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SIDEWALL MINER WITH VERTICALLY SWINGABLE ROTARY CUTTER
AND T-SHAPED CONVEYOR
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W. MENNEKES
LITH. VERTICALLY

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FIG. 2

FIG. 3

INVENTOR:
Werner Mennekes
BY *Burgess, Drake & Sprung*
his ATTORNEYS

SIDEWALL MINER WITH VERTICALLY SWING- ABLE ROTARY CUTTER AND T-SHAPED CON- VEYOR

Werner Mennekes, Wethmar, near Lunen, Westphalia, Germany, assignor to Gewerkschaft Eisenhütte West-
falia, Wethmar, near Lunen, Germany, a corporation
of Germany

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The present invention relates to a mining arrange-
ment for the preliminary removal of mineral in the ad-
vancement along a mine stretch, with adjoining dam or
machine depot, and more particularly to a mining con-
veyor having a T-shaped configuration and a rotary cut-
ting means movable back and forth along the conveyor,
for the extraction of mineral from a mine face adjacent
the wings of the T-shaped conveyor, so as to achieve the
excavation of a corridor, if desired, having a width cor-
responding to that of the conveyor for placement thereat
of mining equipment used in the normal long wall mining
operation.

The very appreciable advance in cutting minerals, such
as coal, as it is achieved with the employment of a mining
planer or other automatic or independent mineral-win-
ning or coal-extracting device, renders it necessary also
to advance along the mineral-cutting stretches with ap-
propriately high speed. This applies not only with respect
to coal stretches, for example, as such, but also for a dam
which may be contiguous with the coal stretch or a ma-
chine depot or machine stall which may be contiguous as
well with such stretch. As a rule, preliminary removal
of minerals, such as coal, has been done manually up to
the present, although in the normal long wall mining ex-
traction, once the preliminary coal has been removed to
provide the required working space, mining planers are
employed to extract mineral from the mine face which
has become exposed by the preliminary workings. While
certain proposals have already been made with respect to
automatic, preliminary mining apparatus, especially with
respect to the preliminary removal of coal, up to the
present no such automatic preliminary apparatus has be-
come usable in practice, because of the comparatively
complicated structure thereof and the attendant limita-
tions in using the same.

It is an object of the present invention to overcome
the foregoing drawbacks and to provide a mining arrange-
ment for the preliminary removal of mineral in the ad-
vancement along a mine stretch, with sufficient area being
excavated to provide working space for the normal long
wall mining operation as well as space for the machinery
necessary to the long wall methods of extracting mineral.

It is another object of the present invention to provide
a mining arrangement of the foregoing type which is
simple in construction, durable in use, inexpensive to pro-
duct, easy to operate, and mobile in nature.

It is still another object of the present invention to
provide for such mining arrangement a rotary cutting
means which may be conducted back and forth longi-
tudinally along the mine face being worked in extractive
engagement therewith for the removal of mineral from
such mine face.

It is a further object of the invention to provide in
a mining arrangement of the foregoing type a mining
conveyor adapted to extend longitudinally along the mine
face to convey away from the mine site mineral ex-
tracted from the mine face.

It is a still further object of the present invention to
provide a combination of a T-shaped conveyor with a
rotary cutting means of the foregoing type, such cutting
means being mounted for travel along the wings of the

T-shaped conveyor for extractive engagement with the
mine face, whereby mineral extracted may be conveyed
away from the mine site from the wings of the conveyor
to the rearwardly extending stem portion thereof.

It is another object of the present invention to provide
a combination of the foregoing type in which the rotary
cutting means is pivotably mounted so that the rotating
cutting means will be displaced in a vertical path to en-
gage not only the lower portion of the mine face directly
therebefore the same, but also the upper portion of the
mine face situated upwardly and forwardly thereof.

It is still another object of the present invention to pro-
vide traction cable means on the T-shaped conveyor to
cause mineral placed thereon at the mine face to be con-
veyed medially toward the stem portion of the T-shaped
conveyor and thence rearwardly along such stem portion.

It is still another object of the present invention to pro-
vide traction cable means of the foregoing type in which
scraper bars are provided thereon for conducting the
mineral on the conveyor in the desired direction, such
scraper bars being situated on the traction cable means in
a manner allowing the traction cable means and scraper
bars to execute right angle turns in their path of move-
ment without disturbing the conveying disposition thereof
with respect to the coal or other mineral being removed
from the mine site.

Other and further objects of the present invention will
become apparent from a study of the within specification
and accompanying drawings.

It has been found in accordance with the present in-
vention that a rotary cutting means adapted to be con-
ducted back and forth longitudinally along a mine face
in extractive engagement therewith for the removal of
mineral from such mine face may be provided, which
comprises a longitudinally movable sled, a motor
mounted on the sled, and a cutting wheel operatively
connected to the motor for rotation about an axis sub-
stantially parallel to the path of longitudinal movement
of the sled. Such cutting wheel is provided advanta-
geously with cutting tools thereon, such that the outward
peripheral path of the cutting tools extends beyond the
sled for extractive engagement of the cutting tool trans-
versely and longitudinally with a mine face adjacent the
longitudinal path of movement of the sled. Preferably
a pair of cutting wheels is provided attached to the motor,
and the motor is operatively positioned on the sled and
operatively connected to the cutting wheel or cutting
wheels, such that the cutting wheel or wheels will pivot
about a horizontal axis extending more or less parallel
to the mine face to provide a vertical sweep of the cut-
ting means for extracting mineral to a greater height from
the mine face in one pass of the sled than was possible
heretofore.

Also, the present invention contemplates a mining con-
veyor adapted to extend longitudinally along a mine face
to convey away from the mine site mineral extracted
from the mine face, with the conveyor comprising a T-
shaped conveyor including a pair of longitudinal wing
portions adapted to extend along a mine face, and a
transverse stem portion connected to the wing portions
intermediate the outer ends of the wing portions, endless
traction cable means, having forward and return sec-
tions, extending longitudinally along the wing portions
between the outer ends thereof and the adjacent end of
the stem portion and continuing transversely along the
stem portion to the remote end of such stem portion,
and spaced apart scraper elements or bars secured to the
cable means for conveying mineral loaded onto the wing
portions to the remote end of the stem portion during
conveying movement of the cable means in a direction
toward said remote end. Each wing portion is prefer-
ably provided with a separate forward and return chain

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to cause the movement of the material on the conveyor toward the medial portion of the conveyor, and then rearwardly along the stem.

In accordance with the present invention, a mining arrangement is contemplated which comprises, in combination; a T-shaped mining conveyor including a pair of longitudinal wing portions adapted to extend longitudinally along a mine face and a transverse stem portion connected to the wing portions intermediate the outer ends of such wing portions, whereby to convey away from the mine site mineral extracted from the mine face, said conveyor further including endless traction cable means, having forward and return sections, extending longitudinally along the wing portions between the outer ends thereof and the adjacent end of the stem portion and continuing transversely along the stem portion rearwardly to the remote end of such stem portion, and spaced apart scraper elements secured to the cable means for conveying mineral loaded onto the wing portions to the remote end of the stem portion during conveying movement of the cable means in a direction toward the remote end; and a rotary cutting means including a sled mounted on the conveyor above the cable means and scraper elements for longitudinal movement back and forth along the wing portions, a motor mounted on the sled, and a cutting wheel operatively connected to the motor for rotation about an axis substantially parallel to the path of longitudinal movement of the sled, the wheel having cutting tools thereon, the outermost peripheral path of the tools extending beyond the sled for extractive engagement of such tools with a mine face adjacent the wing portions to cause removal of mineral from the mine face.

In accordance with a preferred embodiment of the present invention, the rotary cutting means is provided with radially outward and laterally outward cutting tools peripherally on the wheel in question to permit extractive engagement of such cutting tools transversely and longitudinally with the mine face. In accordance with another preferred embodiment of the invention, the scraper elements are spaced apart on one corresponding cable means serving one wing portion and a corresponding lateral side portion of the stem portion of the conveyor in staggered relation with respect to the scraper elements on the other cable means serving the other wing portion, whereby to permit the scraper elements of both cable means to travel in an unhindered manner along the stem portion in parallel staggered relation. In accordance with a preferred embodiment of the combination construction of the rotary cutting means and the T-shaped conveyor, the wing side wall portions extending longitudinally in parallel relation to the mine face in question, are provided with corresponding parallel tracks at the upper ends thereof to accommodate the sled which is mounted thereon for longitudinal travel back and forth such that the cutting wheel extends therepast a sufficient distance to permit extractive engagement with the mine face being worked. In accordance with a still further preferred embodiment of the invention, the side of the wing portions remote from the stem portion is provided with a ramp having a surface upwardly inclined toward the wing portions and the path of the cutting tools in the lowermost pivotal position of movement of the cutting wheel, when pivotally mounted on the sled, is spaced slightly from the inclined surface of the ramp, whereby when said wheel or wheels will rotate in a direction such that the upper side of the wheel or wheels will move outwardly away from the conveyor and the under side of the wheel or wheels will move inwardly toward the ramp, the extracted mineral, such as coal, will be conducted directly over the ramp and onto the conveyor for efficient removal from the mine site.

In the accompanying drawings:

FIG. 1 is a schematic plan view of one embodiment of

the invention illustrating a T-shaped mining conveyor having a rotary cutting means mounted for longitudinal movement therealong and showing the positional relationship between the mining arrangement in combination and the mine face being worked,

FIG. 2 is a schematic view of one longitudinal end of the mining arrangement illustrating the sweep of a pivotable cutting wheel, of slightly different construction from that shown in FIG. 1, and

FIG. 3 shows a schematic enlarged partial view of an alternate embodiment of the traction cable means and scraper elements used to conduct mineral material along the conveyor in the desired direction despite changes in the linear disposition of the cable means and the conveying path.

