Jan. 3, 1967 W. HEYER 3,295,632

SCAFFOLDING FOR A MINE ARRANGEMENT

Filed May 13, 1964 2 Sheets-Sheet 1

Fig.5

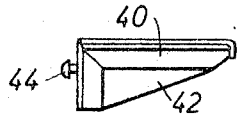


Fig.6

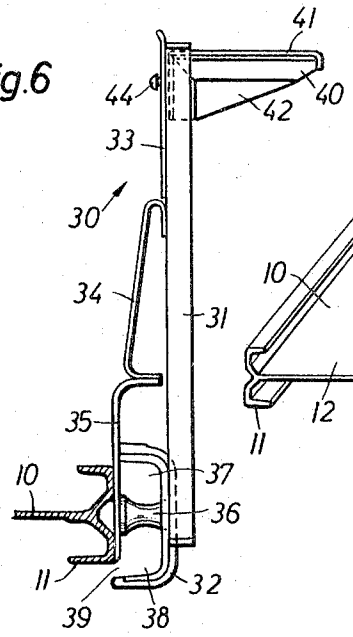


Fig.1

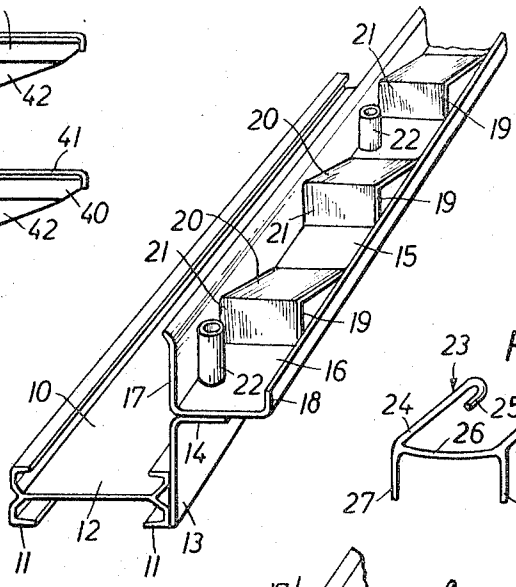


Fig.2

Fig.3

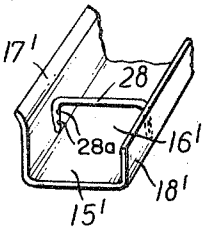
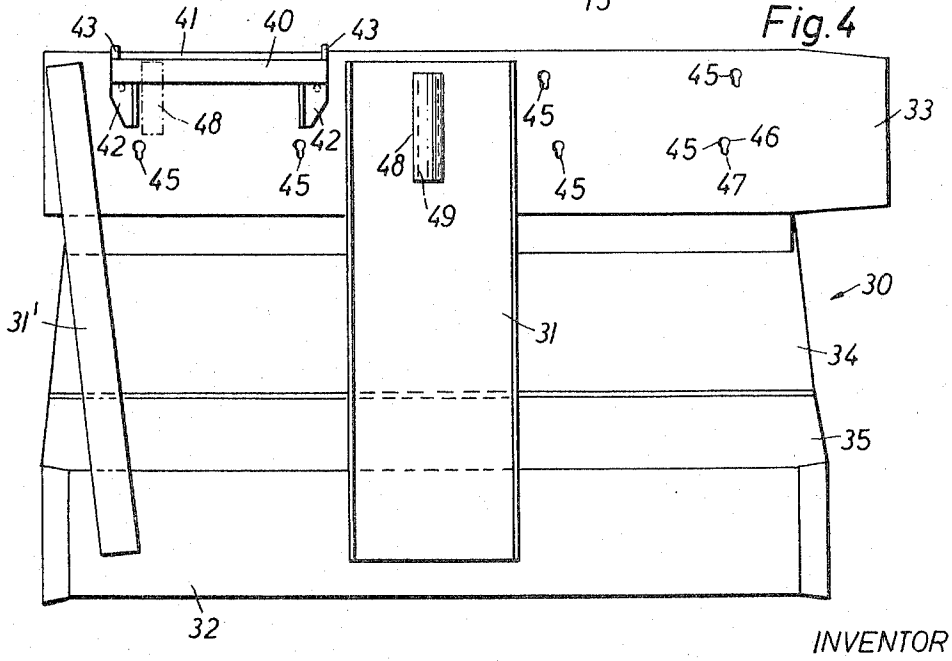


Fig.4



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Fig.8

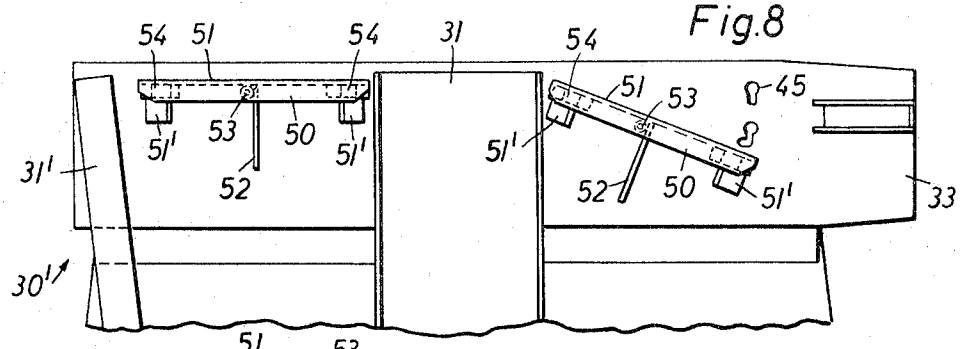


Fig.7

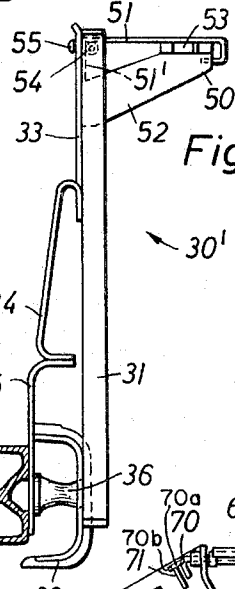


Fig.10

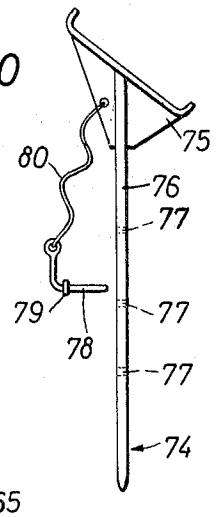


Fig.9

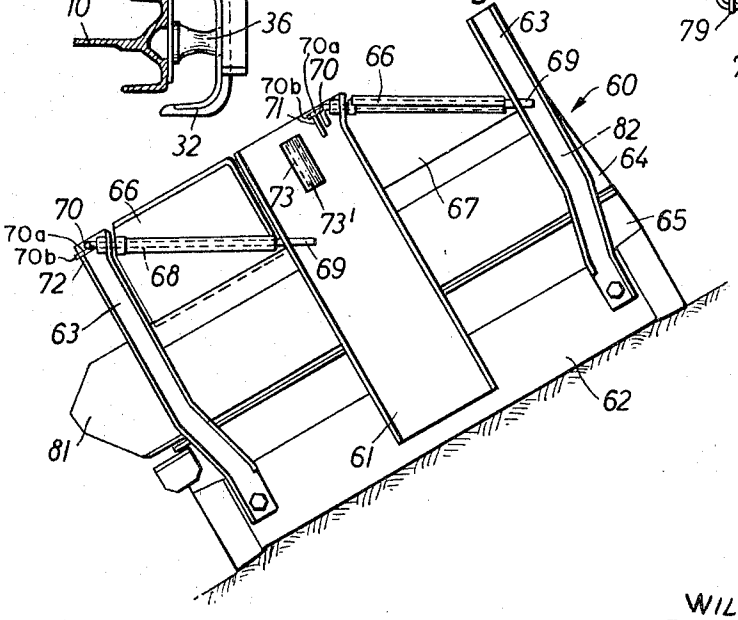
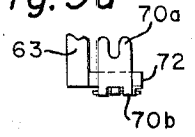


Fig.9a



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SCAFFOLDING FOR A MINE ARRANGEMENT

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Claims priority, application Germany, Jan. 29, 1964, G 39,729
19 Claims. (Cl. 182—93)

The present invention relates to scaffolding for a mine arrangement, and more particularly to an elongated scaffold for mounting on a mining conveyor at an elevated level with respect to the conveyor, such scaffold having separate transverse foot support means spaced apart therealong whereby to provide a walkway for workmen at a raised level spaced from the mine floor.

Mining conveyors, such as long wall mining conveyors of the double chain scraper conveyor type are well known and are used for conveying away from a mine site mineral which has been extracted from a mine face, i.e. a more or less horizontal seam of mineral, such as coal. In order to increase the capacity of mining conveyors, generally, top shield plates, overflow plates, rebound plates or bounce plates have been used so as to extend upwardly the sides of the conveyor path to retain thereon a larger volume of extracted coal or other mineral. Most often the conveyor construction contemplates a pair of longitudinally extending vertical side walls interconnected at mid height by an elongated horizontally extending central plate whereby to form an H-shaped configuration in cross section. As a rule, however, but one top shield plate is utilized along the side wall of the conveyor remote from the mine face being worked so that mineral material, such as coal, which is conducted onto the conveyor from the side thereof adjacent the mine face will not overflow at the remote side of the conveyor or over-shoot the conveyor and land in the area next to the side of the conveyor remote from the mine face. The top shield plate in such instance usually takes the form of a metal plate projecting upwardly to a certain height sufficient to retain the extracted mineral on the conveyor and such metal plate is normally bolted onto the side wall for removal if and when necessary. In connection with an alternate construction, the top shield plate takes the form of an elongated box-like tubular housing at the side of the conveyor remote from the mine face in order to receive therewithin cables, hoses, signal lines, and the like, which must be accommodated close to the mine face being worked yet which must be protected from flying coal, dirt, and debris which is ever present at the mine site. Advantageously, the box-like top shield plate containing the various cables, hoses, signal lines, etc. is advanced together with the mining conveyor in transverse direction as the mining extraction progresses, in order to keep the conveyor and cables, etc. close to the mine site. Considering the conditions which exist during the extraction of coal or other mineral from a mine site, the use of a box-like top shield plate is valuable as constant protection will be provided thereby against falling coal or rock from the overhead seam as well as against other types of mechanical damage which might occur if the cables, hoses, signal lines, etc. were exposed.

In the exploitation of thick seams of mineral, such as coal, i.e. seams extending vertically far above head height, the danger always exists that coal, rock, and the like will fall down from the upper level portion of such seams. Since the height of seams of this type is greater than usual, the coal or rocks which fall will have a greater force than if a thinner seam of a smaller height were being worked, i.e. a seam having an exposed mine face at most

approximately equal to the head height of the workmen, for example. With the removal of coal from the upper level portions of an extra high mine seam, naturally the coal will have a somewhat different trajectory and such coal will usually fall only in part onto the conveyor, the remainder over-shooting the conveyor on the side thereof remote from the mine face. The conveyor cannot merely be maintained at a greater distance from the mine face as a certain amount of coal will fall directly downwardly from the mine face and this coal would miss the conveyor too. There is also the question of danger to the miners working at the off side of the conveyor, i.e. the side thereof remote from the mine face, with regard to any coal or rocks which may fall from the upper level of the seam and over-shoot the conveyor, so as to land behind the off side thereof. Understandably, at the off side of the conveyor an area exists which contains gangue and/or waste rock material, as for example will occur as the mining extraction advances and the previously extracted area is robbed of support to allow the mine roof to cave in behind the mining operation. Since suitable props extend along the mining conveyor, the mine workers will be protected from such cave in and adequate working space will be present between the mine face being worked and the space immediately adjacent the rear side of the conveyor. However, normally a certain quantity of coal or other mineral which falls from the upper level portion of the mine seam being worked will fall beyond the off side or remote side of the conveyor and land in the waste rock resulting from a previous cave-in and such coal will be lost as the recovery of individual lumps of coal admixed with the waste rock or gangue would require an expenditure of time and labor which would be prohibitive. While in the past any over-shooting of the coal or other mineral landing on the off side of the conveyor could be avoided by installing a top shield plate of the aforementioned kind, where mine means of extra large height are encountered, the top shield plate cannot be developed sufficiently high for the desired purposes. In fact, where the thickness of the mine seam extends beyond head height, many difficulties arise in the setting up of the mine arrangement, including the mining planer, the mining conveyor, etc. Frequently, the miners must employ ladders or other auxiliary stands or frames in order to be able to lift the lagging caps or sheathing caps forwardly as far as possible under the overhead seam or mine roof to protect the workmen thereat. This procedure is cumbersome and toilsome to say the least. Such auxiliary stands or frames and/or ladders must be manually transported as the mining progresses in order to bring forward repeatedly the lagging caps, etc. and of course there is always danger that the workmen will fall from such a height if the stands, frames, or ladders are not properly supported, etc., especially considering the steep inclines and uneven mine floors which exist due to the waviness of the horizontally extending mine seam through the rock formation.

It is an object of the present invention to overcome the foregoing drawbacks and to provide a scaffolding for a mine arrangement which may be mounted on a mining conveyor at an elevated level with respect thereto such that a walkway for workmen at a raised level spaced from the mine floor will exist.

It is another object of the present invention to provide a scaffolding of the foregoing type which is sturdy in construction, adaptable to the various inclinations of the conveyor which follow the steep inclines of the mine floor, yet permits the miners to pass therealong with a minimum danger of falling.

It is a further object of the present invention to provide a scaffolding of the foregoing type which contains a cor-

respondingly high top shield plate particularly suited for use in the extraction of mineral from seams of extra great thickness, i.e. in which the mine face being worked is substantially above head height.

It is still another object of the present invention to provide a scaffolding of the foregoing type which will avoid substantially the danger to the workmen on the off side of the conveyor from falling coal or other mineral or rock, and simultaneously prevent the loss of coal or other mineral which might occur if the same were permitted to fall into the waste rock or gangue situated in the off side area of the conveyor.

It is a further object of the present invention to provide a scaffolding of the foregoing type which will permit mining operations to be carried out more economically than therefore and with less stress and strain on the part of the workmen.

It is still a further object of the present invention to provide adjustable means in the scaffolding to increase the height thereof adjustably to accommodate mine seams of even greater height.

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 invention that a scaffolding for a mine arrangemet which is durable in use, simple in construction, safer with regard to the workmen, and efficient in operation, may be provided, which comprises generally means defining an elongated scaffold for mounting on a mining conveyor at an elevated level with respect thereto, the scaffold having separate transverse foot support means spaced apart therealong whereby to provide a walkway for workmen at a raised level spaced from the mine floor. More specifically, the scaffolding is used in the form of an elongated scaffold mounted on a mining conveyor disposed longitudinally along a mine face, such that the scaffold extends upwardly from one longitudinal side of the mining conveyor at an elevated level spaced from such conveyor and the mine floor. A plurality of separate transverse foot supports spaced apart along the scaffold is also provided, such supports having support surface means theeron to hold the workmen both when the scaffold is positioned horizontally and when the scaffold is positioned at an inclined angle with respect to the horizontal, so that the walkway for workmen at an elevated level spaced from the mine floor will be achieved without the perils and troubles to the workmen as existed in the past with prior art constructions. The inclined angle in question refers to the true horizontal, of course, rather than the longitudinal axis of the scaffold and/or of the mining conveyor, as such mining conveyor and scaffold may be disposed longitudinally along a mine seam which itself is inclined with respect to the true horizontal. Advantageously, seating means are provided on the scaffold to accommodate an auxiliary scaffold at a further elevated level spaced thereabove, as for example when the mine seam and/or mine face being worked is extremely high, running to a distance far above the head height of the workmen. Moreover, a further feature of the invention concerns the inclusion of depending extension means on the scaffold for attachment with the mining conveyor to maintain the scaffold at a particular predetermined elevated level.

In accordance with one particular embodiment of the invention, the scaffold has a horizontal bottom wall and the foot supports are in the form of angle members situated with their outer ends in supporting contact with the scaffold bottom wall and with their apexes upwardly extending from the scaffold bottom wall to form a series of steps along the scaffold. The apexes of the angle members of the steps preferably possess an obtuse angle, whereby to provide a corresponding stairway in each direction of incline of the scaffold with respect to the horizontal, so as to accommodate the workmen regardless of whether the conveyor and the scaffold connected thereto

extend upwardly in an incline of the mine floor in one longitudinal direction or in the other.

In accordance with a further preferred embodiment of the invention, the scaffold has a pair of substantially parallel vertical side walls and the foot supports are in the form of cross rungs extending transversely between the side walls of the scaffold, such cross rungs being preferably releasably hung onto the scaffold side walls to permit the reversal of the position thereof whereby to provide a corresponding ladder-way in each direction of incline of the scaffold with respect to the horizontanl depending upon which longitudinal direction of incline the mine floor possesses.

In accordance with another preferred emboliment of the invention, the scaffold has a vertical side face portion and the foot supports are in the form of side brackets releasably hung laterally onto the scaffold side face portion by bolts on the brackets having heads retainedly coacting with slots defined vertically in the scaffold side face portion. The brackets are provided with transverse retaining edges in accordance with one preferred feature in order to prevent foot slippage of the workmen and also to provide, together with the particular bracket a receiving platform for retaining an auxiliary scaffold thereat.

More particularly, each side bracket may be provided with two longitudinally spaced apart bolts substantially at the same height and the corresponding side face portion of the scaffold may be provided with two pairs of longitudinally spaced apart slots, the slots of one pair being spaced from each other a slightly larger linear distance than the spacing between the slots of the other pair, with said one pair being spaced vertically above and laterally outwardly of said other pair, the distance between one slot of said one pair and the corresponding slot of the same pair being substantially equal to the distance between said one slot of said one pair and diagonally opposite slot of the other pair disposed therebelow. In this way one of the bolts may be releasably placed in said one slot of said one pair with the head thereof retainedly coacting with the slot while the other of the bolts may be placed in the corresponding slot of the same pair to maintain the side bracket parallel to the longitudinal axis of the scaffold and alternately in the diagonally opposite slot of the other pair disposed therebelow to maintain the side bracket at an incline to the longitudinal axis of the scaffold especially where the scaffold is at a corresponding incline with respect to the horizontal. Furthermore, the side brackets may include a longitudinal bolt-carrying strip for abutting disposition with the scaffold side face portion as well as a longitudinal plate hingedly attached to the strip for pivoting about a longitudinal axis, and a transverse brace member hingedly attached to the under side of the plate for pivoting about a transverse axis of pivot. In this way a collapsible hide bracket is provided, such that when the brace member is substantially perpendicular to the plate, the brace member is also substantially perpendicular to the scaffold side face portion and in abutment therewith and maintains the plate in turn substantially perpendicular to the side face portion thus to provide the walkway, and such that when the bracket member is pivoted to place the same in abutment with a corresponding portion of the under side of such plate, the plate in turn will pivot to place the same in abutment with a corresponding part of the side face portion thus to provide the collapse of the side bracket.

In accordance with another preferred embodiment of the invention, the scaffold has a vertical side face portion disposed in a vertical plane and includes a longitudinally extending top edge containing longitudinally spaced apart downwardly extending slot-like indentations defined in the top edge, with the foot supports being in the form of swivel panels occupying correspondingly the slot-like indentations. Each swivel panel is preferably pivotally attached to the side face portion at a corre-

sponding indentation for swiveling about a swivel axis inclined with respect to the longitudinal axis of the scaffold from a position in which the panel is disposed in the same vertical plane to a position in which the panel is disposed in another plane substantially perpendicular to the vertical plane of the vertical side face portion and in turn perpendicular to such side face portion at an inclined angle with respect to the longitudinally extending top edge. Also, the indentations and panels may be of corresponding rectangular configuration and dimensions and a diagonal rod may be fixedly secured to each panel and pivotally mounted at one longitudinal end of the rod to the upper outer edge of a respective slot-like indentation at a corresponding longitudinal end of such indentation and at the other longitudinal end of such rod to the lower inner edge of the same indentation at the other corresponding longitudinal end of such indentation. Locking means may be provided for locking the panel in each of said positions as desired.

In accordance with still another preferred embodiment of the invention, the scaffold has a longitudinally extending vertical side face portion, and the foot supports are in the form of separate, spaced apart flat step elements movable to a position perpendicular to the side face and at an angle inclined with respect to the longitudinal axis of the side face, with auxiliary angle step means being removably positioned in the space between adjacent flat step elements to render the walkway more continuous. Specifically, the angle step means define intermediate steps along the walkway. A shaft holder having a vertical bore may be disposed on the side face portion in each said space and each angle step means may include a vertical shaft receivable in a corresponding holder bore and releasable lock means for locking such shaft in the bore in a plurality of vertical positions may be included in order to adjust the height of the angle step means with respect to the adjacent flat step elements.

In the accompanying drawing: FIG. 1 is a schematic partial view in perspective of an elongated mining conveyor showing a scaffolding mounted thereon in accordance with one embodiment of the present invention.

FIG. 2 shows a particular form of foot support means usable on the scaffolding of the present invention,

FIG. 3 shows a schematic partial view in perspective of an alternate embodiment of scaffolding in accordance with the present invention utilizing cross-rungs rather than steps,

FIG. 4 is a schematic side view of a mining conveyor arrangement having a scaffolding in accordance with another embodiment of the present invention mounted thereon,

FIG. 5 is a schematic view of a side bracket for the scaffolding shown in FIG. 4,

FIG. 6 is a schematic end view showing a portion of the mining conveyor in section, and the profile of various parts of the scaffolding connected therewith,

FIG. 7 is a schematic view of an alternate embodiment of the scaffolding in accordance with the present invention, similar to that shown in FIG. 6, but utilizing a side bracket which is collapsible,

FIG. 8 is a schematic partial view of a side of the scaffolding mountable upon a conveyor, the arrangement shown differing essentially from that shown in FIG. 4 by the provision for collapsible side brackets of the type illustrated in FIG. 7,

FIG. 9 is a schematic side view of still another embodiment of scaffolding in accordance with the present invention utilizing swivel panels as steps, especially where the conveyor and scaffolding is situated on a mine floor which is inclined steeply with respect to the horizontal, and

FIG. 9*a* is a schematic partial top view of a portion of FIG. 9 showing a locking means for the swivel panels,

FIG. 10 is a schematic view of an auxiliary angle step means used to increase the height of the scaffolding obtainable with the embodiments shown in FIGS. 1–9.

Referring to the drawing, FIG. 1 shows a longitudinally extending conveyor **10** having vertical side walls **11** and a central plate **12** interconnecting the side walls **11** at mid height. Conveyor **10** may be of the double chain scraper conveyor type as contemplated, for instance, in U.S. Patent 2,745,651, such that parallel endless drive chains pass along the side grooves at the top of the central plate **12** and return at the under side of plate **12** along similar grooves, with the two parallel chains having scraper bars spaced apart therealong to convey the extracted minerals, such as coal in the desired direction along the conveyor and away from the mine site. The conveyor **10** may be made of interconnected separate sections which permit articulation between the sections both in horizontal and vertical direction to accommodate the conveyor to the uneveness of the mine floor and/or the mine face being worked and to permit the conveyor to be advanced by any suitable urging means toward the mine face as the extraction of mineral therefrom progresses, i.e. in sections in an undulating manner. A bounce plate or top shield plate **13** is provided along one of the side walls **11** of conveyor **10**, that side wall being remote from the mine face. In this way, as coal or other mineral is extracted by a planer or other mining means conducted back and forth along the mine face, the mineral material will be forced onto conveyor **10** from the side remote from plate **13**, i.e. the mine side of the conveyor. With respect to seams of coal or other mineral which extend very high in the mineway, i.e. above head height, the normal planer devices cannot cause the removal of mineral and the forcing of the same onto conveyor **10** from the mine side beyond a particular height. In order to extract the coal situated in the upper level portion of the mine seam, auxiliary equipment for cutting the upper portion of the seam must be used. As the extracted mineral is loosened from the mine face high above the conveyor **10**, which normally extends along the mine floor, the loosened mineral will fall onto conveyor **10** and by reason of the bounce plate **13**, that which would normally fall beyond conveyor **10** on the side thereof remote from the mine face, will be retained on central plate **12**. In the past, as the height of the mine seam increased, the utility of conventional bounce plates decreased in effectiveness as the coal could over-shoot even such bounce plates or bounce off of plate **12** and onto the mine floor at the off side of the conveyor, i.e. the side remote from the mine face.

By way of the present invention, a bounce plate **13** is utilized which contains an outwardly extending flange **14** whereby a scaffold **15** may be mounted thereon. Scaffold **15** contains a bottom wall **16**, a long upwardly extending side wall **17** representing a continuation of bounce plate **13** and a short side wall **18** remote from the mine face. Whereas in the past the extension of a bounce plate in upward direction could not be achieved because of the cumbersome assembling thereof and the lack of structural reinforcement thereof, in accordance with the present invention, a scaffold is used representing a walkway for the miners at a height sufficiently above the mine floor to permit access to the upper portion of the mine shaft and mine face. The foot supports **19** take the form of angle members having a tread wall **20** and a riser wall **21** which preferably have an obtuse angle to allow the resulting series of steps along bottom wall **16** to be utilized regardless of the inclined direction which the scaffold **15** and the conveyor **10** may take with regard to the true horizontal. Seating means **22** in the form of cylindrical members having a central bore may be situated on bottom wall **16**, and perhaps attached to the long side wall **17** for accommodating further scaffold equipment which may be situated thereabove and held in place by downwardly extending shafts received in the seating means **22**.

By reason of the fact that the angle members **19** have an obtuse angle, in one direction of incline of the scaffold

15, the treads 20 will represent the stair steps for the workmen, whereas in the opposite direction of incline, the risers 21 will represent such steps.

It will be realized that the scaffold 15 may be made in sections of similar length to the sections of conveyor 10 to permit a certain degree of articulation of the scaffolding with respect to the longitudinal in order to accommodate unevenness in the mine floor aside from steep inclines. Naturally, by suitably connecting seating means 22 both to the bottom wall 16 and the side wall 17, further reinforcement of the scaffold 15 will be achieved, although a significant degree of reinforcement will be achieved by reason of the disposition of the angle members in abutment with the side walls 17 and 18. It will be appreciated in accordance with the embodiment of FIG. 1, for instance, that workmen may pass along scaffold 15 up and down the angle member steps without danger of falling and that such workmen are to some extent protected from the mining operations by reason of the height of side wall 17. More importantly, not only does the scaffold 15 permit the wormken to attain a working height far above head height in a safe manner but also the side wall 17 which represents an extension of bounce plate 13 permits a much higher shield from the falling coal to be maintained at the off side of the conveyor.

In FIG. 2 an alternate embodiment of the foot supports is shown, such foot support being a rod support 23 having the longitudinal arm 24, the transverse arm or cross rung 26, and the downwardly depending legs 27 as well as the hooks 25. Hooks 25 may be passed through corresponding eyes (not shown) situated on scaffold 15, for example at side walls 17 and 18 yet near bottom wall 16 with depending legs 27 resting upon bottom wall 16. Suitable lugs in place of the eyes (not shown) may also be utilized, whereby the advantages obtained are that the workmen may merely graps the transverse arm 26 to remove the hooks 25 from engagement with the eyes, bolts, or the like to reverse the position of the rod support 23 with respect to the longitudinal. This will be done where the degree of incline changes from one direction to another. Since at the appropriate incline the hooks 25 will hang slantedly downwardly, there will be no chance that the rod supports 23 will be inadvertently loosened to endanger the miners. Versatile accommodation of different angles of incline will be obtained with a rod support of the type shown in FIG. 2 since the workmen may engage the transverse arm 26 through a substantial arc of its periphery. Furthermore, as a safety measure, transverse arm 26 is somewhat arcuate in configuration to maintain the feet of the workmen intermediate the ends of such arm and prevent slippage in lateral direction.

Concerning FIG. 3, an embodiment similar to that shown in FIG. 1 is provided, having a bottom wall 16', a long side wall 17', adjacent the conveyor, and a short wall 18' remote from the conveyor with the cross rungs 28 extending transversely between the side walls 17' and 18' at spaced intervals along the scaffold 15'. The cross rungs 28 are in U-shaped form with downwardly depending legs suitably secured to the side walls, for example by removable pins 28*a*. In this embodiment as well, the angle of incline may change from one direction to the other, yet the workmen will be able to pass along the scaffold without difficulty.

In FIG. 4, an alternate embodiment is shown including the scaffolding 30 which is attached by suitable depending members 31 and 31' with a cable housing 32 in turn connected with the mining conveyor. The vertical side face portion of the scaffold includes the upper plate 33, the lower plate 34, and the bounce plate 35 attached on its opposite face to the conveyor. Suitable side brackets 40 are mounted on the upper plate 33 whereby to provide the foot supports and the walkway at a level spaced vertically above the conveyor and mine floor. Only one such bracket 40 is shown in FIG. 4 for clarity of illustration. The bracket 40 contains the longitudinal plate 41 extending transversely with respect to the direction of the conveyor and horizontally with respect to the main floor, assuming such mine floor to be in true horizontal relation, as well as the transverse brace members 42 at the longitudinal ends of plate 41, the side bracket 40 being mounted on the upper plate 33 by means of bolts 44 (see FIGS. 5 and 6) coacting with the slots 45 defined in upper plate 33. The side brackets are provided with transverse retaining edges 43 to prevent foot slippage of the workmen and to provide a receiving platform on the top of plate 41 for retaining any auxiliary scaffolding thereat, as for example might be extended transversely across the conveyor toward the mine face for holding workmen who might need to carry out operations close to the mine roof at the particular height in question.

As is clear from FIGS. 5 and 6, the bolts 44 are provided with heads which are wider than the neck portions situated between such heads and the adjacent portion of the side bracket 40. In this way, as is clear from FIGS. 4 and 6, the bolt heads may pass through the upper wider portion 46 of the slots 45 and descend within such slots to the lower narrower portion 47 thereof which serves to coact with the heads of bolts 45 to keep the brackets 40 in a releasable yet safely retained manner on the scaffolding. FIG. 4 also shows that the slots 45 assume a particular configuration, more or less in the form of a parallelogram, with the upper pair of slots being spaced farther apart than the lower pair of slots, and also with the upper pair of slots being spaced a predetermined distance above the lower slots. This predetermined distance is such that the left upper slot 45 as shown on the right hand side of plate 33 in FIG. 4 is the same distance from the upper right hand slot 45 at the same level and the lower right hand slot 45 at the lower level. On the other hand, the upper right hand slot 45 is the same distance from the upper left hand slot 45 as from the lower left hand slot 45. This relationship permits the bolts 44 at either longitudinal end of the side bracket 40 to engage correspondingly either the top slots 45 or a top slot and a bottom slot diagonally disposed with respect thereto. By such arrangement steep inclines in the mine floor may be accommodated, inasmuch as the positioning of one bolt 44 in an upper slot and the other bolt 44 in a corresponding lower slot will slant the longitudinal plate 41 with respect to the longitudinal axis of the vertical side face portion and the conveyor, as well as the inclined surface of the mine floor. On the other hand, the side bracket will be maintained more or less in true horizontal direction as the slanting thereof compensates for the slanting of the conveyor arrangement and scaffolding due to the inclined nature of the mine floor. Of course, it will be realized that a plurality of slots 45 may be disposed in pairs below one another at particular intervals of height to allow adjustment of the side brackets about one of the upper slots as pivot point to achieve a gradual change in the angle of slant of the side bracket with respect to the scaffolding in question. The nature of the coaction between the bolts 44 and the slots 45 permits easy rearrangement of the side brackets on upper plate 33 and a minimum of wasted time on the part of the workmen.

It will be seen from FIG. 6 that the scaffolding 30 is in fact attached to the conveyor 10 at the side wall 11 thereof via the lower plate 34 and the bounce plate 35 having mutually abutting flange portions as well as by the depending member 31 attached to the cable housing 32 which, in turn, is secured by the spacer 36 to the side wall 11 through the adjacent portion of the bounce plate 35. The upper end portion of lower plate 34 is arcuate in configuration so as to provide a resilient connection with the depending member 31 as well as with the depending member 31' laterally disposed with respect thereto. The vertical extent of the bounce plate 35, the lower plate 34, and the upper plate 33, permits a high shield, well above head height, to be attained at the mine site so as to pro-

tect the workmen at the off side of the conveyor as well as to retain falling coal on the conveyor, regardless of the height from which such coal may reasonably be expected to fall onto the conveyor. It will be realized that the housing **32** is separated by the brace **36** into an upper channel **37** and a lower channel **38** for receiving slidably therealong the drive chain or cable used to drive a planer back and forth along the mine face for extraction of mineral therefrom. A construction of this type is well known and the same normally presupposes the use of a mining planer having an underlying plate of keel extending rearwardly from the front side of the conveyor adjacent the mine face to the rear side thereof. Such keel stabilizes the position of the mining planer and prevents the same from tipping backwardly due to the existence of the mine floor therebeneath and the presence of the mining conveyor arrangement exerting its weight downwardly thereon. Nevertheless, the keel is sufficiently stream-lined to permit the same to slide back and forth along the under side of the conveyor and such keel serves to drive the mining planer back and forth by suitable attachment with the forward section of the drive chain normally slidably positioned in the channel **38**. The rearward end of the keel of the mining planer extends through the slit **39** between the under side of the rearward side wall **11** of the conveyor and the adjacent lower flange portion of the U-shaped housing **32**. The construction of the housing **32** and the mining planer as well as the drive chain or cable utilized therewith are well known expedients and therefore are not illustrated to any extent in the drawing. Nevertheless, the embodiment of FIG. 6 shows specifically how the scaffolding of the present invention may be utilized effectively with a mining conveyor arrangement of the box-type, that is an arrangement having a housing of which housing **32** is typical. Indeed, such a construction permits a more or less triangular base or support to be attained for the scaffold, utilizing not only the housing **32** and the depending member **31** but also the composite reinforcement construction provided by the bounce plate **35** and the lower plate **34** suitably connected at its upper end portion to the depending member **31**.

As may be seen in FIG. 4, a cylindrical pipe or shaft holder **48** is provided containing the central vertical bore **49** therewithin, such holder being similar to the seating means **22** of FIG. 1. Thus, the depending shaft of a further scaffolding arrangement may be held in place by any suitable means within the bore **49**. Either a cotter pin, bolt, or a sealed off bottom end of the bore **49** may accomplish the desired seating arrangement of the depending shaft being held in place.

In FIGS. 7 and 8 an embodiment of a scaffolding **30'** is shown which is similar to that of FIGS. 4–6, but in this case a side bracket **50** is provided which is collapsible in nature. Specifically, the longitudinal plate **51** is hingedly connected by the hinges **54** to the bolt carrying strips **51'** spaced longitudinally apart. Below the longitudinal plate **51**, the transverse brace member **52** is hingedly disposed at hinge **53** having an axis transverse to the axis of longitudinal plate **51** so that brace member **52** may extend in its downward position against plate **33** to keep side bracket **50** normally perpendicular to such plate **33** as well. Of course, upon pivoting bracket member **52** about the axis of hinge **53**, i.e. out of its perpendicular position with respect to longitudinal plate **51**, the support of plate **51** will be lost and plate **51** will in turn pivot about hinges **54** and collapse so as to rest against the appropriate portion of upper plate **33**. In order to hold the side bracket **50** in place, the bolt carrying strips **51'** (see FIG. 7) are provided with the bolts **55** similar to bolts **44** of FIGS. 4–6, whereby such bolts may extend into the slots **45** of upper plate **33** in the same manner as in the embodiment of FIGS. 4–6. If desired, the bolt carrying strips **51'** may be interconnected so as to form a strip longitudinal in direction and more or less coextensive with plate **51**. If desired, a seating means may be situated on depending member **31** similar to the shaft holder **48** of FIG. 4 and the seating means **22** of FIG. 1. As may be seen in FIG. 8, a further set of slots **45** is provided than in the case of FIG. 4 to attain a more pronounced variation in the angle of incline of the plate **51** with respect to the longitudinal axis of the vertical side face portion and the conveyor.

In FIG. 9 an alternate embodiment of a scaffolding **60** is shown which includes the depending member **61** which is attached at its lower end to a housing **62** similar to housing **32** as shown in the embodiments of FIGS. 4, 6, and 7. The additional depending members **63** are provided for further structural reinforcement. The lower plate **64** is similar in configuration to the lower plate **34** as shown in FIGS. 6 and 7, and the same is true with respect to the bounce plate **65** as compared with the bounce plate **35**. In this embodiment the swivel plates **66** are situated in the downwardly extending slots **67** in the vertical side face portion of the scaffolding **60** with the slanting rod **68** being suitably journaled at the lower end **69** thereof in the appropriate portion of the depending member **61** or **63**, as the case may be, and with the upper end **70** thereof being suitably journaled in the upper end portion of the depending member **61** or **63** as the case may be. The upper end **70** is displaced at an angle to the axis of rotation of rod **68** so that a suitable stop means **71** on member **61** or stop means **72** on member **63** may be used to keep the particular rod from turning out of its particular position. Any lock means may be used to achieve this locking of the rod **68** and swivel plate **66** in place, as for example a conventional latch assembly, cotter pin, set screw, etc.

Thus, latch **70***a* and hinge **70***b* are shown for this purpose in FIG. 9*a*. The latch **70***a* is attached via hinge **70***b* to the appropriate stop means **71** or **72**, as the case may be, such that the same overlies the top edge of the stop means in its normal position, yet may be swiveled upwardly and away in order to permit the appropriate upper end **70** to be rotated 90° as between the positions thereof shown in the left and right upper portions of FIG. 9. On the left upper portion, as shown in FIG. 9, the latch **70***a* is situated below the upper end **70** which is disposed transversely thereacross, and due to the presence of the upper surface of stop means **72**, the latch **70***a* will be prevented from downward displacement, thus holding the upper end **70** in the desired transverse position and swivel plate **66** thereat in the vertical position. On the upper right hand side of FIG. 9, the upper end **70** is shown in downwardly directed position, thus with such end being received within the prongs of the forked portion of latch **70***a*. This prevents deviation of upper end **70** and thus undesired rotation of the swivel plate **66** from the horizontal or transverse position shown. To change from one position to the other simply requires the lifting of latch **70***a* to permit the upper end **70** in either instance to clear the same and be turned as desired, whereupon the latch may be returned to its seating engagement with stop means **71** or **72** to hold the downwardly depending upper end **70** in the case where the swivel plate is to be maintained in the position shown at the upper right portion of FIG. 9, or to hold the upper end **70** in the transverse position upon swiveling such upper end **70** downwardly from an upwardly extending position onto the latch in its returned position. In such instance, it will be appreciated that when the upper end **70** is in upwardly extending position, the latch will just clear the same upon being returned to its seating engagement with the appropriate stop means, whereupon the upper end **70** may be downwardly swiveled onto the upper side of such latch. The relationship of the seating engagement of the latch and the hinged connection thereof with the depending member **63**, as seen from above at the upper left hand portion of FIG. 9 is clear from FIG. 9*a*.

A shaft holder 73 having a bore 73', similar to the shaft holder 48 of FIG. 4 and the seating means 22 of FIG. 1 may be used on depending member 61 for the desired purpose. It will be seen that where an incline in the mine floor is encountered, especially where the mine seam is extremely large in height, the scaffold means of the invention may be suitably adjusted to swivel the plate 66 from the vertical disposition thereof as shown at the left hand side of the figure to the horizontal disposition thereof as shown at the right hand side of the figure, such horizontal disposition being the true horizontal disposition thereof or an approximate approach to suct true horizontal disposition even though the same may be at an angle with the inclined mine floor. The longitudinal axis of the mine floor and the conveyor as well as of the vertical side face portion will all be inclined with respect to the true horizontal, although, depending upon the angle of slant of the rod 68, the swivel plate 66 will achieve a closer approach to the normal horizontal.

As seen in FIG. 10, an angle step means 74 is provided which has the foot support 75 connected at an angle to the depending shaft 76 which is provided with the bore holes 77 horizontally therethrough to permit the pin 78 having the stop 79 to extend into a particular bore hole 77 to adjust the height of the shaft 76 where the same is inserted into the bore hole of a shaft holder of the type shown at 73 in FIG. 9, at 48 in FIG. 4 and at 22 in FIG. 1. The cable 80 tied to the foot support 75 prevents the loss of the pin 78. Such pin 78 may merely rest upon the top of the particular bore hole stand or it may extend through a pair of coaxial openings in the side walls which may be aligned with the particular bore hole 77 to keep the shaft 76 in place. Naturally, as may be appreciated from FIG. 9, the foot support 75 may be adjusted to take up the space between adjacent swivel plates 66 to prevent injury from falling as the workmen move along the walkway, or the angle steps 75 may be positioned at a much higher level as where the mine seam being worked is extraordinarily high, i.e. much higher than the level of the main scaffolding 60, or for that matter higher than the scaffolding 30', 30, or 15, as the case may be. It will be appreciated by the artisan that in place of the angle foot supports of FIG. 10, other types of foot supports having different configurations and angles of incline may be utilized and the same is true with respect to the various embodiments of FIGS. 1–9. Moreover, other types of auxiliary scaffolding equipment than that shown in FIG. 10 may be provided to extend longitudinally along the top of the vertical side face portion as well as vertically upwardly therefrom to achieve additional height. In any case, a safe walkway for efficient mobility along the mine face being worked will be attained by the instant construction, and such walkway will always remain close to the mine face being worked, as the same will be advanced with the conveyor assembly as the mine face is increasingly planed away.

In effect, the present invention provides a detachable scaffolding assembly which serves not only to increase the height of the top shield plate or bounce plate but also to provide a walkway for the miners at a raised level with respect to the mine floor, regardless of the angle of incline of the mine floor. Naturally, as will be appreciated by the artisan, the angle members 19, the rod members 23, the cross-rungs 28, and the side brackets 40 and 50, as well as the swivel panels 66, may all be made in an interchangeable manner so that other foot supports having different dimensions may be inserted in their place, i.e. to achieve a different angle of the foot support with respect to the longitudinal direction of the scaffold whereby to accommodate the walkway to different angles of incline of the mine floor, etc. Nevertheless, the rod members 23 and the cross rungs 28 will be for the most part independent of the inclination of the conveyor and the scaffolding, the particular foot support serving as a convenient step no matter what the angle of incline of the scaffolding is with respect to the true horizontal.

Conveniently, the scaffolding of the present invention may be provided in sections which correspond to the sections of the mining conveyor, whereupon each section of the scaffolding will articulate with respect to adjacent sections in the same manner as the corresponding conveyor section to which the same is attached will articulate with respect to the adjacent conveyor sections along the mine face. Each scaffolding section may be provided in this respect as a separate and complete apparatus and/or means may be provided to connect linkably the adjacent portions of the scaffolding along the mine face permitting articulation therebetween in both a vertical and a horizontal direction in the same manner as the conveyor sections are able to articulate with respect to one another. If desired, one longitudinal end portion of the scaffolding may be constructed to extend beyond the remainder of the scaffolding whereas the opposite end of the same scaffolding may be provided with a suitable recess therein, so that a degree of nesting of the protuberance at one longitudinal end of a particular scaffolding section may be articulatedly received within the corresponding recess in the adjacent portion of the next successive scaffolding section. In this connection, in FIG. 9, a protuberance 81 is provided at one longitudinal end of the scaffolding 60 and a recess is defined between the adjacent lower plate 64 and the depending member 63 overlapping the same as shown at 82, whereby the protuberance 81 of the next adjacent scaffolding may be inserted in the flat space 82 between depending member 63 and lower plate 64. A certain degree of articulation will be provided due to the pointed end of protuberance 81 and by providing the recess or slit 82 with a wider dimension between the underside of member 63 and the adjacent portion of plate 64 than the dimension of the thickness of protuberance 81. Articulation in the vertical as well as in the horizontal directions will thereby be permitted.

It will be realized that the vertical long side wall in the embodiments of FIGS. 1, 2 and 3 may be extended upwardly beyond the position shown if it is desired to attain a larger height of the bounce plate or top shield plate construction of the arrangement. This is also true as regards the upper and lower plates of the embodiments of FIGS. 4–9, and of course even greater heights can be attained by auxiliary scaffolding equipment such as that provided by the construction of FIG. 10, for example.

Aside from the fact that the brackets 40 and/or the swivel panels 66 may be used for positioning a transverse plank across the conveyor, with the other end being situated on a separate support structure or on a ledge at the mine face, the brackets 40 and/or the swivel panels 66 may be used in conjunction with the auxiliary angle step means of FIG. 10, i.e. as for example in the socket or holder 48 shown at the left in FIG. 4. The angle step means 74 may also be utilized per se for running a plank thereon across the conveyor toward the mine face, or in the opposite direction, for that matter, where the mine floor is inclined with respect to the true horizontal and where it is necessary for the workmen to function at a raised level from the mine floor over the conveyor, rearwardly thereof, or even forwardly thereof at the mine face itself. It will be appreciated, therefore, that the present invention provides a versatile scaffolding construction usable under conditions of extremely steep inclines of the mine floor at mine sites wherein extra large mineral seams are being worked which are vertically disposed beyond head height in the mineway and which, therefore, require special equipment for carrying out the over-all extraction operations.

It will be realized that the foregoing specification and drawings are set forth for the purpose of illustration and not limitation, and that various changes and 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 I claim is:

1. In a mining arrangement including a longitudinally extending mining conveyor adapted to rest normally upon a mine floor longitudinally along a mine face and having a conveyor path bounded by longitudinally extending side walls, said arrangement being slidably displaceable on such mine floor transversely toward and away from such mine face, the improvement for increasing the range of height which may be served by the mining arrangement which comprises an elongated scaffold mounted on one longitudinal side of such mining conveyor at an elevated level spaced from the mining conveyor and mine floor, and a plurality of separate transverse foot supports spaced apart along the scaffold whereby to provide a walkway for workmen at an elevated level spaced from the mine floor.

2. Improvements according to claim 1 wherein said foot supports have support surface means thereon to hold workmen both when the scaffold is positioned horizontally and when the scaffold is positioned at an inclined angle with respect to the horizontal.

3. Improvement according to claim 2 wherein said scaffold includes seating means thereon to accommodate an auxiliary scaffold at a further elevated level spaced thereabove.

4. Improvement according to claim 2 wherein said scaffold has a horizontal bottom wall and said foot supports are in the form of angle members situated with their outer ends in supporting contact with the scaffold bottom wall and with their apexes upwardly extending from said scaffold bottom wall to form a series of steps along the scaffold.

5. Improvement according to claim 4 wherein the apexes of the angle members of said steps possess an obtuse angle, whereby to provide a corresponding stairway in each direction of incline of the scaffold with respect to the horizontal.

6. Improvement according to claim 2 wherein said scaffold has a pair of substantially parallel vertical side walls and said foot supports are in the form of cross rungs extending transversely between said side walls.

7. Improvement according to claim 6 wherein said cross rungs are releasably hung onto said scaffold side walls to permit the reversal of the position thereof whereby to provide a corresponding ladder-way in each direction of incline of the scaffold with respect to the horizontal.

8. Improvement according to claim 2 wherein said scaffold has a vertical side face portion and said foot supports are in the form of side brackets releasably hung laterally onto said scaffold side face portion by bolts on said brackets having heads retainedly coacting with slots defined vertically in the scaffold side face portion.

9. Improvement according to claim 8 wherein said brackets are provided with transverse retaining edges to prevent foot slippage and to provide together with the particular bracket a receiving platform for retaining an auxiliary scaffold thereat.

10. Improvement according to claim 8 wherein each side bracket is provided with two longitudinally spaced apart bolts substantially at the same height and the corresponding side face portion of the scaffold is provided with two pairs of longitudinally sepaced apart slots, the slots of one pair being spaced from each other a slightly larger linear distance than the spacing between the slots of the other pair, and said one pair being spaced vertically above and laterally outwardly of said other pair, the distance between one slot of said one pair and the corresponding slot of the same pair being substantially equal to the distance between said one slot of said one pair and the diagonally opposite slot of the other pair disposed therebelow, whereby one of said bolts may be releasedly placed in said one slot of said one pair with the head thereof retainedly coacting with said slot while the other of said bolts may be placed in the corresponding slot of the same pair to maintain said said bracket parallel to the longitudinal axis of the scaffold and alternately in the diagonally opposite slot of the other pair disposed therebelow to maintain said side bracket at an incline to the longitudinal axis of the scaffold especially where said scaffold is at a corresponding incline with respect to the horizontal.

11. Improvement according to claim 10 wherein said side brackets include a pair of longitudinally spaced apart bolt-carrying strips for abutting disposition with said scaffold side face portion, a longitudinal plate hingedly attached to said strips for pivoting about a longitudinal axis, and a transverse brace member hingedly attached to the underside of said plate for pivoting about a transverse axis of pivot, whereby to provide a collapsible side bracket, such that when said brace member is substantially perpendicular to said plate brace member is also substantially perpendicular to said scaffold side face portion and in abutment therewith and maintains said plate in turn substantially perpendicular to said side face portion thus to provide said walk way, and such that when said brace member is pivoted to place the same in abutment with a corresponding portion of the underside of said plate, said plate in turn will pivot to place the same in abutment with a corresponding part of said side face portion thus to provide the collapse of said side bracket.

12. Improvement according to claim 2 wherein said scaffold has a vertical side face portion disposed in a vertical plane and includes a longitudinally extending top edge containing longitudinally spaced apart downwardly extending slot-like indentations defined in said top edge, and said foot supports are in the form of swivel panels occupying correspondingly said slot-like indentations, each said swivel panel being pivotally attached to the side face portion at the corresponding indentation for swiveling about a swivel axis inclined with respect to the longitudinal axis of the scaffold from a position in which said panel is disposed in said same vertical plane to a position in which said panel is disposed in another plane substantially perpendicular to said vertical plane and in turn perpendicular to said side face portion at an inclined angle with respect to the longitudinally extending top edge.

13. Improvement according to claim 12 wherein said indentations and said panels are of corresponding rectangular configuration and dimension, and a diagonal rod is fixedly secured to each panel and pivotally mounted at one longitudinal end of such rod to the upper outer edge of a respective slot-like indentation at a corresponding longitudinal end of such indentation and at the other longitudinal end of such rod to the lower inner edge of the same indentation at the other corresponding longitudinal end of such indentation.

14. Improvement according to claim 13 wherein locking means are provided for locking said panel in each of said positions.

15. Improvement according to claim 2 wherein said scaffold has a longitudinally extending vertical side face portion, said foot supports are in the form of separate spaced apart flat step elements movable to a position perpendicular to said side face portion and at an angle inclined with respect to the longitudinal axis of said side face, and auxiliary angle step means are removably positioned in the space between adjacent flat step elements to render the walkway more continuous, said angle step means defining intermediate steps along the walkway.

16. Improvement according to claim 15 wherein a shaft holder having a vertical bore is disposed on said side face portion in each said space and each said angle step means includes a vertical shaft receivable in a corresponding holder bore and releasable lock means for locking said shaft in said bore in a plurality of vertical positions for adjusting the height of said angle step means with respect to the adjacent flat step elements.

17. In a mining arrangement including a longitudinally extending mining conveyor adapted to rest normally upon a mine floor longitudinally along a mine face and having a conveyor path bounded by longitudinally extending side walls, one of said side walls having an elongated bounce plate means upwardly extending therefrom, said arrangement being slidably displaceable on such mine floor transversely toward and away from such mine face, the improvement for increasing the range of height which may be served by the mining arrangement which comprises an elongated scaffold mounted on the bounce plate means of the conveyor at an elevated level spaced from said conveyor, and a plurality of separate transverse foot supports spaced apart along the scaffold whereby to provide a walkway for workmen at an elevated level above the conveyor, said foot supports having support surface means thereon to hold workmen both when the scaffold is positioned horizontally and when the scaffold is positioned at an inclined angle with respect to the horizontal.

18. In a mining arrangement including a longitudinally extending mining conveyor adapted to rest normally upon a mine floor longitudinally along a mine face and having a conveyor path bounded by longitudinally extending side walls, one of said side walls having an elongated drive cable housing secured thereto and an elongated bounce plate means upwardly extending therefrom, said arrangement being slidably displaceable on such mine floor transversely toward and away from such mine face, the improvement for increasing the range of height which may be served by the mining arrangement which comprises

an elongated scaffold mounted on the conveyor at an elevated level spaced from the conveyor and attached to the bounce plate means and the drive cable housing thereof, a plurality of separate transverse foot supports spaced apart along the scaffold whereby to provide a walkway for workmen at an elevated level above the conveyor, said foot supports having support surface means thereon to hold workmen both when the scaffold is positioned horizontally and when the scaffold is positioned at an inclined angle with respect to the horizontal, and wall means extending upwardly from said bounce plate means to said walkway to close off said side wall side of the conveyor from overflow of mineral from the direction of the conveyor.

19. Improvement according to claim 18 wherein said scaffold includes seating means thereon to accommodate an auxiliary scaffold at a further elevated level spaced thereabove.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,295,632 January 3, 1967

Willy Heyer

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 3, line 16, for "therefor" read -- heretofore --; column 4, line 55, for "hide" read -- side --; column 7, line 36, for "grps" read -- grasp --; column 13, line 64, for "sepaced" read -- spaced --; column 14, line 2, for "said", second occurrence, read -- side --.

Signed and sealed this 3rd day of October 1967.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents