April 12, 1966 J. GONSKI 3,245,723

CONTINUOUS MINING MACHINE

Filed Sept. 19, 1962 3 Sheets-Sheet 1

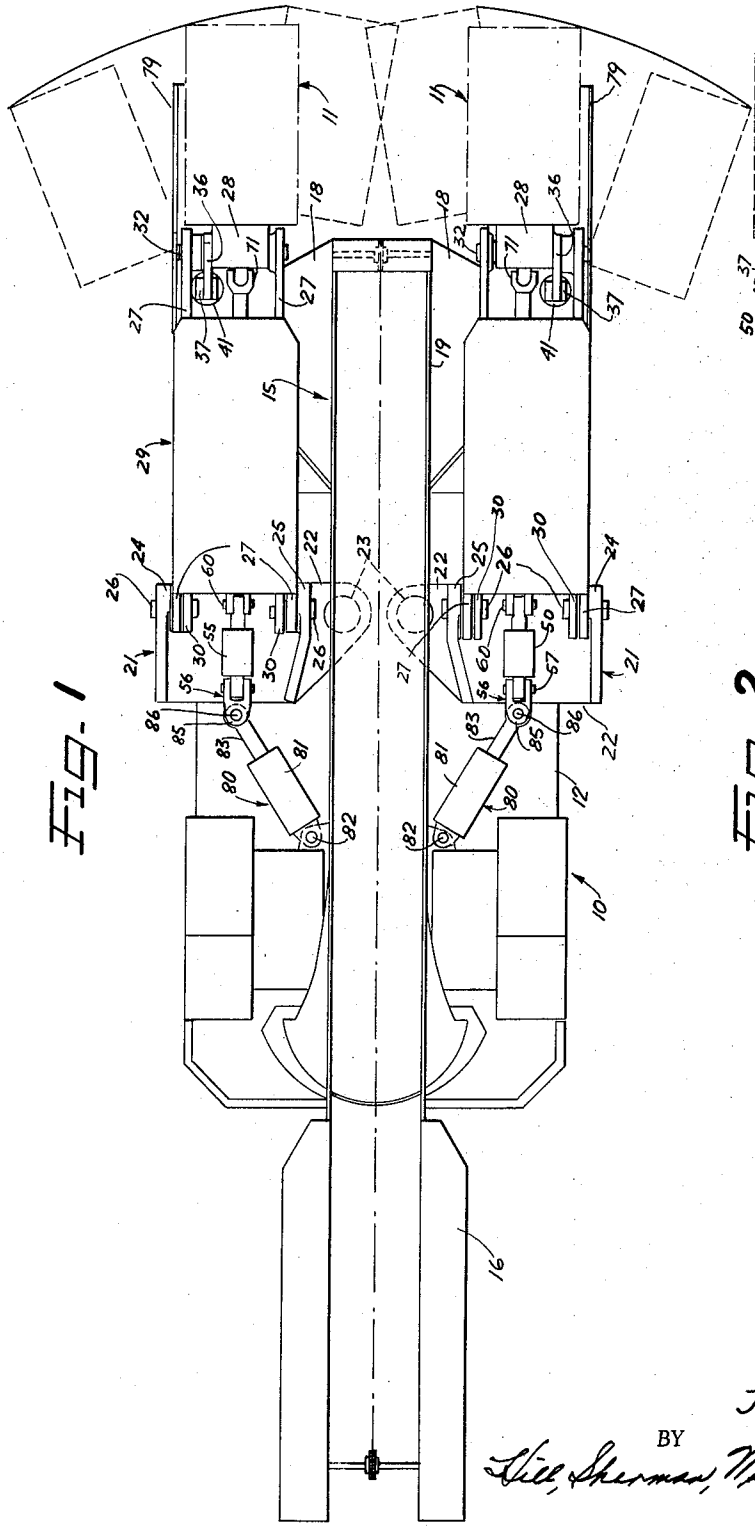


Fig. 1

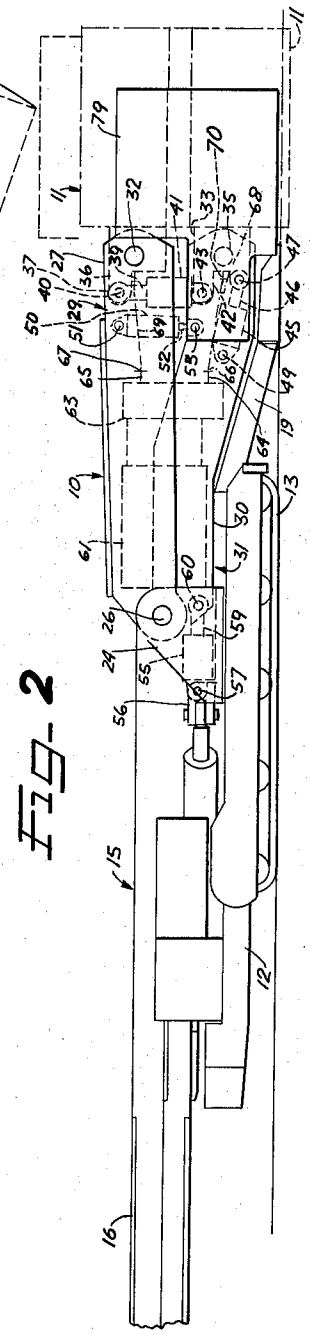


Fig. 2

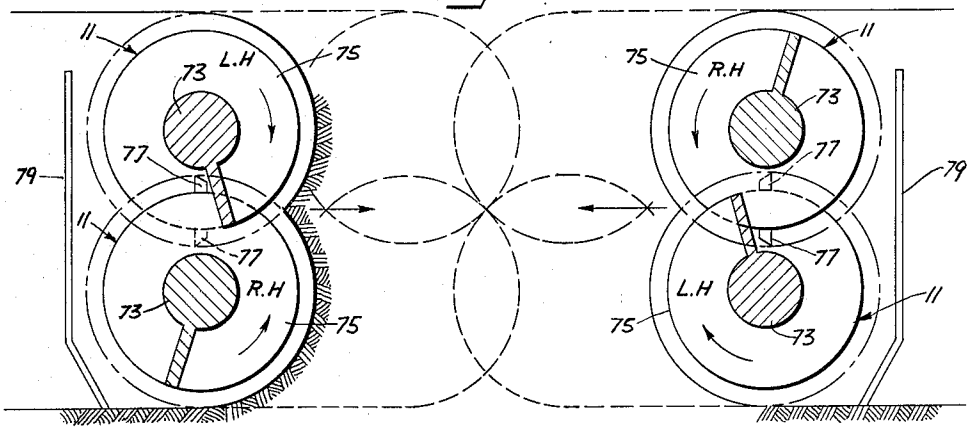
INVENTOR.
Joseph Gonski
BY
Hill, Sherman, Meroni, Gross & Simpson
ATTORNEYS