Referring to the drawing, in FIGS. 1 and 2, a longitudinally extending mine face 10 is shown which is to be extracted to provide a corridor 11 extending transversely to the mine face 10, whereby the excavation of the corridor 11 will provide sufficient room to position the normal mining conveyor and mining planer for long wall mining operations and the machine depot and/or dam needed in connection with long wall mining operations. The corridor 11 is formed with the transverse walls 12 and 13 providing a width of the corridor consistent with the length of the T-shaped mining conveyor 14 disposed thereat. Once the corridor 11 is excavated, the normal mining planer and mining conveyor may be positioned in the corridor parallel to the mine face 12 or 13 for long wall mining operations at mine face 12 or 13. Of course, as the mining apparatus of the invention is advanced along the excavated corridor 11 suitable pit props or bracing beams will be extended between the mine floor and mine ceiling to prevent the cave-in of the mine roof robbed of its under support as the mine face 10 is progressively extracted. This may be accomplished in accordance with the present invention by the use of a rotary cutting means 15 which is advantageously mounted for longitudinal movement along the top of the conveyor 14. Obviously, since the space on either end of the conveyor 14 is limited by the adjacent walls 12 and 13 of corridor 11, the extracted mineral must be conducted rearwardly rather than longitudinally along the mine face past one particular end of the mine face being worked.

The T-shaped mining conveyor 14 is provided with the transversely extending stem portion 16 and the longitudinally outwardly extending wing portions 17 and 18. As the rotary cutting means 15 moves longitudinally along mine face 10 in a direction toward mine face 13, a new face portion 19 is exposed, which in the next step of operation, i.e. after cutting means 15 has reached the opposite end of the conveyor, becomes the mine face 10. In order to advance the mining apparatus of the invention toward such new face 19 for the next extractive sweep, an urging means of the conventional type may be used, including the piston cylinder means 20, 21 supported rearwardly by the bracing shoe 24 to which the piston cylinder means is articulately connected by pin 23. Bracing shoe 24 in turn is pivotally connected to a bracing prop 25, such that upon extension into engagement with the mine roof 27, the shoe 24 will be pressed into engagement with the mine floor 26 to prevent rearward displacement of the piston cylinder means 20, 21. The piston cylinder means must be operated to advance the conveyor 14 a sufficient distance to provide a trough 22 between the front edge of the conveyor and the mine face 10, so that sufficient room will be present to permit the cutting wheel to carry out its necessary function. While the bracing props 25 have been omitted from FIG. 1 in the interests of clarity of illustration, these pit props are shown in FIG. 2 as are the mine roof and mine floor in question. The forward end of the cylinder 21 is articulately connected by means of pin 28 with the lug 29 connected to the conveyor. Thus, as the cylinder 21 is advanced with respect to the piston 20, the conveyor

will be urged in the desired direction, whereupon the bracing prop 25 may be released from engagement with the mine ceiling 27 and advanced by retracting the piston 20 within the cylinder 21 in the known way, after which the bracing prop 25 may again be placed in engagement with the mine ceiling for repeating the cycle once the next exposed layer 19 has been produced along the extent of mine face 10.

The T-shaped conveyor 14 is provided with a central plate 30 in the embodiment shown which interconnects the vertical side walls 31 and 32 (see FIG. 2) such that the center plate 30 is spaced from the mine floor 26 sufficiently to permit the traction cable means 33 and 34, together with the appropriate spaced apart scraper elements 35 to pass along the under side of center plate 30 without hinderance from the mine floor 26. While the return sections for the traction cable means 33 and 34 are not shown, these would pass on the under side of plate 30 in the same way as the traction cable means and scraper elements are shown on the upper side of plate 30, albeit in inverted disposition. The forward chain portions of the cable means 33 and 34 are mounted so as to move in the wings 17 and 18 in medial direction toward one another and upon reaching the stem portion 16, to turn approximately 90° in direction and continue to move along the stem center plate 30' between the stem side walls 31' and 32' rearwardly to the remote end of stem portion 16, with respect to the wings 17 and 18, for discharge from the downwardly extending chute 36 onto another receiving conveyor 37 or other receiving means for recovering the extracted mineral, such as coal, from the mine site.

