June 22, 1965

J. GONSKI

LATERALLY SWINGABLE CONVEYORS FOR CONTINUOUS MINING MACHINE

3,190,697

Filed Sept. 30, 1960

5 Sheets-Sheet 1

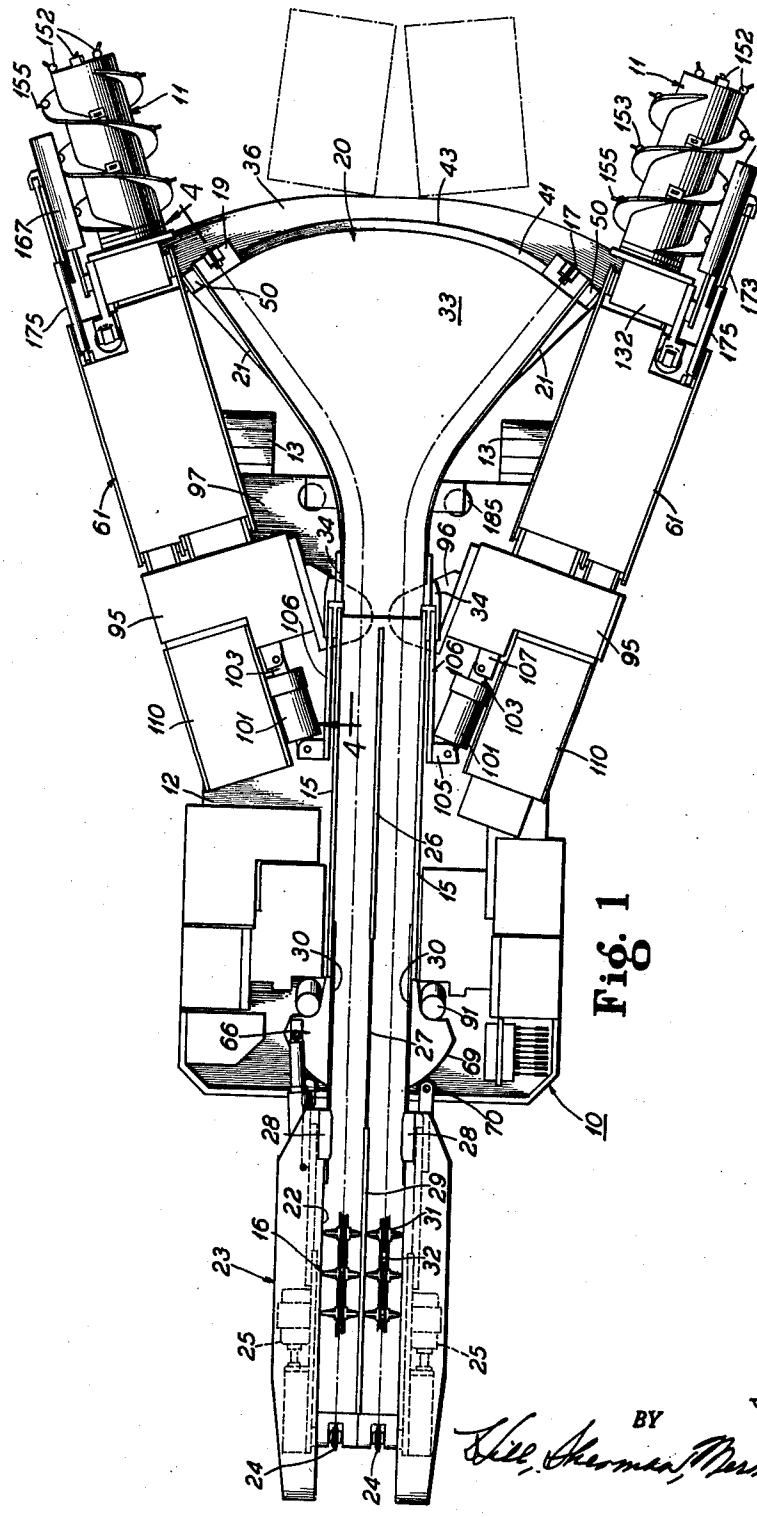


Fig. 1

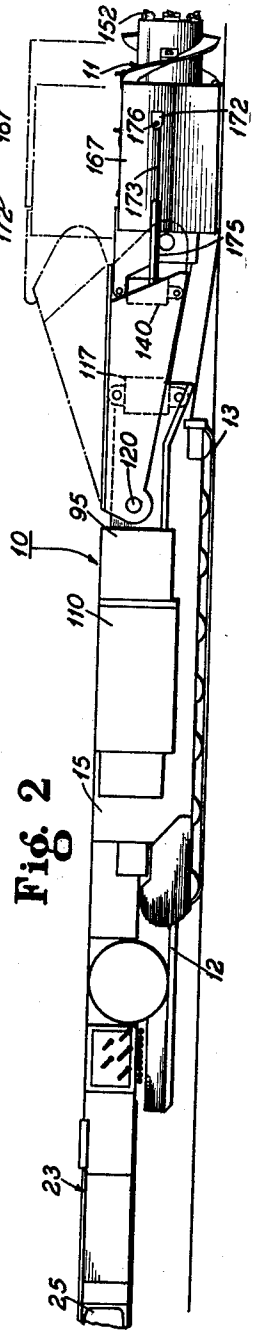


Fig. 2

INVENTOR.