April 12, 1966 J. GONSKI 3,245,723

CONTINUOUS MINING MACHINE

Filed Sept. 19, 1962 3 Sheets-Sheet 2

Fig. 3



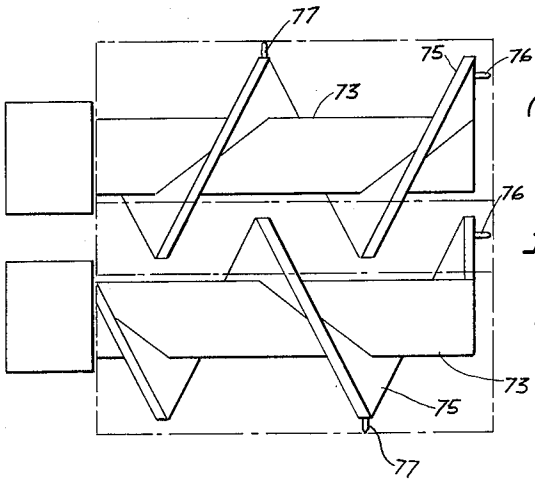


Fig. 4

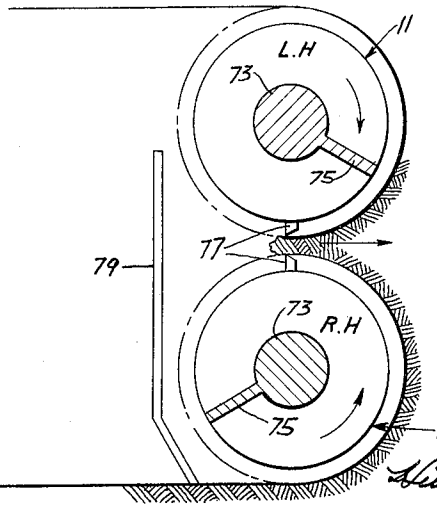


Fig. 5

INVENTOR.
Joseph Gonski

BY

ATTORNEYS

April 12, 1966 J. GONSKI 3,245,723

CONTINUOUS MINING MACHINE

Filed Sept. 19, 1962 3 Sheets-Sheet 3

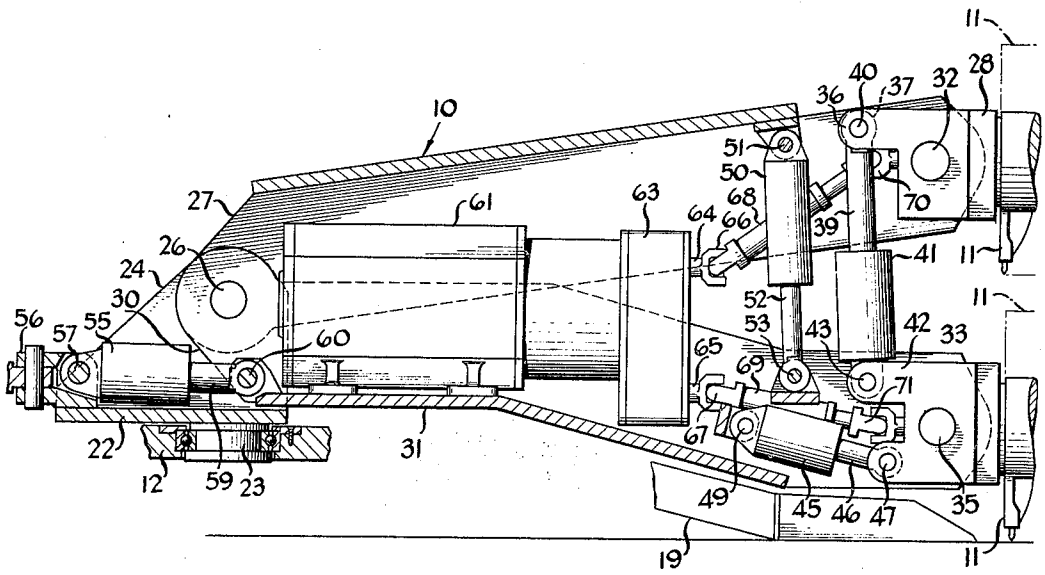


Fig. 6

INVENTOR.
Joseph Gonski

BY

Hill, Sherman, Meroni, Gross & Simpson

ATTORNEYS

United States Patent Office 3,245,723 Patented Apr. 12, 1966

3,245,723

CONTINUOUS MINING MACHINE

Joseph Gonski, Chicago, Ill., assignor to Goodman Manufacturing Company, Chicago, Ill., a corporation of Illinois

Filed Sept. 19, 1962, Ser. No. 224,674
10 Claims. (Cl. 299—59)

This invention relates to improvements in continuous mining machines.

In continuous mining machines of the class described, having two side cutting mining heads angularly moved toward each other after having been sumped endwise into a working face of a mine, where the coal seam is thicker than the diameter of the mining head, the seam must be mined, in benches, the first mining operation usually being along the roof and the second mining operation usually being along the floor. This requires two sumping and lateral feeding operations together with one withdrawing operation in order to completely mine a working face to the cutting depths of the side cutting augers.

While the use of two augers with one auger spaced in advance of the other has been contemplated, with such an arrangement of augers, benches or ledges are left along each rib, or a bench or a ledge may be left along one rib and a relatively large bench or ledge, which may be termed a cusp is left at the center of the seam. These benches or ledges must be mined out before the machine can advance to a next mining and loading operation.

A principal object of the present invention is to improve upon the foregoing types of continuous mining machines by utilizing two side cutting augers to mine from the ribs to the center of a working face and by so driving and arranging the side cutting augers that the cutter bits of one auger may blend or interdigitate into paths of cutting of the cutter bits of the next vertically spaced auger, to enable the mining heads to be adjusted to mine in one operation, seams which are thicker than the diameter of a side cutting mining head.

A further object of the invention is to provide an improved form of continuous mining machine utilizing two vertically spaced side cutting mining heads in which the two mining heads are so driven and supported that they may be adjustably moved so the paths of cutting of the cutter bits of one auger project into the paths of cutting of the cutter bits of the next adjacent auger.

Still another object of the invention is to provide a continuous mining machine having two angularly movable boom arms supported adjacent the forward end of the machine for movement about vertical axes and having a side cutting auger carried by and supported in advance of each boom arm, in which the boom arms are vertically adjustable toward and from each other to blend the cutting paths of the augers into each other, to enable the augers to be vertically adjustable for completely cutting out seams of coal of less height than the combined diameters of the two augers.

Still another object of the invention is to reduce the size of the cusps projecting upwardly from the floor and downwardly from the roof, left between the side cutting mining heads of a continuous mining machine by utilizing two vertically spaced side cutting mining heads at each side of the machine movable inwardly toward the center of the machine during cutting, and by so supporting the mining heads, that they may cut in interdigitating relation with respect to each other and the cutters of the mining heads on each side of the machine may interdigitate as they move toward each other toward the center of the working face.

These and other objects of the invention will appear from time to time as the following specification proceeds and with reference to the accompanying drawings wherein:

FIGURE 1 is a plan view of a continuous mining machine constructed in accordance with the principles of the present invention;

FIGURE 2 is a view in side elevation of the machine shown in FIGURE 1;

FIGURE 3 is a diagrammatic view illustrating the cutting patterns of the two sets of side cutting mining heads when cutting in interdigitating relation with respect to each other and showing the augers in vertical section;

FIGURE 4 is a view in side elevation of two of the augers showing the augers cutting in interdigitating relation with respect to each other;

FIGURE 5 is a diagrammatic view showing the augers spaced to cut seams thicker than the combined diameters of the two augers; and

FIGURE 6 is an enlarged fragmentary vertical sectional view taken through one pair of upper and lower boom arms and their support, with certain parts broken away.

In the embodiment of the invention illustrated in the drawings, I have shown in FIGURES 1 and 2, a mining machine 10 of the side cutting continuous mining type, adapted to cut out and load an entire seam of coal by advancing two vertically spaced side cutting mining heads 11, 11 on each side of the machine endwise into the working face of a coal seam when in the laterally extended positions shown by dashed lines in FIGURE 1, by advance of the entire machine toward the working face, and by feeding the mining heads toward each other across the working face.

The mining machine 10 includes generally a main frame 12 mounted on a pair of laterally spaced continuous traction tread devices 13, 13, for propelling the machine from working place to working place and for advancing the machine toward a working face to feed the two side cutting mining heads 11, 11 on each side of the machine into the working face in a generally endwise direction. The continuous traction tread devices 13, 13 may be independently driven in a conventional manner at either high tramming or low feeding speeds and are no part of the present invention, so need not herein be shown or described further.

Extending along the machine from a position in advance of the forward end of the main frame 12, adjacent the ground, is a conveyor 15 having a laterally flexible discharge end portion 16 adjustable to discharge into shuttle cars, room conveyors and the like, to accommodate the material mined to be carried away from the machine as it is mined. Inclined aprons 18, 18 may extend along opposite sides of an inclined elevating portion 19 of the conveyor to guide the mined material onto the conveyor as it is progressed rearwardly to the conveyor by the side cutting mining heads 11, 11. The conveyor may be a center strand endless chain and flight type conveyor of the laterally flexible type and is no part of the present invention so need not herein be shown or described further.

An individual angularly movable feeder frame 21 forms a support for each pair of vertically spaced side cutting mining heads 11. As shown in FIGURE 1, each feeder frame 21 has a base plate 22 extending inwardly beneath conveyor 15 and pivotally mounted on the main frame 12 on a vertical pivot pin 23.

Each feeder frame 21 also includes a pair of spaced outer and inner upright trunnion supports 24 and 25, respectively, having trunnion pins 26 extending inwardly

therefrom forming mountings for parallel spaced arms 27, 27 of an upper boom arm 29 and for parallel spaced arms 30, 30 of a lower boom arm 31. The arms 27, 27 of the upper boom arm 29 extend along opposite sides of a tilting frame 28 forming a support for the upper mining head 11, and are pivotally connected to said tilting frame as by a transverse pivot pin 32 connected between said boom arms.

The arms 30, 30 of the lower boom arm 31 extend along opposite sides of a similar tilting frame 33 forming a bearing support for the lower mining head 11, and are pivotally connected to said tilting frame as by pivot pins 35.

As shown in FIGURES 1 and 2, an arm 36 extends rearwardly of the tilting frame 28 and is pivotally connected to the bifurcated upper end portion 37 of a piston rod 39 by a pivot pin 40. The piston rod 39 forms the piston rod of a hydraulic jack and is extensibly and retractibly movable with respect to a cylinder 41 pivotally connected at its lower end to an arm 42 of the tilting frame 33 on a pivot pin 43.

The lower tilting frame 33 is held in position and is angularly moved about the axis of the pivot pins 35, as by a hydraulic cylinder 45 having a piston rod 46 extensible therefrom. The piston rod 46 is pivotally connected to the tilting frame 33 by a pivot pin 47, while the cylinder 45 is pivotally connected to the arms 30, 30 by a pivot pin 49.

The cylinder 45 and piston rod 46 may thus adjust the angular position of the lower tilting frame 33 and the side cutting mining head 11 supported thereon with respect to the ground, while the hydraulic cylinder 41 and piston rod 39 may adjust the angular relation of the upper tilting frame 28 and side cutting mining head 11 supported thereby with respect to the lower tilting frame to support the upper mining head 11 in parallel relation with respect to the lower mining head 11.