In order to achieve the smooth operation of the traction cable means, the outward ends of the wing portions 17, 18 are provided respectively with the horizontally disposed rotatable shafts 38 and 39, which in the embodiment shown are provided with suitable sprocket wheels centrally positioned to maintain the drive cable means 33 and 34 in the middle of the conveying path along plate 30. On the other hand, the rearward end of the stem portion 16 is provided with the horizontally positioned rotatable shaft 40 provided with a pair of spaced apart parallel sprocket wheels to engage operatively the corresponding portions of traction cable means 33 and 34. The traction cable means may be driven by means of the motor 41 operatively coupled with the shaft 40. It will be appreciated that at the shafts 38, 39, and 40, there is a transition of the drive cable means in question from the return section passing along the under side of plate 30 and 30' to the forward section passing along the upper side of plate 30 and plate 30'. Specifically, the return section of traction cable means 33 becomes the forward section thereof at the shaft 38, and the forward section becomes the return section at shaft 40, and the return section of traction cable means 34 becomes the forward section at shaft 39 while the forward section thereof becomes the return section at shaft 40. Operatively, the scraper elements 35 will carry the mineral deposited upon plate 30 medially from the outward ends of wing portions 17 and 18, and as the cable means turn from the respective wing portion to the respective lateral side of the stem portion, the scraper bars will continue to conduct the extracted mineral in the desired manner to the discharge chute 36. It will be appreciated from FIG. 2 that the stem portion 16 is disposed at an angle with respect to the vertical to raise the remote end thereof carrying the discharge chute 36 above a further conveyor, such as that shown schematically at 37 in FIG. 2 to allow easy transfer of the mineral from one conveying means to another.

If desired, in accordance with a preferred embodiment of the invention, the wing portions 17 and 18 may be provided as separate conveyor sections 17' and 18' on either side of the stem portion 16, with the corresponding sections being articulately connected with one another to

permit both horizontal and vertical displacement with respect to one another. The provision for articulately connecting conveyor sections is well known. However, in the case of the medial section of the conveyor, this will contain the wing portions 17' and 18' connected with one another and suitably connected at the rearward longitudinal side thereof with the stem portion immediately thereat. If desired, the medial section containing the wing portions 17' and 18' may be contiguous and even integrally connected with the stem portion 16. By providing the conveyor sections in an articulately interconnected manner, the mining conveyor will readily adapt to unevenness in the mine floor and unevenness in the mine face, so that the cutting means 15 may travel along the conveyor in a desired manner for efficient extraction of mineral from the mine face.

While in the embodiment shown in FIGS. 1 and 2, it is preferred to provide a separate chain as the cable means 33 on the one hand and as the cable means 34 on the other hand, it will be appreciated that a single cable means may be provided for the entire conveyor arrangement such that the forward section of cable means 33 at shaft 40 becomes the return section of cable means 34, while the forward section of cable means 34 at shaft 40 becomes the return section of cable means 33. Naturally, as the artisan will appreciate, suitable guiding sprocket wheels and/or other means may be provided to keep the various chain portions from entangling with one another and to keep the various chain sections in the desired linear disposition during their passage along straight and curved parts of the path of movement of the cable means. The primary purpose of the cable means, of course, is to convey the extracted mineral deposited upon the conveyor in a medial direction towards the forward end of the stem portion and thereafter in a rearward direction along the transverse stem portion to the discharge chute 36.

Advantageously, the forward longitudinal side of the conveyor is provided with a ramp 42 having a surface extending in an inclined direction from the mine floor 26 up to the top portion of the adjacent side wall 32 (see FIG. 2). The ramp 42 determines the width of the trough 22 between the conveyor and the mine face 10 being worked. At the top portion of the ramp 42 a forward track 43 is provided which extends longitudinally along the top of side wall 32 of the conveyor, and in the same way a track 45 connected to the bounce plate 44 is provided along the rear longitudinal side of the conveyor, the bounce plate 44 in turn being connected with the side wall 31. By reason of the bounce plate 44, the track 45 is positioned higher on the conveyor than the track 43. Moreover, the bounce plate 44 serves to prevent material deposited on the conveyor from overflowing at the rear side thereof, or material rearwardly flung by the rotary cutting means 15 from overshooting the conveyor.

The rotary cutting means takes the form of a sled 46 having slides or rollers 47 and 48 (see FIG. 2) suitably received in tracks 43 and 45 to permit the cutting means 15 to move longitudinally back and forth along the conveyor wing portions in the desired manner. For this purpose, a chain 49 (see FIG. 2) passing along the rear portion of track 43 may be provided which is connected at its ends to the corresponding sides of the sled 46 and which is mounted suitably at the ends of the wing portions to achieve the movement of the sled in the desired direction. The actual drive means for the drive chain 49 are omitted from the drawing, but such means are well known, and various constructions of the type in question are illustrated in U.S. Patent 2,691,514, for example. In accordance with an alternate embodiment of the invention, the cutting means 15 may be a self-propelling unit, utilizing for this purpose power from the drive motor of the rotary cutting means on the sled 46. Accordingly, a suitable coupling may be extended to the rollers 47 and 48 to propel the sled 46 along the tracks 43 and 45.

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As may be appreciated from FIG. 2, the lower edge 50 of the sled 46 is elevated sufficiently from the center plate 30 to avoid any obstruction in the movement of sled 46 along the conveyor, as for example where large pieces of coal or other mineral are disposed on plate 30 for conveyance therealong.