Joseph Gonski

BY

Kile, Sherman, Morris, Cross & Haynes

June 22, 1965

J. GONSKI

LATERALLY SWINGABLE CONVEYORS FOR CONTINUOUS MINING MACHINE

3,190,697

Filed Sept. 30, 1960

5 Sheets-Sheet 2

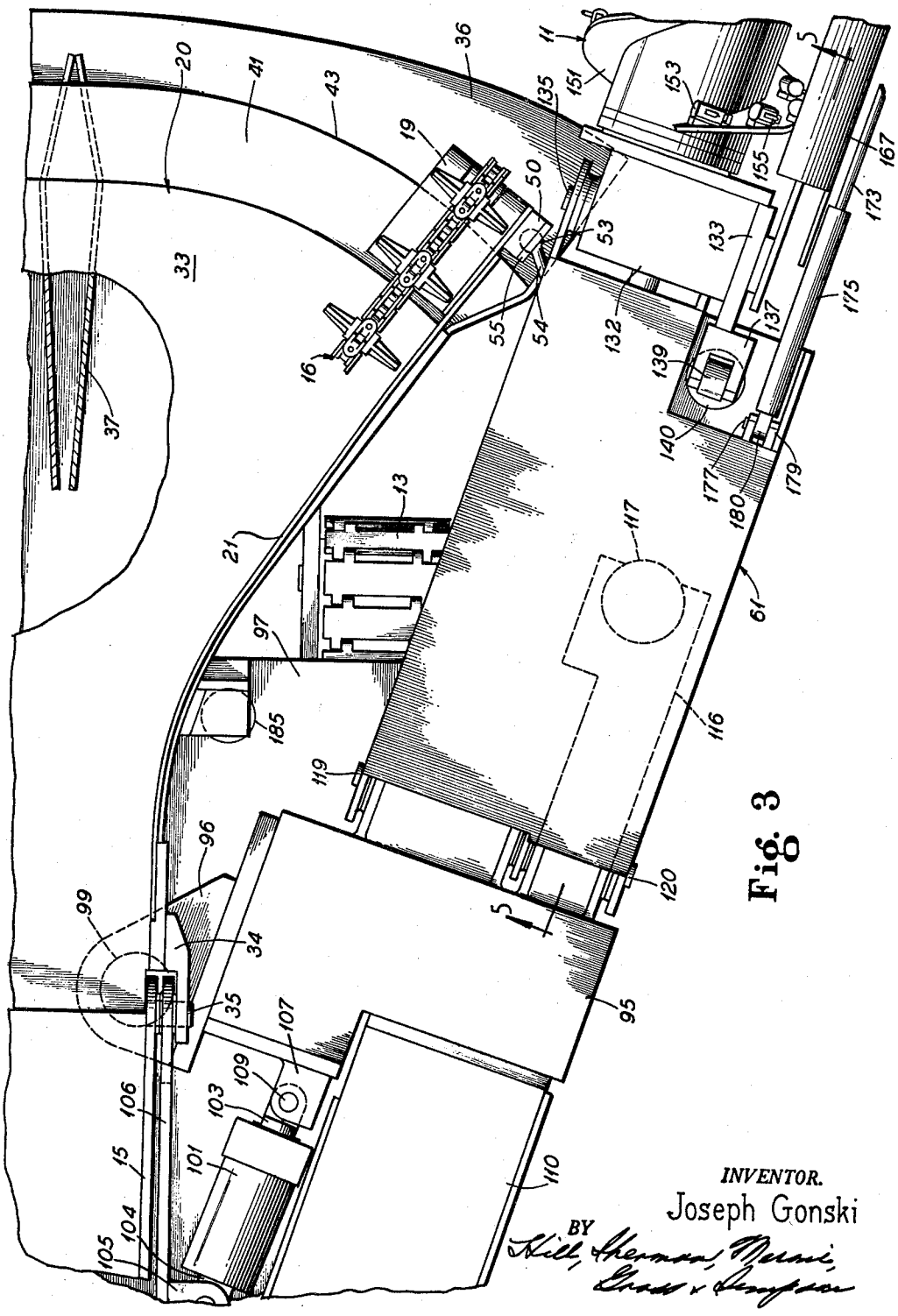


Fig. 3

INVENTOR.

Joseph Gonski

BY

Kill, Sherman, Morsell, Gross & Simpson

June 22, 1965

J. GONSKI

LATERALLY SWINGABLE CONVEYORS FOR CONTINUOUS MINING MACHINE

3,190,697

Filed Sept. 30, 1960

5 Sheets-Sheet 3

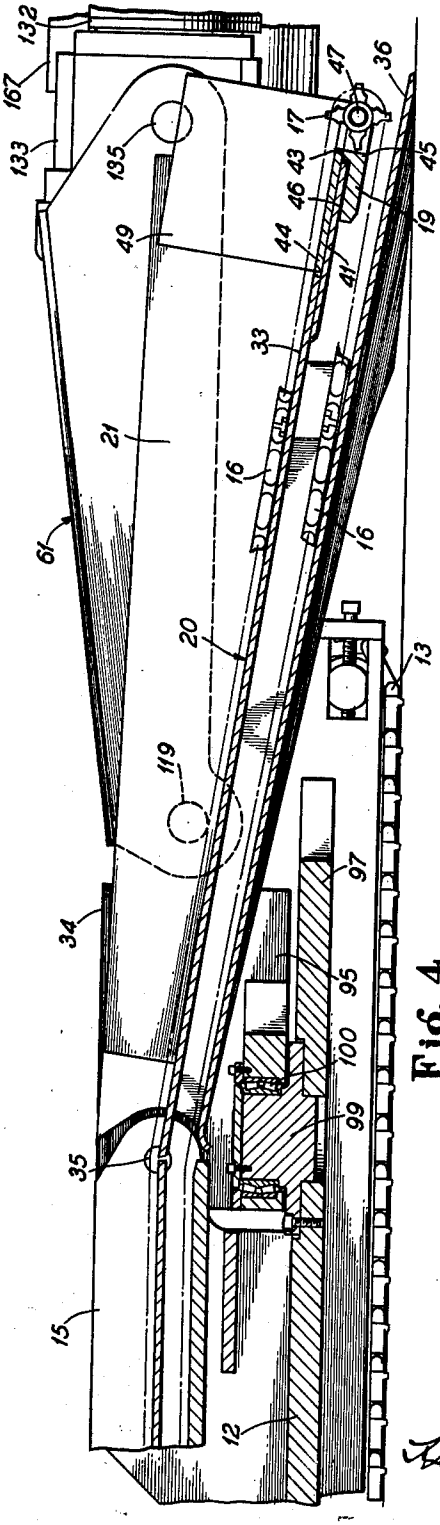


Fig. 4

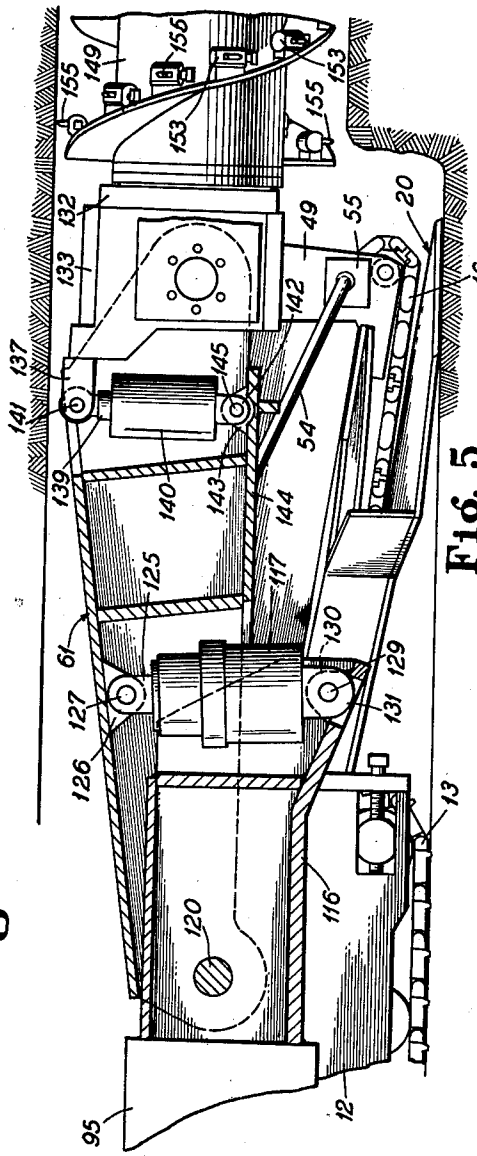


Fig. 5

INVENTOR.

