located pivot, and a fluid supply and control system operatively associated with said fluid jacks and embodying means for effecting operation of said jacks first one and then the other with said events occurring automatically in a definite sequence, said operation effecting means of said fluid supply and control system embodying a shiftable control valve device for effecting control of the operation of one of said jacks, said control valve device embodying means for effecting trapping of fluid in said first mentioned fluid jack to lock said arm parts for movement in unison when said parts assume an aligned position.

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