The boom arms 27, 27 are held in fixed relation with respect to the boom arms 30, 30 and are adjustably moved toward and from each other by a hydraulic jack including a cylinder 50 pivotally connected between the boom arms 27, 27 on a pivot pin 51, and a piston rod 52 extensibly and retractibly movable with respect to the cylinder 50 and pivotally connected between the boom arms 30, 30 on a pivot pin 53. The hydraulic cylinder 50 and piston rod 52 thus hold the boom arms 27, 27 and 30, 30 in fixed relation with respect to each other and serve to adjust the two mining heads 11, 11 to cut a seam of the required thickness, and to hold said mining heads in adjusted relation with respect to each other.

The boom arms 27, 27 and 30, 30 are adjustably moved as a unit about the axes of the trunnion pins 26 by a hydraulic jack including a cylinder 55 pivoted to a support bracket 56 extending upwardly of the base plate 22 of the associated feeder frame 21, on a transverse pivot pin 57. A piston rod 59 is extensibly and retractably movable with respect to the cylinder 55 and is pivotally connected to the lower boom arms 30, 30 on a transverse pivot pin 60.

A drive motor 61 for the two vertically spaced mining heads 11, 11 is suitably mounted between the lower boom arms 30, 30 and extends upwardly into the space between the two upper boom arms 27, 27. The motor 61 may be a well known form of electrical motor commonly used to drive mining machine cutter mechanisms, and as generally shown in FIGURE 2, has a speed reducer housing 63 extending forwardly from the forward end thereof containing reduction gearing driving two vertically spaced lower and upper output shafts 64 and 65 respectively. The output shafts 64 and 65 form drive members for universal couplings 66 and 67 respectively, driving extensible drive shafts 68 and 69 respectively, having flexible couplings 70 and 71 connected to the respective forward ends thereof for driving the individual mining heads 11, 11. The drive connections to the two mining heads may be conventional forms of universal extensible drive connections and are no part of the present invention so are only shown diagrammatically herein.

The mining heads 11, 11 are mounted on the respective tilting frames 28 and 33 for rotation about axes extending longitudinally of the boom arms 27, 27, and 30, 30 in a suitable manner, and as shown in FIGURES 3, 4 and 5 comprise longitudinally extending shafts 73 having helical conveyor scrolls 75 extending therealong for substantially the length of said shafts. The conveyor scroll 75 has a series of cutter bits 76 extending forwardly of the forward end thereof and also has cutter bits 77 extending radially of said scrolls and pitched to cut as said scrolls are fed sidewise along a working face after first having been sumped therein by endwise movement of said scrolls into the working face.

A cuttings confining member 79 is mounted on each outer lower boom arm 30 in outwardly spaced relation with respect thereto and extends forwardly therefrom from a position clearing the ground, upwardly beyond the upper mining head 11, when the lower mining head is positioned to cut along the ground, to confine the cuttings to the scrolls 75, 75 to be conveyed thereby towards the conveyor, to be loaded onto said conveyor as the mining heads are fed inwardly toward each other.

As shown in FIGURES 3, 4 and 5, the scrolls 75 of the two vertically spaced mining heads 11, 11 are pitched in opposite directions, that is the upper scroll at the right hand side of the machine when looking towards the forward end of the machine is a left hand scroll and is driven in a clockwise direction. The lower scroll on the same side of the machine is a right hand scroll and is rotatably driven in a counterclockwise direction. The upper scroll on the left hand side of the machine is a right hand scroll and is driven in a counterclockwise direction, while the lower scroll is a left hand scroll and is driven in a clockwise direction. The cutter bits 77, 77 of all four scrolls are driven to approach each other towards the vertical and horizontal center of the seam and the four scrolls are driven to progress the cuttings towards the conveyor 15.

As shown in FIGURE 4, the helical or spiral arrangements of the four scrolls 75 are such that when the upper and lower mining heads 11, 11 are adjustably moved toward each other, the peaks of one scroll will move into the valleys of the next adjacent scroll, with the result that the cutting paths of the cutter bits 77 of the two vertically spaced scrolls may blend or move into interdigitating relation with respect to each other, and the working face may be mined when the mining heads are so adjusted, by sidewise movement of the mining heads along the working place toward the center of the working place.

The speeds of rotation of the four mining heads 11, 11 are the same and since the scrolls on opposite sides of the machine are of opposite hands and are driven in opposite directions, the four mining heads may move, inwardly toward each other into positions where the cutting paths of the cutter bits and scrolls on the right hand mining heads interdigitate with the cutting paths of the cutter bits and scrolls on the left hand mining heads at the center of the working face, as diagrammatically illustrated in dashed lines in FIGURES 1 and 3.

The mining heads on each side of the machine may be maintained at the same rates of speed by electrically connecting the motors 61, 61 to operate in synchronism with each other. That is, the fields (not shown) of the two motors may be connected in series and the armatures (not shown) may be connected in parallel. The foregoing connections of the two motors are well known to those skilled in the art and are no part of the present invention so need not herein be shown or described further.

The feeder frames 21, 21 and mining heads 11, 11 supported thereby are angularly moved to feed the mining heads 11, 11 inwardly toward each other and are held in laterally extended positions to accommodate the mining

heads to be sumped into the working place of a mine, by means of individual hydraulic jacks **80, 80** including cylinders **81** pivotally connected to the main frame **12** on vertical pivot pins **82**. Piston rods **83** extensibly and retractably movable with respect to the cylinders **81** extend between the furcations of a bifurcated portion **85** of each bracket **56** and are pivotally connected thereto on vertical pivot pins **86**.

In the operation of mining, where mining a relatively thick seam of coal, the two mining heads **11** on each side of the machine may be adjusted in vertically spaced relation with respect to each other with the upper mining heads positioned to cut downwardly from the roof of the mine towards each other and the lower mining heads positioned to cut upwardly from the floor of the mine towards each other. With the mining heads so adjusted, a cusp is left between the upper and lower mining heads (FIGURE 5) but this cusp readily breaks off and is progressed toward the conveyor to be loaded thereonto during the mining operation.

In mining a thin seam of coal the two mining heads on each side of the machine may be adjusted as shown in FIGURE 3, to cut in blending or interdigitating cutting paths and at the start of the mining operation may be positioned in the laterally extended positions shown by dashed lines in FIGURE 1, along each rib of the working place. The mining heads may then be held in this position by the hydraulic jacks **80**. The four mining heads properly adjusted to effect cutting of the upper mining heads towards each other downwardly from the roof of the seam and of the lower mining heads to cut towards each other upwardly from the floor of the seam may then be rotatably driven by the two motors **61** at the same rates of speed. The mining heads being held in the laterally extended positions shown in FIGURE 1, may be fed generally endwise into the working face to the required depth by operation of the traction tread devices **13**. When the mining heads have been sumped into the working face to the required depth, the machine being stationary with respect to the ground, the four mining heads **11, 11** may then be advanced inwardly toward each other at suitable feeding speeds by operation of the hydraulic jacks **80**, feeding the mining heads across the working place inwardly toward each other, with the forward end portions of the scrolls **75** and the cutter bits **77** projecting therefrom, cutting into interdigitating relation with respect to each other at the center of the working place until inward feeding movement of said mining heads is stopped by suitable stop means (not shown) which may either be in the hydraulic system controlling the flow of hydraulic fluid to the jacks **80**, or which may be mechanical stop means of a conventional form.

As the inward limit of movement of the mining heads is reached, the machine is moved backwardly a slight amount, sufficient to clear the mining heads from the working face, and the mining heads are then moved laterally to the laterally extended positions shown in FIGURE 1 and again sumped into the working place and moved thereacross to the inwardly extending dashed line positions shown in FIGURES 1 and 3.

It may be seen from the foregoing that by supporting the two mining heads on each side of the machine one above the other and by so arranging the scrolls that the mining heads may cut in blending or interdigitating cutting patterns, coal seams of various heights may be completely mined in a single mining operation, and that the necessity of mining in benches or of cleaning up the working place by mining the benches or ledges left either at the ribs or at one rib and the center of the working place has been eliminated.

It may further be seen that since all of the mining heads rotate at synchronized speeds, they may also cut in interdigitating cutting paths as they approach each other, to thereby reduce the size of the cusps between the mining heads and extending upwardly from the mine floor and depending from the mine roof to such proportions that they need not be mined out by separate mining operations.

While I have herein shown and described one form in which my invention may be embodied, it may readily be understood that various variations and modifications in the invention may be attained without departing from the spirit and scope of the novel concepts thereof as defined by the claims appended hereto.

I claim as my invention:

1. In a continuous mining machine,
a mobile main frame,
two vertically spaced aligned side cutting mining heads projecting forwardly of said main frame,
each mining head including a horizontal shaft having a scroll extending therealong and having cutter bits projecting therefrom,
the upper of said scrolls being of one hand and the lower of said scrolls being of an opposite hand,
a motor,
means driven by said motor for rotatably driving said scrolls in opposite directions at the same rates of speed to progress the mined material rearwardly toward said main frame,
a feeder frame mounted on said main frame for pivotal movement with respect thereto about a vertical axis,
individual boom arms for said mining heads transversely pivoted to said feeder frame and extending in advance thereof,
means supporting said mining heads on said boom arms to extend forwardly therefrom,
means for maintaining said boom arms and mining heads in fixed relation with respect to each other and for vertically adjusting said boom arms and mining heads with respect to each other, to adjustably move said scrolls toward and from each other and to position said scrolls to cut in interdigitating relation with respect to each other.

2. In a continuous mining machine,
a mobile main frame,
a feeder frame pivotally mounted on said main frame for movement with respect thereto about a vertical axis,
a pair of boom arms transversely pivotally mounted on said feeder frame and extending in advance thereof,
a side cutting mining head carried by said boom arm and extending in advance thereof,
each side cutting mining head including a longitudinal shaft having a scroll extending therealong having cutter bits projecting radially therefrom, said scrolls being in vertical alignment with respect to each other and one scroll being of an opposite hand from the other scroll,
means for driving said scrolls in opposite directions at the same rates of speed,
means interconnected between said boom arms for adjustably moving said boom arms and mining heads independently of each other to bring said scrolls from vertically separated positions into interdigitating relation with respect to each other,
and other means connected between said feeder frame and one of said boom arms for adjustably moving said boom arms vertically as a unit about their axis of transverse pivotal mounting on said main frame.

3. A continuous mining machine in accordance with claim **2**,
wherein a feeder frame,
boom arms and side cutting mining heads are mounted on each side of said main frame and project forwardly therefrom to effect cutting by movement toward each other and wherein the scrolls of opposite upper mining heads and of opposite lower mining heads are of opposite hands and are driven in opposite directions to cut towards the center of the working place and to cut in blending cutting paths

as they approach the transverse center of the working place.

4. In a continuous mining machine,
a mobile main frame,
a feeder frame mounted on said main frame for lateral swinging movement with respect thereto about a vertical axis,
power means for laterally moving said feeder frame about said vertical axis,
a pair of vertically spaced boom arms pivoted to said feeder frame for movement about a common transverse axis,
power means retaining said boom arms in fixed spaced relation with respect to each other and vertically adjusting said boom arms with respect to each other,
other power means connected between said feeder frame and one of said boom arms for vertically moving said boom arms together about said transverse axis,
a side cutting mining head rotatably supported on each boom arm and extending in advance thereof,
said mining heads being vertically aligned and having cutter bits projecting radially therefrom and spaced radially from the axes of rotation thereof,
means for rotatably driving said mining heads in opposite direction at the same rates of speed,
said power means retaining said boom arms in fixed spaced relation with respect to each other and vertically adjusting said boom arms with respect to each other to position said cutter bits to cut in intersecting cutting paths and to vertically move said boom arms and mining heads apart to mine a seam thicker than the combined diameters of the cutting paths of said cutter bits.

5. A continuous mining machine in accordance with claim 4, wherein a feeder frame is pivotally mounted at each side of said main frame,
wherein each feeder frame has a pair of vertically spaced boom arms projecting therefrom and having side cutting mining heads mounted thereon,
wherein the opposite upper mining heads and the opposite lower mining heads are driven in opposite directions to cut towards each other and towards the center of the working place in blending cutting paths as they approach the center of the working place.

6. In a continuous mining machine, a mobile main frame,
a feeder frame mounted on said main frame for lateral swinging movement with respect thereto about a vertical axis,
vertically aligned upper and lower side cutting mining heads spaced in advance of said feeder frame,
vertically aligned upper and lower boom arms transversely pivoted to said feeder frame,
each boom arm forming a support for a respective side cutting mining head,
supporting the associated side cutting mining head to project forwardly therefrom,
means for laterally moving said feeder frame about said vertical axis,
means for holding said boom arms in fixed spaced relation with respect to each other and for vertically adjusting said boom arms toward and from each other,
other means connected between said feeder frame and one of said boom arms for vertically moving said boom arms as a unit,
a motor,
means driven by said motor for rotatably driving said mining heads in opposite directions,
each mining head including a longitudinally extending shaft rotatably driven by said motor and having a scroll extending therealong having cutter bits projecting outwardly therefrom,

the scrolls of said vertically aligned upper and lower mining heads being of opposite hands and driven in opposite directions at the same rates of speed and being so positioned on said shafts as to accommodate adjustment of said mining heads toward each other to rotate together in interdigitating relation with respect to each other.

7. In a continuous mining machine,
a mobile main frame,
a feeder frame mounted on said main frame for lateral swinging movement with respect thereto about a vertical axis,
two vertically aligned side cutting mining heads spaced in advance of said feeder frame,
two vertically aligned boom arms transversely pivoted to said feeder frame, each boom arm supporting an associated side cutting mining head to project in advance thereof,
means for laterally moving said feeder frame about said vertical axis,
means connected between said boom arms for holding said boom arms in fixed spaced relation with respect to each other and for vertically adjusting said boom arms toward and from each other,
other means for vertically moving said boom arms as a unit,
a motor,
means driven by said motor for rotatably driving said mining heads in opposite directions at the same rates of speed,
each mining head including a longitudinally extending shaft rotatably driven by said motor and having a scroll extending therealong having cutter bits projecting outwardly therefrom,
means for transversely pivoting said scrolls with respect to said boom arms and for retaining said scrolls in fixed relation with respect to said boom arms,
and said means connected between said boom arms for vertically adjusting said boom arms with respect to each other having sufficient travel to bring said scrolls into interdigitating relation with respect to each other.

8. In a continuous mining machine,
a mobile main frame,
a feeder frame mounted on said main frame for lateral swinging movement with respect thereto about a vertical axis,
hydraulic jack means for moving said feeder frame about said vertical axis, two spaced vertically aligned side cutting mining heads extending in advance of said feeder frame,
support means for said mining heads including upper and lower boom arms pivotally mounted on said feeder frame for movement with respect thereto about a common transverse axis,
hydraulic jack means for holding said boom arms in fixed relation with respect to each other and vertically adjusting said boom arms with respect to each other to adjust the cutting positions of said side cutting mining heads,
other hydraulic jack means for vertically moving said boom arms together about said common transverse axis,
said mining heads each comprising a drive shaft rotatably supported by and extending in advance of the associated boom arm and a scroll extending along said drive shaft having cutter bits projecting therefrom,
a motor,
means driven by said motor for driving said drive shafts and scrolls at the same rates of speed in opposite directions and driving said cutter bits on each scroll to cut toward each other in the direction of lateral movement of said mining heads, and said scrolls being of opposite hands to effect progression of the mined material toward said main frame and

to enable said scrolls to be adjustably moved into interdigitating relation with respect to each other,
to position said cutter bits to cut in blending cutting patterns.

9. In a continuous mining machine,
a mobile main frame,
a feeder frame mounted on said main frame for lateral swinging movement with respect thereto about a vertical axis,
hydraulic jack means for moving said feeder frame in feeding and return directions,
two spaced vertically aligned side cutting mining heads extending in advance of said feeder frame,
support means for said mining heads including upper and lower boom arms pivotally mounted on said feeder frame for movement with respect thereto about a common transverse axis,
an individual tilting frame transversely pivoted to the forward end of each boom arm and forming a bearing support for an associated mining head,
hydraulic jack means connected between the lower of said boom arms and the associated tilting frame for tilting said tilting frame and the side cutting mining head mounted thereon,
other hydraulic jack means connected between said tilting frames for tilting the upper of said tilting frames,
hydraulic jack means connected between said boom arms for holding said boom arms in fixed spaced relation with respect to each other and moving said boom arms toward and from each other and thereby adjusting the vertical positions of said mining heads,
other hydraulic jack means connected between said feeder frame and one of said boom arms for pivoting said boom arms together about their axis of transverse connection to said feeder frame,
a motor for driving said mining heads in opposite directions at the same rates of speed,
each mining head including a drive shaft rotatably supported in the associated tilting frame and extending forwardly therefrom, and a scroll extending along said shaft,

said scrolls being of the same pitch and diameter and of opposite hand to accommodate the movement of one scroll into interdigitating relation with respect to the other,
to effect the continuous mining of a seam of less thickness than the combined diameters of the two mining heads.

10. A continuous mining machine in accordance with claim **9**,
wherein a feeder frame is provided at each side of said main frame and wherein each feeder frame carries a pair of upper and lower boom arms, each rotatably supporting a mining head, wherein the mining heads are vertically and horizontally aligned and opposite upper mining heads and opposite lower mining heads are driven in opposite directions to cut towards each other and towards the center of the working place and are movable into interdigitating relation with respect to each other and mining by angular movement of said feeder frames toward the center of the machine to positions wherein the side cutting mining heads on opposite sides of the machine move into positions to cut in intersecting cutting paths as they approach the center of the working place.

References Cited by the Examiner

UNITED STATES PATENTS

1,303,797	5/1919	Holmes	299—71
2,801,091	7/1957	Joy	299—71 X
2,920,879	1/1960	Driehaus	299—73 X
2,967,701	1/1961	Wilcox	299—73 X
2,979,319	4/1961	Anderson	299—71
3,066,924	12/1962	Queer	299—68

FOREIGN PATENTS

560,813	7/1923	France.
322,894	7/1920	Germany.

CHARLES E. O'CONNELL, *Primary Examiner.*
BENJAMIN HERSH, *Examiner.*