Joseph Gonski

BY

Kill, Sherman, Morsell, Gaston & Rothwell

June 22, 1965 J. GONSKI 3,190,697

LATERALLY SWINGABLE CONVEYORS FOR CONTINUOUS MINING MACHINE

Filed Sept. 30, 1960

5 Sheets-Sheet 4

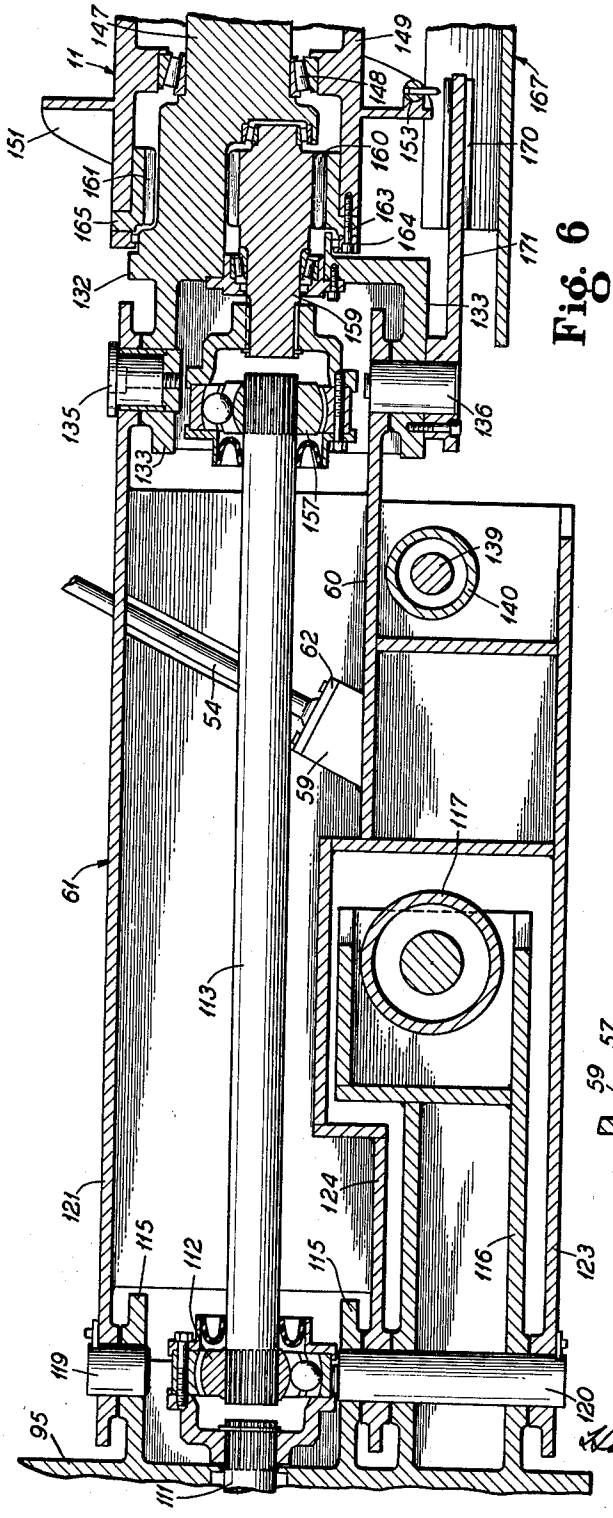


Fig. 6

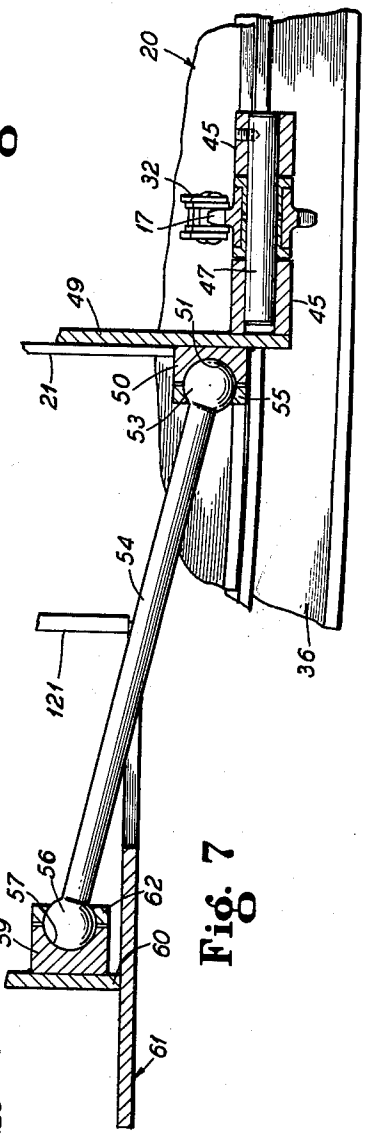


Fig. 7

INVENTOR.
Joseph Gonski

BY Hill, Sherman, Meroni, Gross & Simpson

June 22, 1965

J. GONSKI

LATERALLY SWINGABLE CONVEYORS FOR CONTINUOUS MINING MACHINE

3,190,697

Filed Sept. 30, 1960

5 Sheets-Sheet 5

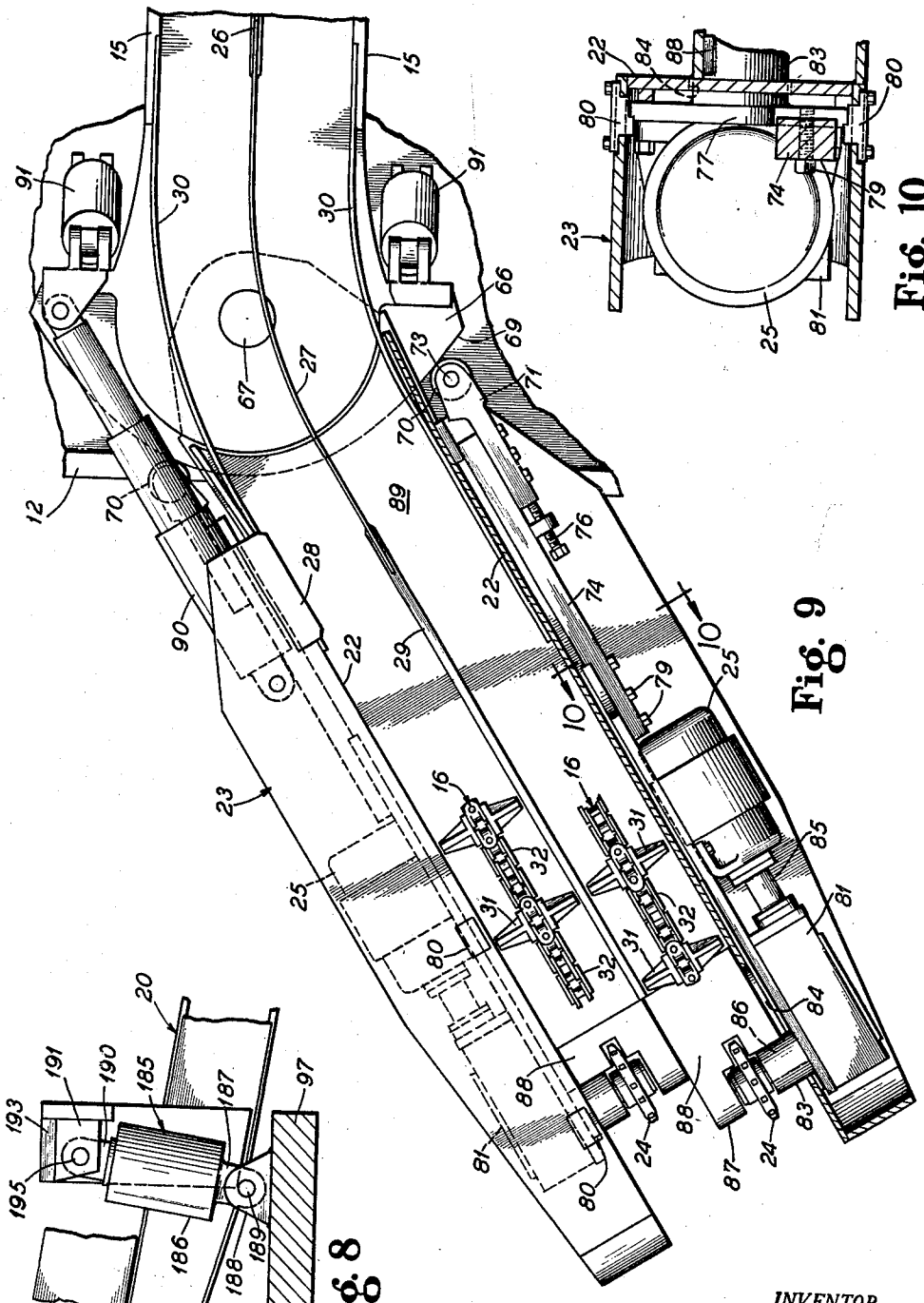


Fig. 9

Fig. 10

Fig. 8

INVENTOR.

Joseph Gonski

BY

Hill, Sherman, Meroni, Gross & Simpson

United States Patent Office 3,190,697 Patented June 22, 1965

3,190,697
LATERALLY SWINGABLE CONVEYORS FOR CONTINUOUS MINING MACHINE

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

Filed Sept. 30, 1960, Ser. No. 59,771
8 Claims. (Cl. 299—64)

This invention relates to improvements in continuous mining and loading machines, particularly adapted for mining and loading thin seams of coal in a continuous operation.

A principal object of the invention is to provide an improved form of mining and loading machine, particularly adapted for mining out thin seams of coal in a continuous mining and loading operation and arranged with a view toward efficiency in mining and simplicity and compactness in construction and operation.

A further object of the invention is to provide an improved form of continuous mining machine of a type having two side cutting mining heads sumped into a coal seam in the general direction of the axes of rotation of the mining heads and fed laterally across the coal seam, and arranged with a view toward efficiency in gathering the mined coal and simplicity in maneuverability of the mining heads and gathering mechanism.

A still further object of the invention is to provide a continuous mining machine particularly adapted for operation in thin seams of coal in which the seam is mined by two side cutting mining heads movable laterally across a working face of a mine from the ribs to the center thereof, in which improved gathering and conveyor means are provided for picking up and conveying the mined coal during the progress of a mining operation.

A still further object of the invention is to provide a simplified form of continuous mining machine of the laterally swingable side cutting auger type having a simplified form of conveyor system movable laterally with the side cutting augers and consisting in independent conveyors for each side cuting auger, movable in side by side relation with respect to each other for gathering and progressing the mined material toward the rear end of the machine for discharge onto shuttle cars and the like.