With specific reference to the power means for the rotary cutting means 15 of the invention, a motor 51 is provided which may be an electrical motor, a pneumatic motor, etc., a transmission 52 being attached thereto which is operatively coupled with a horizontal shaft 53 extending in the longitudinal direction of the conveyor. Shaft 53 is operatively coupled with the transmission 52 of motor 51 such that the cutting wheels 54 and 55 disposed at the outer ends thereof will rotate in a desired direction in vertical planes transverse to the mine face 10. In FIG. 1, the wheels 54 and 55 are provided with radial cutting tools 56 and lateral cutting tools 57 outwardly diverging from both sides of the radial tools 56 whereby to extractively engage not only the immediate forward portion of the mine face being worked but also the lateral portion thereof. In this manner, as the sled 46 moves along the conveyor 14, the cutting wheels will extractively engage the mine face longitudinally and transversely to excavate a new layer of mineral from mine face 10. As aforesaid, motor 51 may be operatively connected as well with the rollers 47 and 48 to drive the same and in turn move the sled along the tracks 43 and 45. By providing cogs on the rollers and appropriate indentations along the tracks 43 and 45, positive forward displacement along the conveyor of the cutting means will be assured, while such means have not been illustrated herein, the same are notoriously old as the artisan will appreciate.

In accordance with a particularly advantageous embodiment of the present invention, the motor 51 is mounted on a bracket 58 pivoted at pins 59 and 60 to sled 46 so as to execute displacement in a vertical plane about the common axis of pins 59 and 60. To achieve controlled pivotal displacement of motor 51 in vertical direction, the pneumatic or hydraulic piston-cylinder arrangements 61, 61 are provided which are connected at their lower ends to sled 46 and at their upper ends to the bracket 58 (see FIG. 2).

In the rotary cutting means embodiment of FIG. 2, it will be seen that the cutting wheels 55' are provided with cutting arms radially outwardly extending which carry at their outer ends the radial pikes 56' and the lateral pikes 57' which operate similarly to the radial and lateral cutting tools 56 and 57 shown in FIG. 1.

In FIG. 2, the upward pivotal position of the cutting means is shown in phantom and it will be clear that as the mining progresses, by rotating the cutting wheels in counterclockwise direction (as seen in FIG. 2), the extracted mineral, such as coal, will be swept along the trough 22 and up the ramp 42 and thus be flung onto the top of conveyor 14 in the desired manner. With respect to the extraction of the upper portion of the seam, i.e. the roof coal below the mine roof 27, the loosened coal will have a downward trajectory, some being flung onto the conveyor and some remaining in the trough 22. Accordingly, as the cutting means 15 pivots downwardly, that portion of the coal or other mineral situated in the trough 22 will be taken up and conducted rearwardly onto the conveyor due to the counterclockwise rotation of the cutting wheels.

It will be appreciated that while two cutting wheels have been shown in the preferred embodiment of FIG. 1, the operation may be carried out as well with just one cutting wheel, so long as the lateral cutting tools at the periphery thereof extend in both lateral directions for attacking the coal both transversely and longitudinally of the mine face. The cutting wheel in question which is advantageously pivoted on the sled will execute an arc in vertical direction permitting a full sweep of the mine

face in vertical direction as well as in horizontal direction, so that the longitudinal extraction of mineral from mine face 10 to expose the new layer 19 will be achieved in an effective short period of time rather than in a cumbersome manner as was carried out manually in the past.

In accordance with the embodiment shown in FIG. 3, the traction cable means is provided in the form of a chain having the vertical links 71 and the horizontal links 70 with the scraper elements being unilaterally situated on the cable means. Thus, the unilateral scraper element 72 is provided at one side of the corresponding horizontal link 70, pivoted at pin 73 to the clamp 74. Clamp 74 engages the upper side and under side of the longitudinal portions of the horizontal chain link 70 such that the scraper element 72 cannot rotate in a vertical plane transverse to the direction of the cable means. Nevertheless, by reason of the pin 73 which is situated in the vertical direction, scraper element 72 may be displaced in a horizontal plane about the vertical axis of pivot pin 73. In this manner, the scraper element 74 may only be displaced in a horizontal plane but not in a vertical plane with respect to the cable means. Scraper element 72 is provided with a transversely upstanding flange 75 to assure that the coal or other mineral being conducted along the conveyor will not overflow or be lost to the particular scraper element. If desired, of course, a similar flange may be downwardly extended from scraper element 72 in the event the scraper element does not slide along the conveyor plate in direct abutment therewith. Inasmuch as the scraper element 72 may execute pivotal movements about the vertical axis of pin 73, a second auxiliary scraper element 76 must be coupled therewith to prevent normally the horizontal displacement of the scraper element 72, yet permit such pivotal movement with respect to the appropriate horizontal link 70 to which the same is connected, where the chain passes around a curve. The scraper element 76 is similarly connected about a vertical pivot pin 77 to a clamp 78 which in turn is connected to a horizontal link 70 in the same manner as clamp 74. The scraper element 72 is provided with an eye 79 extending toward the scraper element 76, and in the same way the scraper element 76 is provided with an eye 80 extending toward the scraper element 72, so that a locking disc 81 may interconnect the scraper elements 72 and 76 at eyes 79 and 80. The lock 81 is provided with arms 82 which extend through the eyes 79 and 80 and which may pivot on the locking disc 81 to open the same for disengaging the locking disc with the scraper elements. The scraper elements 72 and 76 are preferably spaced apart one chain length in vertical direction, but, of course, they may be spaced apart more than one chain length if desired.

A further alternate embodiment of the scraper elements of the invention is also seen in FIG. 3. In accordance with this alternate embodiment, the unilaterally situated scraper elements 83 and 87 are provided such that the same are pivotally connected by means of the vertical pivot pins 85 and 88, respectively, to the unilaterally extending clamps 86 and 89, which correspond to the clamps 74 and 78. These clamps are similarly fixedly attached to horizontally extending chain lengths 70 to prevent movement of the scraper elements 83 and 87 in a vertical direction yet permitting movement about the vertical axes of the pivot pins 85 and 88. In this case the scraper element 83 is similarly provided with an upstanding flange extension 84. In place of the locking disc 81, the scraper elements 83 and 87 are provided with the loops 90 and 91, respectively, which linkably interconnect the two scraper elements in the desired manner. As will be appreciated from the curved disposition of the chain in question, the vertical pins 85 and 88 permit pivotal displacement in the horizontal direction of the scraper elements not only with respect to one another but also with respect to the cable means to which the same are unilaterally

connected. The same effect is achieved with the scraper bar or scraper element arrangement utilizing the lock disc 81 as the scraper bar or scraper element arrangement utilizing the loops 90 and 91. The use of unilateral scraper elements may be made on mining conveyors of the instant type, such that the forward section of the chain passes along one longitudinal side of the conveyor rather than along the middle of the conveyor path. Thus, an over-all sweep of the conveyor path may be made with the scraper elements in question, and assuming that the chain is traveling in the direction shown by the arrow 92 in FIG. 3, the rearward scraper elements 76 and 87 need not be of the same size as the forward scraper elements 72 and 83 as the primary purpose of the scraper elements 76 and 87 is to reinforce the corresponding scraper element thereof against rearward pivoting except when the chain passes around a turn. The return section of the chain in accordance with this embodiment may travel underneath the conveyor in the same way as in connection with the embodiment of FIG. 1, although, if desired, the return chain may be caused to return along the conveyor path on the opposite longitudinal side of the conveyor from the forward section, i.e. on the upper side of the central plate 30. While it is important for unhindered operation in connection with the embodiment of FIG. 1 to stagger the positioning of the scraper elements 35, due to the unilateral positioning of the scraper elements 72 and/or 83, such staggered relationship is not entirely necessary, especially where the medially extending end of the unilateral scraper elements, i.e. the free end thereof only reaches the middle of the conveyor path. In this way, adjacent free ends of the unilateral scraper elements will at most abut one another and travel adjacent thereto along the assigned path. To execute the turns required for moving from the longitudinal wing portions to the transverse stem portion, various cog wheels may be utilized, or sprocket wheels or other known guiding means as the artisan will appreciate.

As regards the unilaterally disposed scraper elements, the locking disc or linking loops should be disposed at a longitudinal point spaced from the chain links, and this may be accomplished near the free ends of the two scraper elements, as for example where they have the same length, or for example, at the outer end of the smaller rearwardly positioned scraper element and a corresponding point on the main scraper element, where such main scraper element extends laterally beyond the end of the rearward scraper element.

As may be appreciated from FIG. 1, the rear track 45 extends over the medial portion of the plate 30 and the initial forward portion of the transverse plate 30' thereof to permit the sled 46 to pass from one wing portion to the other. Understandably, the appropriate area of the bounce plate 44 normally positioned below the rear track 45 at this juncture of the plates 30 and 30' will be omitted and the track 45 carried by the portions of plate 44 on either side of the stem portion 16. In this way, the coal or other mineral and the traction cable means 33 and 34 will be able to pass in an unobstructed way in the resulting slot defined in bounce plate 44 between the upper surface of plates 30 and 30', on the one hand, and the lower surface of track 45, on the other hand.

One particular advantage of the embodiment of unilateral scraper elements in FIG. 3 is that an unobstructed guidance and movement of the cable means may be achieved in negotiating the turn from the longitudinal direction of the wing portions to the transverse direction of the stem portion. Also, the reversing of the direction from the forward chain section to the return chain section may be equally achieved without obstruction, whether this is carried out with the return chain portion being conducted on the upper side of the plates 30 and 30' or on the under side thereof as in the case of the embodiment of FIG. 1. By suitably providing horizontally directed or vertically directed sprocket arrangements, the movement

of the traction chain or cable will be achieved in a positive manner and with the scraper elements remaining approximately vertical to the plates 30 and 30' and transversely across the width of the conveyor path being served thereby. Of course, depending upon the dimensions of the conveyor and of the scraper elements, and especially in the case of the bilateral scraper elements of FIG. 1, the scraper elements on the cable means at each side of the conveyor will be spaced apart along the respective cable means in a staggered relationship with respect to the scraper elements on the other cable means for convenient intermeshing movement of the two cable means as they pass towards the discharge end of stem portion. This will ensure that all of the mineral material being conveyed will reach the discharge end in an even flow.

It will be understood that the foregoing specification and drawing have been set forth for the purposes of illustration and not limitation, and that various modifications may be made without departing from the spirit and scope of the present invention which is to be limited only by the scope of the appended claims.

What is claimed is:

1. Rotary cutting means adapted to be conducted back and forth longitudinally along a mine face in extractive engagement therewith for the removal of mineral from the mine face, which comprises a longitudinally movable sled, a motor mounted on the sled, and a cutting wheel operatively connected to said motor for rotation about an axis substantially parallel to the path of longitudinal movement of said sled, said wheel having cutting tools thereon peripherally extending radially outwardly and laterally outwardly at an angle to the radial direction, the outward peripheral path of said cutting tools extending beyond said sled for extractive engagement of the cutting tools transversely and longitudinally with a mine face adjacent the longitudinal path of movement of said sled.

2. Rotary cutting means adapted to be conducted back and forth longitudinally along a mine face in extractive engagement therewith for the removal of mineral from the mine face, which comprises a sled having a longitudinal axis and a substantially longitudinally extending forward edge, said sled being movable longitudinally back and forth along a mine face with said forward edge adjacent said mine face, a motor mounted on said sled and having a drive shaft extending in a direction substantially transverse to the longitudinal axis of said sled, a wheel shaft extending in a direction substantially parallel to said longitudinal axis and outwardly spaced from said forward edge, said wheel shaft being operatively interconnected with said drive shaft for rotation of such wheel shaft about the axis of the wheel shaft, and a cutting wheel secured to said shaft for rotation therewith, said wheel on said wheel shaft being situated in a plane substantially transverse to said longitudinal axis and having cutting tools thereon peripherally extending radially outwardly and cutting tools thereon peripherally extending laterally outwardly at an angle to the radial direction for extractive engagement of such cutting tools transversely and longitudinally with the mine face.

3. Rotary cutting means according to claim 2 wherein said wheel shaft is provided with a cutting wheel at each end thereof for rotation therewith, each said wheel being situated in a plane substantially transverse to said longitudinal axis, and each wheel being provided peripherally with said radially and laterally outward cutting tools.

4. Rotary cutting means according to claim 2 wherein said motor is mounted pivotably on said sled for pivoting about an axis parallel to said longitudinal axis, such that said drive shaft is displaceable in a vertical plane transverse to said longitudinal axis, whereby said wheel is in turn displaceable vertically in an arc in said plane substantially transverse to said longitudinal axis.

5. Mining conveyor adapted to extend longitudinally along a mine face to convey away from the mine site mineral extracted from the mine face, which comprises a

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T-shaped conveyor including a pair of longitudinal wing portions adapted to extend along a mine face and a transverse stem portion connected to said wing portions intermediate the outer ends of said wing portions, endless traction cable means, having forward and return sections, extending longitudinally along said wing portions between the outer ends thereof and the adjacent end of said stem portion and continuing uninterruptedly transversely along the stem portion to the remote end of said stem portion, and spaced apart scraper elements secured to said cable means for conveying mineral loaded onto the wing portions continuously and uninterruptedly to the remote end of said stem portion during conveying movement of said cable means in a direction toward said remote end.

6. Mining conveyor according to claim 5 wherein each wing portion is provided with a pair of substantially parallel vertical wing side walls and a central substantially horizontal wing plate interconnecting said wing side walls intermediate their height, and said stem portion is provided with a corresponding pair of vertical stem side walls and a central substantially horizontal stem plate interconnecting said stem side walls, with said stem plate forming an intermediate transverse continuation of the medial ends of said wing plates and said stem walls forming transverse continuations substantially of the adjacent wing side wall portions, a separate cable means being provided for each wing portion and a corresponding lateral side of said stem portion, each cable means having the forward section thereof disposed along the upper surface of the corresponding wing plate and in turn along the upper surface of said stem plate at one lateral side thereof and the return section thereof disposed along the under surface of such wing plate and in turn along the under surface of said stem plate at the same lateral side thereof, the forward sections of said cable means being operated to move in a direction toward one another in said wing portions and parallel to one another in a common direction toward said remote end in said stem portion and the return sections being operated correspondingly to move in a direction away from one another in said wing portions and parallel to one another in a common direction away from said remote end in said stem portion.

7. Mining conveyor according to claim 6 wherein the outer ends of said wing portions are provided with corresponding wing sprocket wheels to engage operatively the cable means to change the direction thereof in the transition from the return sections respectively to the forward sections, and the remote end of said stem portion is provided with a pair of parallel stem sprocket wheels to engage operatively the corresponding parallel cable means to change the direction thereof in the transition from the forward sections respectively to the return sections.

8. Mining conveyor according to claim 7 wherein each said wing sprocket wheel is positioned centrally at the end of the corresponding wing portion and said stem sprocket wheels are positioned spaced apart at the remote end of said stem portion, whereby the corresponding sections will travel centrally along said wing portions and laterally spaced apart in parallel disposition along said stem portion, said scraper elements being connected centrally to the corresponding section and having outwardly directed arms extending towards the corresponding side walls of the conveyor.

9. Mining conveyor according to claim 8 wherein the scraper elements are spaced apart on one corresponding cable means in staggered relation to the scraper elements on the other cable means to permit the scraper elements of both cable means to travel in an unhindered manner along the stem portions in parallel staggered relation.

10. Mining conveyor according to claim 5 wherein said scraper elements are connected in substantially parallel transversely extending pairs on the same lateral side of said cable means, each scraper element being fixed against movement with respect to said cable means in a plane substantially transverse to the axis of said cable means yet

being pivotable with respect to said cable means for angular movement in a horizontal plane passing through said cable means, the scraper elements of each pair being linkably interconnected at a lateral point spaced from said cable means to limit the angular movement of such scraper elements in said horizontal plane with respect to each other as well as with respect to said cable means in any linear disposition of said cable means in said horizontal plane.

11. Mining conveyor according to claim 10 wherein alternately horizontal and vertical interconnected chain links are used to form the cable means, and unilateral clamp means are provided for connecting the scraper elements to respective horizontally disposed chain links, each said clamp means having an upper jaw and a lower jaw extending transversely across the adjacent longitudinal side portions of the corresponding horizontal link and respectively engaging the upper side and underside of the link for fixing the clamp means against displacement with respect to the particular link, the corresponding scraper element being pivotably attached to said clamp means for displacement in said horizontal plane about a vertical axis of pivot.

12. Mining conveyor according to claim 5 wherein the wing side wall portions are provided with corresponding continuously extending parallel tracks at the upper ends thereof, the corresponding track of the wing side wall adjacent the stem portion extending across in vertically spaced relation the part of said stem portion situated therebelow, to accommodate a cutting means adapted to be mounted for continuously uninterrupted longitudinal travel thereon for the extraction of mineral from a mine face on the side of said conveyor remote from said stem portion.

13. Mining conveyor according to claim 5 in which urging means are provided for displacing said conveyor in a direction transverse to the longitudinal direction of said wing portions.

14. Mining conveyor according to claim 5 wherein said stem portion is inclined slightly upwardly in the direction of said remote end and a chute is provided at said remote end for discharging conveyed material.

15. Mining arrangement which comprises, in combination; a T-shaped mining conveyor including a pair of longitudinal wing portions adapted to extend longitudinally along a mine face and a transverse stem portion connected to said wing portions intermediate the outer ends of said wing portions, whereby to convey away from the mine site mineral extracted from the mine face, said conveyor further including endless traction cable means, having forward and return sections, extending longitudinally along said wing portions between the outer ends thereof and the adjacent end of said stem portion and continuing uninterruptedly transversely along the stem portion rearwardly to the remote end of said stem portion, and spaced apart scraper elements secured to said cable means for conveying mineral loaded onto the wing portions continuously uninterruptedly to the remote end of said stem portion during conveying movement of said cable means in a direction toward said remote end; and a rotary cutting means including a sled mounted on said conveyor above said cable means and scraper elements for longitudinal movement back and forth along said wing portions, a motor mounted on said sled, and a cutting wheel operatively connected to said motor for rotation about an axis substantially parallel to the path of longitudinal movement of said sled, said wheel having cutting tools thereon peripherally extending radially outwardly and laterally outwardly at an angle to the radial direction, the outermost peripheral path of said tools extending beyond said sled for extractive engagement of said tools transversely and longitudinally with a mine face longitudinally adjacent said wing portions to cause the removal of mineral from such mine face.

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16. Mining arrangement according to claim 15 wherein said motor has a drive shaft extending transversely of said wing portions and said motor is mounted pivotally on said sled for pivoting of said drive shaft about a pivot axis extending in the longitudinal direction of said wing portions, such that said drive shaft is displaceable in a vertical plane transverse to the longitudinal direction of said wing portions, whereby said wheel is in turn displaceable vertically in a transverse arc having the pivot axis as its center point.

17. Mining arrangement according to claim 16 wherein said cable means follow a longitudinal path along said wing portions in a medial direction and turn at the medial ends of said wing portions adjacent said stem portion so as to follow a transverse path along said stem portion in a direction away from said wing portions and toward the end of the stem portion remote from said wing portions.

18. Mining arrangement according to claim 17 wherein the side of said wing portions remote from said stem por-

tion is provided with a ramp having a surface upwardly inclined toward said wing portions and the path of said cutting tools in the lowermost pivotal position of movement of said cutting wheel is spaced slightly from the inclined surface of said ramp, said wheel being rotatable in a direction such that the upper side of said wheel moves outwardly away from said conveyor and the under side of said wheel moves inwardly toward said ramp.

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