A still further object of the invention is to provide an improved gathering conveyor system particularly adapted for continuous mining machines and the like, utilizing two independently driven laterally flexible conveyors, each of which is laterally swingable across the forward end of the machine in accordance with swinging movement of the mining augers, and having individual pickups for the conveyors accommodating lateral swinging movement of the discharge end portions of the conveyors from side to side, during the mining operation.

A still further object of the invention is to provide an improved form of continuous mining machine having an apron extending in advance of the main frame of the machine and floatingly mounted thereon to conform to irregular contours in the ground, and having individual mining heads movable across said apron from the outer sides toward the center thereof and mounted for independent vertical adjustment with respect to the ground.

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 top 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 an enlarged fragmentary top plan view

of the forward end portion of one side of the machine shown in FIGURE 1, with certain parts broken away and certain other parts shown in section;

FIGURE 4 is an enlarged fragmentary longitudinal sectional view of the machine taken substantially along line 4—4 of FIGURE 1;

FIGURE 5 is a vertical sectional view of the machine drawn to substantially the same scale of FIGURE 4, and taken substantially along line 5—5 of FIGURE 3;

FIGURE 6 is a fragmentary horizontal sectional view taken through the support boom for one of the mining heads and the drive end portion of the mining auger supported thereon;

FIGURE 7 is an enlarged fragmentary vertical sectional view taken transversely of the forward end portion of the machine and showing the connection from the mining head to one of the independent conveyors, for moving the conveyor across the front of the machine as the associated mining head is being fed inwardly toward the center of the machine;

FIGURE 8 is a fragmentary vertical longitudinal sectional view taken at the front of the main frame of the machine and illustrating one of the elevating jacks for the apron;

FIGURE 9 is a plan view of the rear end portion of the machine with certain parts shown in horizontal section in order to show the discharge end portion of the conveyors and the independent take-ups for the conveyors; and

FIGURE 10 is a fragmentary transverse sectional view taken substantially along line 10—10 of FIGURE 9.

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 side cutting mining heads 11, 11 endwise into the working face of a coal seam when in the laterally extended position shown in FIGURE 1, by advance of the entire machine toward the working face, and by feeding said mining heads toward each other across the working frace.

The mining machine 10 includes generally a main frame 12 mounted on a pair of laterally spaced continuous traction tread devices 13, for propelling the machine from working place to working place and for advancing the machine toward a working face to feed the side cutting heads 11, thereinto. The continuous traction tread devices may be of any well known form and may be independently driven in a suitable manner well known to those skilled in the art, and no part of the present invention, so not herein shown or described further.

Extending along the central portion of the main frame 12, in parallel relation with respect to each other are a pair of vertically extending parallel spaced side walls 15 for the conveyor structure for the machine, herein shown as being a pair of side by side laterally flexible endless chain and flight conveyors 16. The flight conveyors 16 turn about independent direction changing idler sprockets 17 journalled on shoes 19 guided for movement along the forward end portion of an inclined material carrying and elevating apron 20, transversely pivoted to the forward end portion of the main frame 11 and extending in advance thereof into engagement with the ground.

The laterally flexible chain and flight conveyors 16 extend upwardly along the apron 20 along outer flexible side walls 21 thereof, when in the position shown in FIGURE 1, to and along the side walls 15 extending along the main frame 12. From thence the conveyors 16 extend beyond the rear end of said main frame along a laterally flexible discharge trough section 23 of the conveyor, to the rear end portion thereof. Said flight conveyors change their direction of travel at the rear end of the discharge trough section 23 about direction changing drive sprockets

24, independently driven from separate drive motors 25, as will hereinafter be more fully described as this specification proceeds.

Extending along the main frame 12 between the side walls 15 is a vertically extending divider plate 26, separating the conveyors 16 from each other and connected with a laterally flexible divider plate 27 extending rearwardly from the divider plate 26. The laterally flexible divider plate 27 may be axially movable with respect to the divider plate 26 and is slidably connected at its rear end to a divider 29 extending along the discharge trough section 23 toward the rear end thereof. The side walls 15 are in turn connected to the discharge trough section 23 by flexible side walls 30, which may be secured to the side walls 15 and are slidably guided for movement along the side walls 22 of the discharge trough section 23 in guides 28, extending downwardly along and spaced from the side walls 22.

The laterally flexible conveyors 16 are shown as being center strand endless chain and flight types of conveyors including a plurality of longitudinally spaced flights 31 connected together by strands of chain 32 in such a manner as to accommodate the strands of chain to flex laterally about their points of connection to the flights 31, in a manner well known to those skilled in the art, so not herein shown or described further.

The apron 20 includes a top material carrying plate 33 of a generally fan-like form in plan, along which the side walls 21 extend. The side walls 21 are flexible to move with the conveyors 16 and retain material thereto and are shown in FIGURE 4 as being connected at their rear ends to connector members 34 extending vertically from the plate 33 along the outsides of the side walls 15 and pivotally connected thereto on transverse pivot pins 35, supporting the apron 20 on the main frame 12 for free vertical movement with respect to the ground about said pivot pins. The apron 20 also includes a bottom ground engaging plate 36 spaced beneath the plate 33 by longitudinally extending spacers 37 (FIGURE 3).

The top surface of the bottom plate 36 forms a support for the lower runs of the conveyors 16 as they move toward the front of the machine to change their direction of travel about the direction changing idler sprockets 17 journalled in the shoes 19.

The shoes 19 ride laterally along a plate 41 welded or otherwise secured to the bottom of the plate 33 of the apron 20 and extending across and in advance of the forward end thereof. The plate 41 has a generally arcuate forward end portion 43 conforming generally to the forward end portion of the plate 33 and so formed as to maintain the lengths of the paths of travel of the conveyors uniform in all positions of lateral movement of said conveyors along the plate 41 when the discharge trough section 23 of the conveyor is in the centered position shown in FIGURE 1 and the chains of the conveyors are under proper tension.

As shown in FIGURES 4 and 7, the shoes 19 each have a plate portion 44 mounted on and extending along the plate 41 to the forward end portion of the plate 33. Each shoe also has spaced boss portions 45 at the forward end of the plate 44 and having a guide portion extending rearwardly therefrom and spaced beneath the plate 44 and with the bottom of said plate forming a rearwardly opening slot 46, extending therealong, within which the plate 41 extends to the forward end of said slot.

The boss portions 45 form supports for a shaft 47 forming a bearing support for the sprocket 17. Extending vertically from the outer side of each plate 44 is a vertical side wall 49. The side wall 49 has the forward end portion of a flexible side wall 21 secured thereto and extending therefrom along the material carrying plate 33 of the apron 20.

Each side wall 49 has a block 50 welded or otherwise secured to its outer face and extending outwardly therefrom. The block 50 has a semi-spherical socket 51

therein, for receiving a ball 53 on the inner end of a link 54. The ball 53 is retained to the socket 51 by a cover plate 55, extending across the open end of the socket 51 (FIGURE 7).

The link 54, as shown in FIGURE 7, has a ball 56 on its opposite end extending within a generally spherical socket 57 in a block 59 welded or otherwise secured to a side plate 60 of a boom arm 61 supporting the mining head 11. An end cap 62 is provided for the block 59, to retain the ball 56 to the socket 57.

The boom arms 61 form vertically movable supports for the side cutting mining heads 11, projecting forwardly therefrom and pivotally mounted thereon in a manner which will hereinafter be more fully described as this specification proceeds. As the mining heads 11 are fed across the working face of a mine toward each other, the shoes 19 will move inwardly therewith to cause the forward end portions of the conveyors 16 to converge and pickup and move the loose material upwardly along the apron for discharge beyond the rear end of the machine.

The discharge end portion 23 of the conveyor rests on a generally fan shaped plate 66 at the rear end of the main frame 12 and pivots about a vertical pivot pin 67 (FIGURE 9). The fan-shaped plate 66 has a camming rear edge 69 engaged by spaced follower rollers 70, forming independent take-ups for the conveyors 16, to maintain the shoes 19 in slidable engagement with the contoured forward end portion 43 of the plate 41 and thereby maintain tension on the conveyor chains 32 uniform in all positions of lateral swinging movement of the discharge end portion 23 of the conveyor with respect to the main frame 12.

As shown in FIGURE 9, each follower 70 is mounted on the end of a forked bracket 71, between the furcations thereof, on a vertical pivot pin 73. The forked bracket 71 in turn is bolted or otherwise secured to an arm 74 extending longitudinally of an outer side wall 22 of the discharge trough section 23.

A take up screw 76 is provided to adjust the position of the bracket 71 with respect to the arm 74. The arm 74 is secured at its rear end to a bracket 77 for the motor 25, as by machine screws 79. The bracket 77 is slidably guided at its top and bottom sides in vertically spaced facing gibbed guides 80 spaced outwardly of the side wall 22, and extending parallel thereto (FIGURE 10). The bracket 77 also forms a support bracket for a speed reducer housing 81 in alignment with the motor 25 and spaced rearwardly therefrom. A bearing support boss 83 extends inwardly of the bracket 77 and speed reducer housing 81 through a slot 84 in the side plate 22. The speed reducer housing 81 may house a worm and worm gear type of speed reducer, driven from the motor 25 through a drive shaft 85, and driving a stub drive shaft 86 for the sprocket 24, which sprocket may be keyed or otherwise secured to said drive shaft. A plate 88 extends forwardly from the sprocket 24 along the underside of a bottom plate 89 for the conveyor, and is mounted beneath said bottom plate for slidable movement with respect thereto, as tension on the chain 32 is taken up or let off as the discharge end portion 23 of the conveyor moves laterally beyond one side or the other of the longitudinal centerline of the main frame 12.

It will here be noted that the rollers 70 are maintained in engagement with the camming edge 69 of the plate 66 by the tension of the individual chains 32 and that the camming face 69 in cooperation with the curved face 43 of the shoe 41 is so formed as to maintain tension on the conveyor chains 32 uniform in all positions of lateral adjustment of the discharge end portion 23 of the the conveyor with respect to the longitudinal centerline of the main frame 12.

The discharge trough section 23 of the conveyor, supported on the plate 66, is swung laterally across said plate to one side or the other of the centerline of the main

frame 12 by operation of a hydraulic swing jack 90 pivotally connected between the main frame 12 and one side of the discharge trough section 23 of the conveyor. The plate 66 extends rearwardly along the main frame from a position adjacent the forward end thereof and forms a support for the central and discharge end portions of the conveyor and is suitably mounted at its forward end on the transverse pivot pins 35 for pivotal movement thereabout. Hydraulic jacks 91 transversely pivoted to the main frame 12 at their lower ends and to the plate 66 at their upper ends are provided to elevate and lower said plate and the discharge end of the conveyor.

Referring now in particular to the supporting structure for the side cutting mining heads 11 and the means for swinging said side cutting mining heads across the front end of the apron 20 and elevating and lowering said mining heads with respect to the ground to position said mining heads to cut in various parallel planes with respect to the ground, the mining heads 11, and boom arms 61 on each side of the machine are the same, as are the supporting and adjusting connections therefor, so a mining head and its support on one side of the machine only will herein be referred to in detail.

Each boom arm 61 is transversely pivoted to and projects in advance of an associated feeder frame 95. The feeder frame 95 has an ear 96 extending inwardly therefrom over a plate 97 of the main frame 12 and pivotally mounted on a bearing boss 99 on anti-friction bearings 100 (FIGURE 4). A hydraulic jack in the form of a cylinder 101 having a piston rod 103 extensible therefrom is provided to move the feeder frame about the axis of the bearing boss 99. As shown in FIGURES 1 and 3, the cylinder 101 has a lug 104 projecting from its head end pivotally connected to a lug 105 projecting forwardly from a support bracket 106 projecting upwardly from the main frame 12. The piston rod 103 is connected between parallel spaced ears 107, projecting rearwardly from the feeder frame 95, on a pivot pin 109.

The feeder frame 95 forms a support for a motor 110 for driving the rotary mining head or auger 11. The feeder frame 95 also contains reduction gearing (not shown), for driving a longitudinal shaft 111 from the motor 110. The longitudinal shaft 111 is shown in FIGURE 6 as having a universal coupling 112 splined thereto for driving a drive shaft 113 extending along the boom arm 61.

The feeder frame 95 has two parallel spaced ears 115 projecting forwardly from the forward end thereof. Spaced outwardly of the ears 115 and extending forwardly of the feeder frame 95 and ears 115 is a support structure 116 for a hydraulic jack 117 for elevating the boom arm 61 about the axes of coaxial pivot shafts 119 and 120 for said boom arm. As shown in FIGURE 6, the shaft 119 pivotally connects an inner side frame member 121 of the boom arm 61 to the ear 115. The shaft 120 pivotally connects an outer side frame member 123 and an inwardly spaced side frame member 124 of the boom arm 61 to the frame structure 116 and the inner ear 115.

The hydraulic jack 117, as shown in FIGURE 5 has an extensible piston rod 125 connected to an ear 126, depending from the top of the boom arm 61, on a pivot pin 127. The hydraulic jack 117 in turn is pivotally connected to the forward end portion of the frame structure 116 on a pivot pin 129, extending through an ear 130 extending upwardly from the bottom of the frame structure 116, and an ear 131 depending from the head end of said hydraulic jack.

The mining head 11, as shown in FIGURE 6, is supported on a support frame structure 132 having parallel spaced arms 133 extending rearwardly therefrom, on the outer sides of the plates 121 and 60, and pivotally connected thereto by coaxial trunnion pins 135 and 136. The support frame structure 132 has a tilting arm 137 extending rearwardly of the outer arm 133 and spaced

outwardly therefrom, and pivotally connected to a piston rod 139 of a hydraulic jack 140, on a pivot pin 141 (FIGURE 5). The hydraulic jack 140 has an ear 142 depending from the head end of the cylinder thereof, pivotally connected to an ear 143 projecting upwardly from a bottom plate 144 of the boom arm 61, on a pivot pin 145.

The support frame structure 132 has a stationary shaft portion 147 forming a support for spaced bearings 148, rotatably supporting a cylindrical drum 149 of the mining head 11, only one of said bearings being shown herein.

The side cutting mining head 11 may be of a well known form and includes the drum 149 having a spiral or helical scroll 151 extending therealong from the outer to the inner end thereof and having bit blocks and cutter bits 152 projecting forwardly of the forward end of said drum. The scroll 151 forms a spiral conveyor for moving the dislodged material toward the conveyors 16 along the throat thereof, and has a plurality of bit blocks 153 projecting forwardly therefrom adjacent the outer edge thereof.

The bit blocks 153 carry the usual cutter bits 155. The two mining heads 11 rotate toward each other to cut from the roof of the mine toward the floor as the mining heads are fed inwardly toward the center of the machine to cause the mined material to fall toward the ground onto the apron 20 to be picked up by the inwardly moving conveyors 16.

The drive to the drum 150 and side cutting auger from the shaft 113 includes a universal coupling 157, splined to the forward end of said shaft and driving an aligned shaft 159 journalled in the support structure 132 for the side cutting auger. The shaft 159 is shown as having a pinion 160 formed integrally therewith meshing with and driving an internal gear 161 mounted within the drum 149 and retained thereto as by machine screws 163, extending through a retainer ring 164 abutting an outer flanged portion 165 of said internal gear, and extending through said flanged portion and threaded within the end of the drum 149.

A means is provided to confine the broken down material to the helical scroll 151 to be carried rearwardly thereby to be picked up by the conveyors 16, which is herein shown as being a deflector shield 167 generally conforming to the contour of the helical scroll 151 and paths of travel of the cutter bits 155 carried thereby, and shown as extending along the retreating side of the associated side cutting mining head or auger 11. The deflector shield 167 is shown in FIGURE 6 as having an inwardly extending channelled guide 170 extending therealong for a portion of the length thereof, facing a similar upwardly spaced channelled guide (not shown). Said channelled guides slidably engage opposite sides of an arm 171, mounted on the outer end of the pin 136 and projecting forwardly therefrom. The deflector shield 167 is supported adjacent its forward end on a piston rod 173 extensible from a cylinder 175. The forward end of the piston rod 173 extends along the inside of a connector 172, spaced outwardly of the deflector 167 and connected thereto on a pivot pin 176. The cylinder 175 is in turn pivotally connected to the boom arm 61 at its head ends on a pivot pin 177 extending through parallel spaced ears 179 projecting forwardly of the boom arm 61 and through a lug 180 projecting rearwardly from the head end of the cylinder 175 (see FIGURE 3).

It may be seen from the foregoing that the mining heads 11 supported for vertical adjustable movement about the axes of the pivot pins 119 and 135 may be positioned to cut in parallel relation with respect to the ground and that said mining heads and their deflector shields 167 are vertically adjustable relatively to the apron 33, having floating engagement with the ground.

A means is provided to raise the apron 20 off the ground when the machine is tramming from working place to working place, which is shown in FIGURES 1,

3 and 8 as comprising a pair of hydraulic jacks **185**. Said hydraulic jacks are positioned on each side of the conveyor **16** at the rear end portion of the apron **20** and are pivotally connected between the forward end portion of the plate **97** of the main frame **12** and the rear end portion of the apron **20**. As shown in FIGURE 8, the hydraulic jacks **185** include a cylinder **186** having an ear **187** depending from the head end thereof and pivotally connected to upright ears **188**, extending upwardly from the plate **97**, as by a pivot pin **189**. A piston rod **190** extensible from the cylinder **185** is shown as being connected to a connector **191** depending from a bracket structure **193**, by a pivot pin **195**.

In mining a thin seam of coal with the continuous mining machine herein described, the seam may be mined in benches, unless the thickness of the seam should be of substantially the cutting diameters of the side cutting mining heads **11**. The seam may be first mined along the roof, so the first cut defines the roof line. The seam may then be mined along the floor and the second cut across the seam will define the floor line.

In making the first cut, the feeder frames **95** are first swung outwardly by operation of the hydraulic jacks **101** to position the forward ends of the side cutting mining heads **11** adjacent the ribs of the working place to be mined. The mining heads **11** may then be elevated to extend parallel to the roof of the working place, by operation of the hydraulic jacks **117** and **140**.

Fluid under pressure may then be held in said hydraulic jacks to maintain the mining heads in the required cutting planes.

With the mining heads positioned to cut along the roof line and in their outwardly extending position shown in FIGURE 1, and held in these positions by the hydraulic jacks **101**, the motors **110** may be started to operate the mining heads to rotate toward each other from the roof toward the floor.

Assuming the conveyors **16** are in operation, power may be applied to the continuous traction tread devices **13**, to advance the mining heads **11** into the working face for substantially the full length of said mining heads.

When the mining heads have advanced into the working face to the required depth, they may then be fed transversely of the apron **20** toward each other about the axes of the bearing bosses **99**, by operation of the hydraulic jacks **101**. During this inward feeding movement of the mining heads, the links **54** will move the conveyors **16** inwardly along the plate **41** at the front of the apron **33**, to gather and load the mined materials progressed from the face by operation of the helical scrolls **151**. The mining heads **11** may be fed inwardly toward each other until they reach a position similar to the position shown by broken lines in FIGURE 1. The feeding operation of the mining heads will then stop and the mining heads may be held in the broken line position shown in FIGURE 1 by operation of the hydraulic jacks **101**. The cusps left between the mining heads may then be broken down by slewing the entire machine sideways in one direction and another.

The machine may then be backed from the face by operation of the traction tread devices **13** and the mining head **11** may be lowered in parallel relation with respect to the ground. The mining operation just described may then be repeated to mine and load the bench left at the end of the first mining operation.

It should here be noted that the boom arms **61** on each side of the machine are independently adjustable with respect to each other to accommodate independent vertical adjustment of the mining heads **11** to vary the positions of the mining heads with respect to each other during lateral feeding movement of the mining heads across the working face, to accommodate the mining heads to follow a roll in the seam and mine along the roll without interruption of the mining operation.

While I have herein shown and described one form in which my invention may be embodied, it should be understood that various modifications and variations 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. A continuous mining machine of the class described comprising, a mobile main frame, an apron extending forwardly of a forward end of said main frame and inclined downwardly from said main frame toward the ground, a pair of feeder frames vertically pivoted on said main frame at opposite sides thereof, a side cutting mining head supported on each feeder frame, means mounting said mining heads on said feeder frames to extend forwardly thereof beyond the forward end of said apron, power means connected between said main frame and said feeder frames for moving said feeder frames and mining heads toward and from each other across said apron, two shoes guided for movement along the forward end of said apron, two laterally flexible endless conveyors extending along said main frame and apron and changing their directions of travel at the forward end of said apron about said shoes to convey the mined material upwardly along said apron, each conveyor having an outer flexible side wall extending upwardly along said apron from an associated shoe, and means connecting said feeder frames with said conveyors for moving said conveyors including said flexible side walls and shoes along said apron toward each other upon feeding movement of said mining heads toward each other.

2. In a continuous mining machine of the class described, a mobile main frame, an apron extending forwardly of the forward end of said main frame and inclined downwardly of said main frame toward the ground, a pair of feeder frames vertically pivoted on said main frame at opposite sides thereof, a boom arm transversely pivoted to each feeder frame and extending in advance thereof, a separate side cutting mine head transversely pivoted to each boom arm and extending in advance thereof, cylinder and piston means connected between said main frame and said feeder frames for feeding said feeder frames toward each other about the vertical pivotal axes of connection of said feeder frames to said main frame, second cylinder and piston means connected between said feeder frames and said boom arms for vertically moving said boom arms about their axes of connection to said feeder frames, third cylinder and piston means connected between said boom arms and mining heads for vertically moving said mining heads about their axes of connection to said boom arms, two shoes slidably mounted on the forward end of said apron for movement therealong, individual conveyors extending along said apron and main frame and having outer flexible side walls extending rearwardly from said shoes along said apron, said conveyors changing their directions of travel to move upwardly along said apron about said shoes, and universal linkage connections between said boom arms and side walls accommodating vertical adjustment of said boom arms with respect to said conveyors and moving said conveyors toward each other across the forward end of said apron to gather the mined material onto said apron in all positions of vertical adjustment of said boom arms and mining heads with respect to said conveyors, upon corresponding movement of said boom arms and mining heads toward each other to effect a mining operation.

3. In a continuous mining machine, a mobile main frame, an apron extending forwardly of the forward end of said main frame and inclined downwardly from said main frame toward the ground, two side by side independently driven conveyors extending along said main frame and apron and having outer flexible side walls extending upwardly along said apron, a separate shoe for each conveyor guided on said apron for movement across the forward end thereof, said shoes having said conveyors trained

thereabout for upward movement along the upper surface of said apron for conveying material therealong, two laterally spaced feeder frames vertically pivoted on said main frame at opposite sides of said conveyor, a boom arm transversely pivoted to each feeder frame and extending in advance thereof, a side cutting mining head transversely pivoted to each boom arm and extending in advance thereof, individual motors for driving said mining heads, hydraulic cylinder and piston means connected between said main frame and feeder frames for moving said feeder frames and mining heads toward and from each other, second hydraulic cylinder and piston means connected between said feeder frames and boom arms for vertically moving said boom arms about their axes of connection to said feeder frames, third hydraulic cylinder and piston means pivotally connected between said boom arms and mining heads for vertically moving said mining heads about their axes of connection to said boom arms, cuttings deflector means extending along the outer sides of said mining heads and mounted for vertical movement with said mining heads, and universal linkage connections between said boom arms and said flexible side walls accommodating vertical adjustment of said boom arms with respect to said flexible side walls and moving said side walls and conveyors toward each other across the forward end of said apron as said mining heads are moved toward each other to effect a mining operation.

4. A conveyor gathering system particularly adapted for continuous mining machines and the like comprising, a mobile main frame, a laterally swingable boom extending rearwardly of the rear end of said main frame, an apron extending forwardly of the forward end of said main frame and inclined downwardly from said main frame toward the ground, a pair of shoes guided for movement along the forward end of said apron, flexible side walls extending from the outer sides of said shoes upwardly along said apron in converging relation with each other and spaced apart at the upper end of said apron, a pair of orbitally guided side by side laterally flexible conveyors, each conveyor being trained about an associated shoe upwardly along said apron along the inside of an associated flexible side wall and rearwardly along said main frame and changing its direction about the rear end portion of said boom, means on said boom for driving said conveyors independently of each other, and means connected with the forward end portions of said flexible side walls for moving said flexible side walls, shoes and the forward end portions of said conveyors across the forward end of said apron toward each other to gather loose material upon operation of said conveyors to travel upwardly along said apron.

5. A conveyor gathering system in accordance with claim 4, in which independent takeups are provided on said boom for maintaining tension on said conveyors upon lateral movement thereof.

6. A conveyor gathering system in accordance with claim 4, in which independent takeups are provided for

said conveyors at the rear end of said boom comprising, an independent cam follower for each conveyor, operable to take up or let off tension on the associated conveyor in accordance with the position of said boom with respect to the center line of said main frame, and in which cam means coact with said cam followers for independently controlling the positions of said followers and maintaining the tension of said chains uniform in all positions of said boom with respect to said main frame.

7. A gathering conveyor system comprising, a main frame, an apron extending forwardly of said main frame and inclined downwardly from said main frame toward the ground, a pair of orbitally movable laterally flexible endless chain and flight conveyors guided for movement along said apron and main frame, said apron having an arcuate forward end portion having a pair of shoes mounted thereon for slidable movement therealong, each shoe having a direction changing sprocket journaled thereon and forming a direction changing member for an associated chain and flight conveyor, flexible side walls extending along opposite sides of said apron and having connection with the outer sides of said shoes and forming outer flexible side walls for the portions of said conveyors traveling upwardly along said apron, power means for driving said conveyors to turn about said sprockets and move upwardly along said apron, and other power means for moving said side walls, shoes and the forward end portions of said apron inwardly along the forward end portion of said apron toward each other during travel of said endless chains upwardly along said apron, to effect a gathering operation.

8. A conveyor gathering system in accordance with claim 7, in which independent motors are provided for driving said conveyors and independent takeups are provided for said conveyors maintaining said shoes in slidable engagement with the forward end portions of said apron, and in which the forward end portion of said apron is of a generally arcuate form so contoured as to maintain uniform tensions on said conveyors in all positions of lateral movement of said conveyors across the forward end of said apron in cooperation with said takeups.

References Cited by the Examiner

UNITED STATES PATENTS

1,317,812	10/19	Noble.	
1,550,087	8/25	McNeil.	
1,832,965	11/31	Christopher	198—11
2,834,588	5/58	Boesewetter.	
2,967,701	1/61	Wilcox.	
2,973,949	3/61	Densmore.	
2,979,319	4/61	Anderson.	
3,047,279	7/62	Bergmann.	

BENJAMIN HERSH, *Primary Examiner.*

PHILIP ARNOLD, *Examiner.*

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,190,697 June 22, 1965

Joseph Gonski

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 1, line 41, for "cuting" read -- cutting --; column 2, line 40, for "frace" read -- face --; column 7, line 48, after "front" insert -- end --; column 10, line 28, for "apron" read -- conveyors --; line 36, for "portions" read -- portion --.

Signed and sealed this 18th day of January 1966.

(SEAL)

Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents