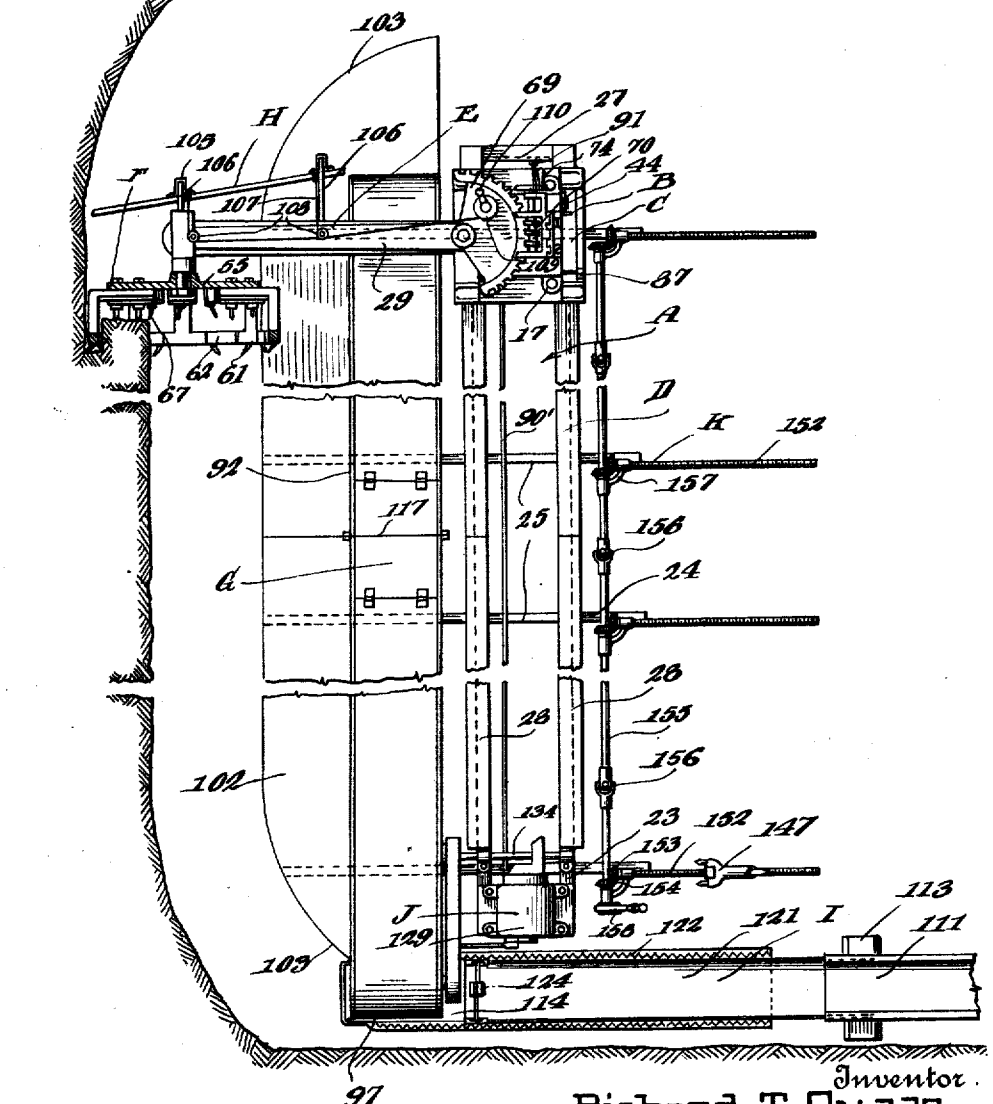
May 13, 1924. 1,493,701

R. T. QUAAS

COAL MINING MACHINE

Filed March 30, 1920 7 Sheets-Sheet 1

Fig. 1.



Inventor.

Richard T. Quaas

By Lancaster Allwine

Attorneys

May 13, 1924. 1,493,701

R. T. QUAAS

COAL MINING MACHINE

Filed March 30, 1920 7 Sheets-Sheet 2

Fig. 2.

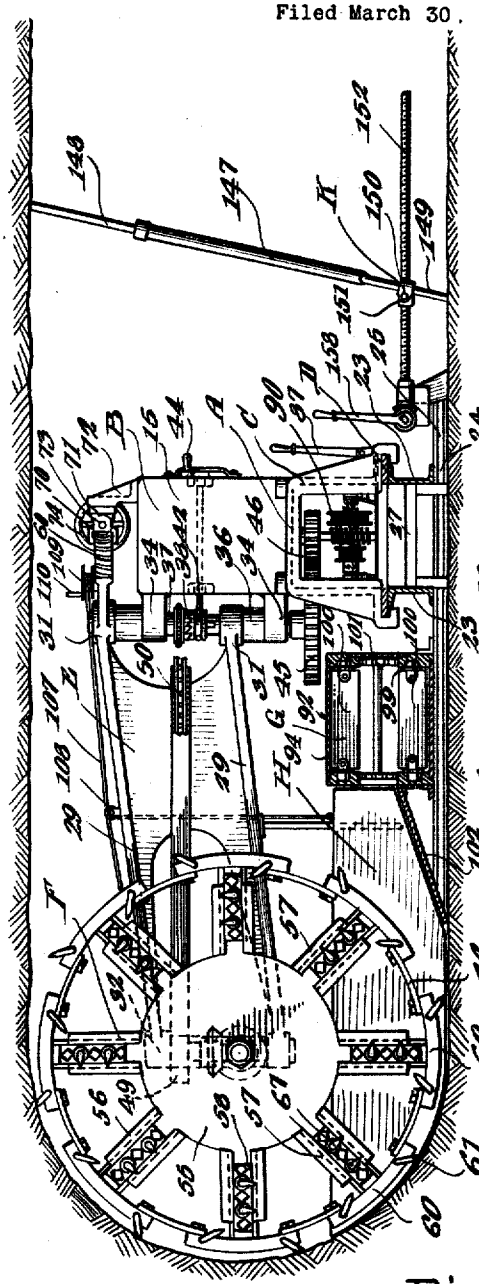
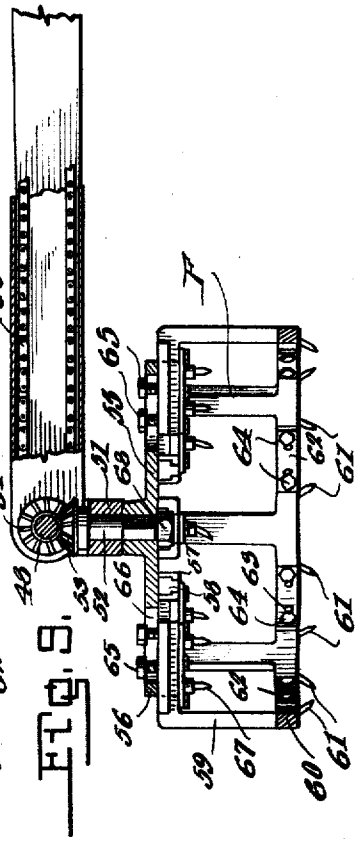


Fig. 3.



Inventor
Richard T. Quaas

By Lancaster & Allwine
Attorneys

May 13, 1924. 1,493,701

R. T. QUAAS

COAL MINING MACHINE

Filed March 30, 1920 7 Sheets-Sheet 3

Fig. 3.

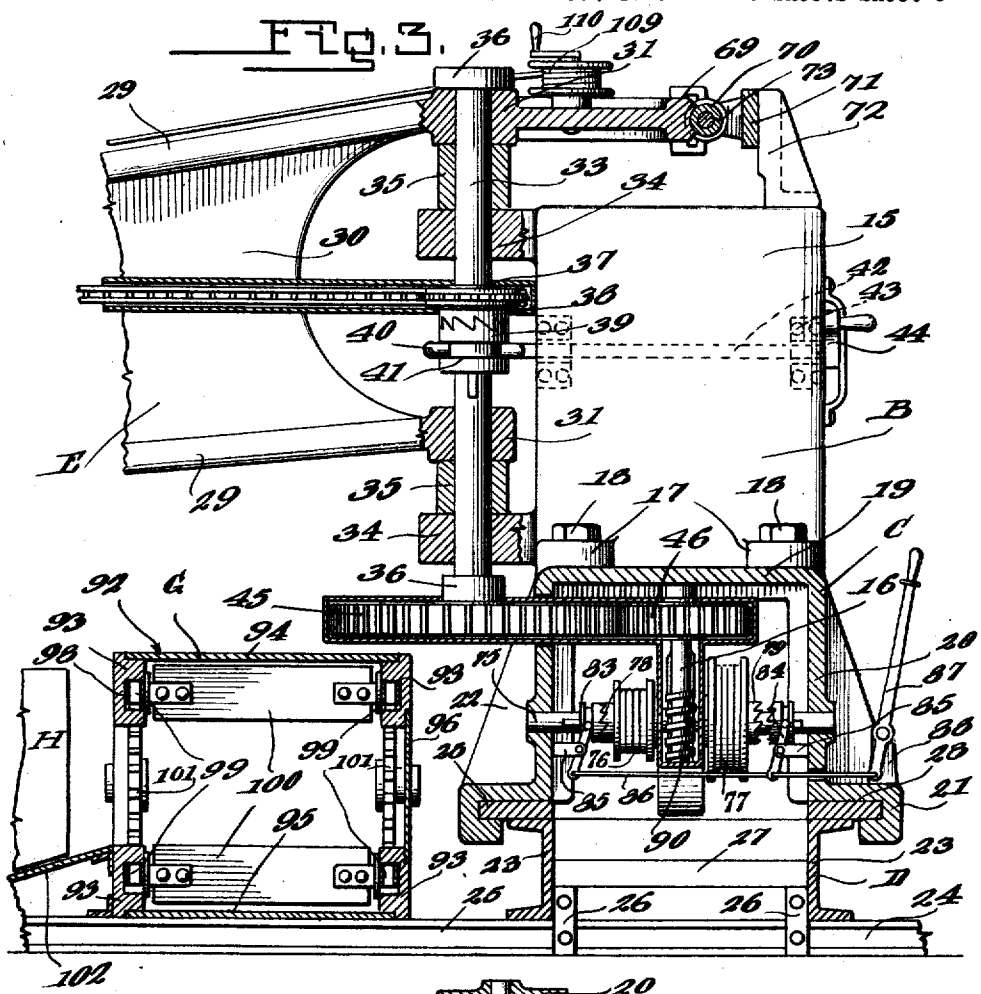
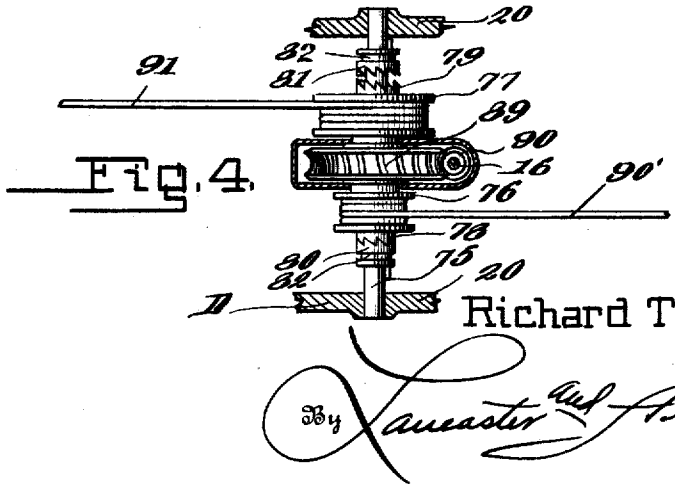


Fig. 4.



Inventor
Richard T Quaas

By Lancaster and Allwine
Attorneys

May 13, 1924.

1,493,701

R. T. QUAAS

COAL MINING MACHINE

Filed March 30, 1920

7 Sheets-Sheet 4

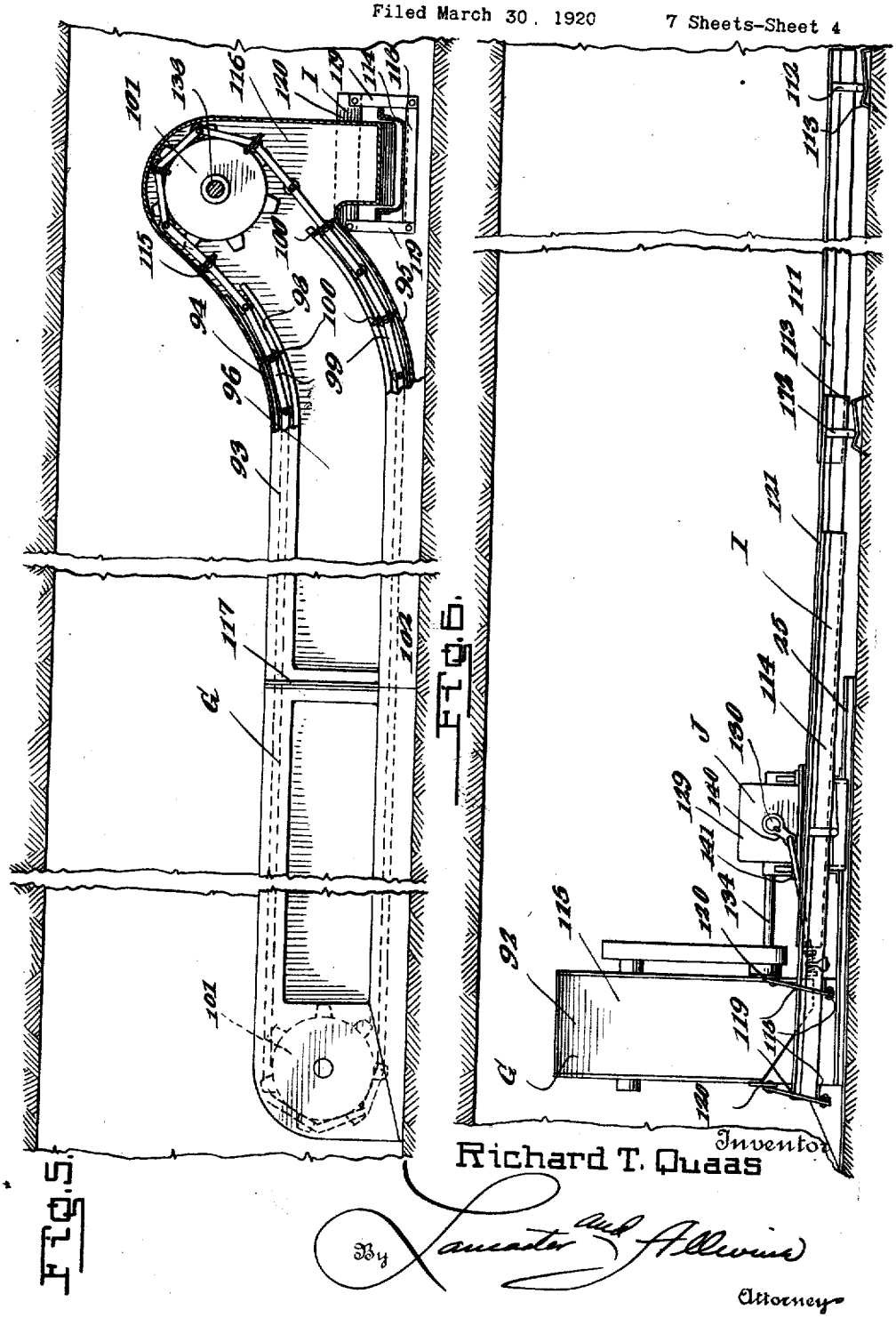


Fig. 5.

Fig. 6.

Inventor

Richard T. Quaas

By Lancaster and Allwine

Attorneys

May 13 , 1924. 1,493,701

R. T. QUAAS

COAL MINING MACHINE

Filed March 30 . 1920 7 Sheets-Sheet 5

Fig. 7.

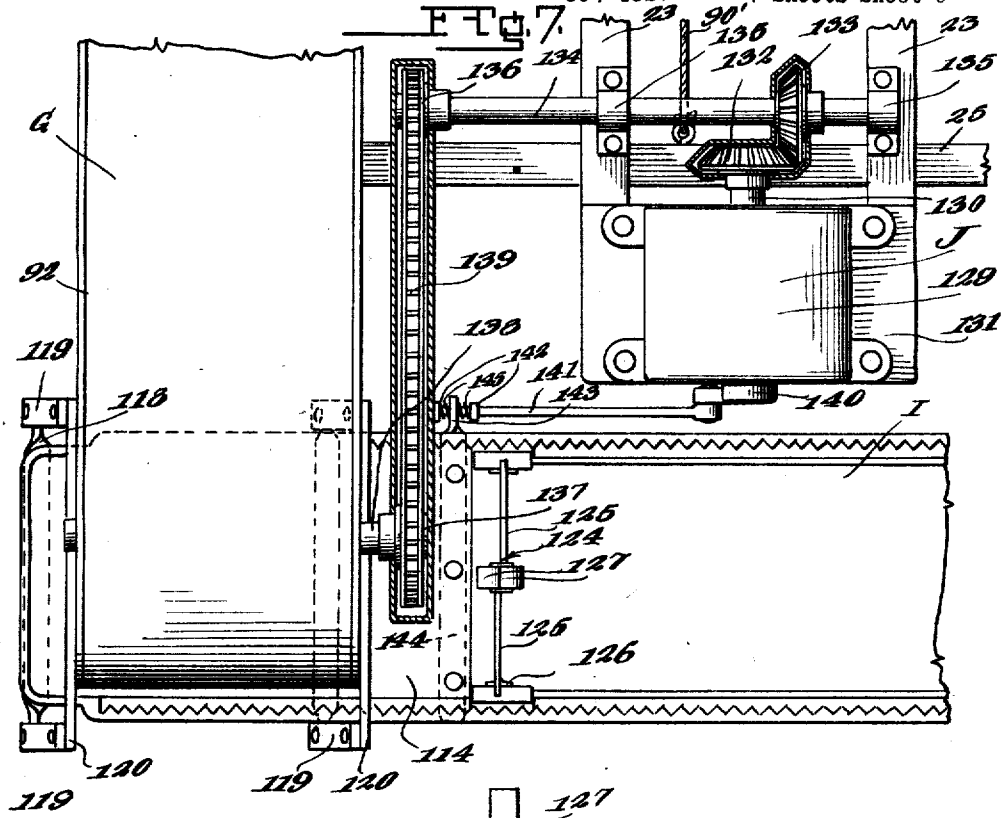
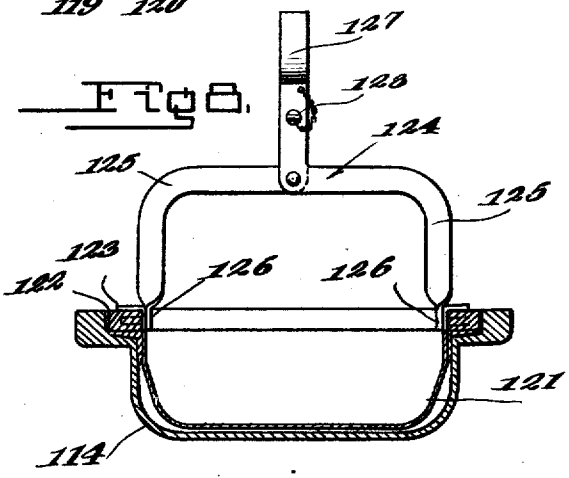


Fig 8.



Inventor

Richard T. Quaas

By Lancaster and Allwine

Attorneys

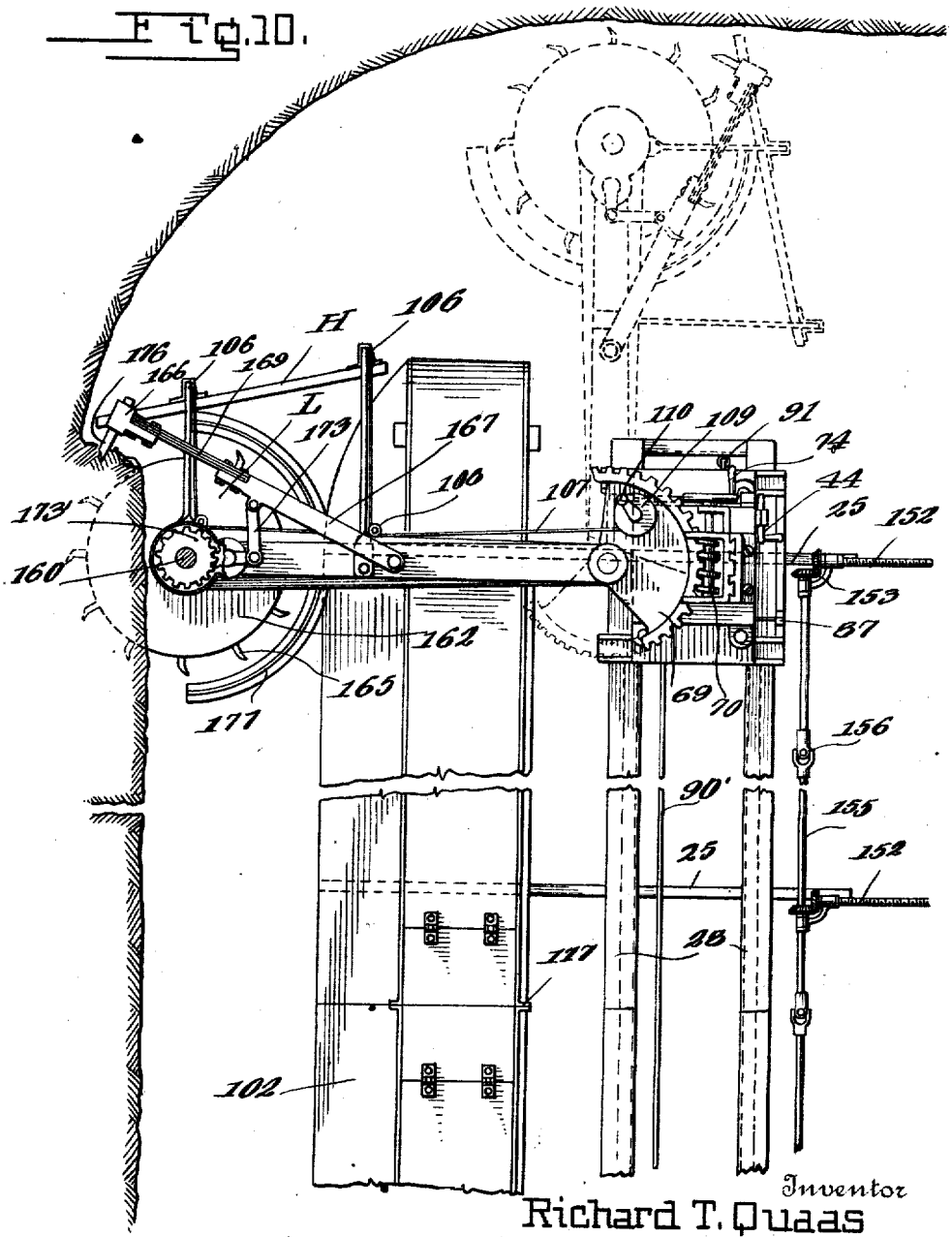
May 13, 1924. 1,493,701

R. T. QUAAS

COAL MINING MACHINE

Filed March 30, 1920 7 Sheets-Sheet 6

Fig. 10.



Inventor

Richard T. Quaas

By Lancaster and Allwine

Attorneys

May 13, 1924. 1,493,701

R. T. QUAAS

COAL MINING MACHINE

Filed March 30, 1920 7 Sheets-Sheet 7

Fig. 11.

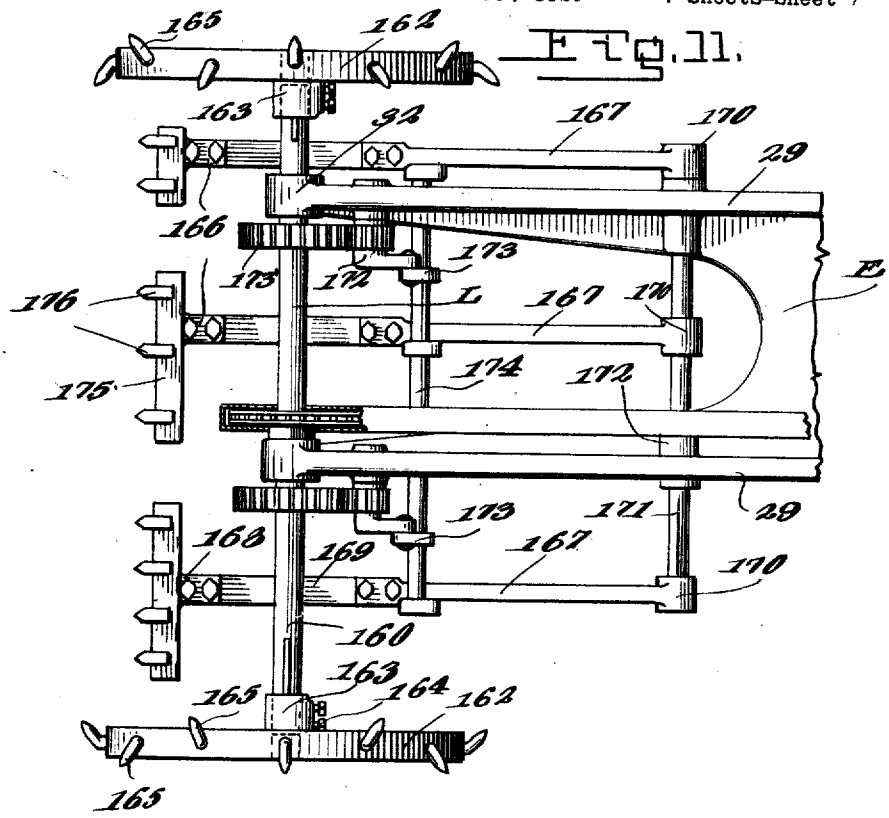
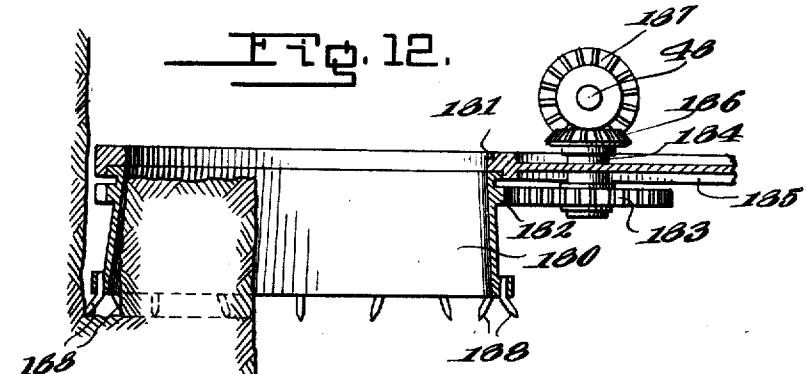


Fig. 12.



Inventor

Richard T. Quaas

By Lancaster and Allwine

Attorneys

Patented May 13, 1924. 1,493,701

UNITED STATES PATENT OFFICE.

RICHARD TH. QUAAS, OF NEW YORK, N. Y.

COAL-MINING MACHINE.

Application filed March 30, 1920. Serial No. 369,921.

To all whom it may concern:

Be it known that I, RICHARD T. QUAAS, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Coal-Mining Machines, of which the following is a specification.

This invention relates to coal mining machines, and the primary object of the invention is to provide an improved machine for mining coal and automatically delivering the coal to the pit cars, and thereby obviate the laborious and expensive methods now in vogue.

Another object of the invention is to provide an improved coal mining machine especially adapted for use in cutting coal from the entire face or fall of a coal seam, in a room or stall, and for delivering the cut coal to the pit cars at the entries or headings.

A further object of the invention is the provision of a coal mining machine embodying an improved type of cutter and means for automatically moving the cutter along the face of the coal seam as the coal is being cut.

A further object of the invention is the provision of means for swinging the cutter in an arc of a circle at the sides of the machine, so as to effectively finish the cut at the sides of the room or stall.

A further object of the invention is the provision of a cutter for the coal which is adjustable within certain limits, so that the same can be regulated in size according to the height of the coal seam.

A further object of the invention is the provision of a coal mining machine embodying a rotary cutter arranged to move laterally of the room in which the coal is being dug, the machine having an improved means adapted to simultaneously rotate the cutter and move the same along the face of the coal seam as the coal is being dug.

A still further object of the invention is the provision of an improved means carried by the cutter and arranged in rear thereof for scraping the coal cut by the cutter into a laterally arranged conveyor carried by the machine.

A still further object of the invention is the provision of means permitting the scraper to be lifted above the surface of the floor of the room when the cutter is being returned to its initial starting position.

A still further object of the invention is the provision of an improved means for receiving the coal from the cutter and scraper and delivering the same to a longitudinally extending conveyor arranged to transport the coal to the pit cars arranged at the entries.

A still further object of the invention is the provision of an improved means for simultaneously operating the laterally extending conveyor and the longitudinally extending conveyor.

A still further object of the invention is the provision of an improved means for shifting or bodily moving the whole machine when it is desired to position the cutter in place for a new cut.

A still further object of the invention is the provision of an improved coal mining machine especially adapted for use in cutting coal from the face of a seam in a room or for digging headings which is durable and efficient in use, one that is comparatively simple and easy to manufacture, and one which can be placed upon the market at a reasonable cost.

With these and other objects in view, the invention consists in the novel construction, arrangement and formation of parts as will be hereinafter more fully described, claimed and illustrated in the accompanying drawings, forming a part of this specification, in which drawings:

Figure 1 is a horizontal section through a room of a mine showing a plan view of the improved coal mining machine, parts of the cutter being shown in section.

Figure 2 is a vertical transverse section through the improved machine showing the cutter in side elevation.

Figure 3 is an enlarged fragmentary vertical section through the improved machine illustrating the means for operating the cutter and for moving the cutter laterally of the machine.

Figure 4 is an enlarged fragmentary horizontal section through the machine illustrating the means for moving the cutter laterally of the machine.

Figure 5 is an elevation of the laterally

extending conveyor showing parts of the same in section, the longitudinally extending conveyor being shown in cross section.

Figure 6 is an end elevation of the laterally extending conveyor and side elevation of the longitudinally extending conveyor. showing the means for operating the same.

Figure 7 is an enlarged fragmentary horizontal section through the machine illustrating the means for actuating the improved conveyors.

Figure 8 is an enlarged detail transverse section through the longitudinally extending conveyor illustrating the means for connecting the extensible section of the conveyor with the rigid section of the conveyor.

Figure 9 is a fragmentary horizontal section through the cutter.

Figure 10 is a horizontal section through a room of a coal mine illustrating a top plan view of a machine embodying a modified form of coal cutter.

Figure 11 is an enlarged side elevation of the modified form of the cutter or digger illustrating the operating means therefor.

Figure 12 is a horizontal section through a further modified type of cutter.

Referring to the drawings in detail, wherein similar reference characters designate corresponding parts throughout the several views, the letter A generally indicates the improved coal mining machine, which includes the motor B arranged on the supporting bracket C slidably mounted on the lower supporting frame D, the swinging boom E, the cutter F, the lateral conveyor G, the scraper H, the longitudinally extending conveyor I, the lateral and longitudinal conveyor operating means J, and the shifting means K.

The motor B is of the electric type and may be of any preferred make or size, which is practical for the purpose and includes the usual casing 15, and armature shaft 16. The lower edge of the casing 15 is provided with outwardly extending attaching ears 17 which are bolted or otherwise secured as at 18 to the upper surface of the supporting bracket C.

The supporting bracket C is of substantially inverted U-shape in cross section and includes the top plate or bight portion 19 and the depending side legs 20, which carry outwardly extending depending guide flanges 21, for a purpose which will be hereinafter more fully described. The outwardly extending depending guide flanges 21 are braced by outwardly extending webs 22 carried by the legs 20.

The lower supporting frame D includes a pair of spaced parallel channel beams 23, which extend transversely across the room of the coal mine and across the lower frame 24, which includes a plurality of spaced longitudinally extending bars 25, which form runners on which the machine A is shifted bodily over the floor of the mine towards the face of the coal seam. The spaced channel beams 23 are bolted or otherwise secured to the longitudinally extending bars 25, and additional sections of strap iron 26 are provided, which are bolted to the channel beams and bars 25. The terminals of the beams 23 are connected together by means of cross braces 27. The upper faces of the spaced laterally extending beams 23 carry tracks 28 which are engaged by the outwardly extending depending guide flanges 21, and the supporting bracket C with the motor B is adapted to be shifted over the track 28, and laterally of the machine A and the room of the mine for a purpose which will be hereinafter more fully described. The lower frame D as shown is arranged relatively near the rear ends of the spaced bars 25, for a purpose which will hereinafter more fully appear. The boom E which carries the cutter F is mounted on the casing 15 of the motor B in such a manner that the same can swing in an arc of a circle, so that the cutter F may be swung to the side of the machine and start the cut in the face of the seam. The boom E includes an upper and a lower arm 29, which are connected by a vertically extending rib or web 30. The terminals of the superposed arms 29 carry bearings 31 and 32 and the bearings 31 are adapted to receive a vertically disposed shaft 33. The shaft 33 is carried by outwardly extending ears or bearings 34 formed on the inner face of the casing 15 of the electric motor B. Suitable spacing washers or collars 35 are interposed between the bearings 31 and the ears or bearings 34. The shaft 33 adjacent to the terminals thereof carries collars 36 which are adapted to engage the opposite faces of the bearings 31 and ears 34. This absolutely precludes any vertical movement of the shaft in the bearings. A sprocket wheel 37 is rotatably mounted upon the shaft 33 intermediate its ends, and has formed integral therewith a clutch segment 38 which is adapted to be engaged by the sliding clutch section 39 which is splined or feathered on the shaft 33. The movable clutch section 39 is adapted to move into and out of engagement with the clutch section 38 carried by the sprocket wheel 37 by a forked member 40 which is positioned in an annular groove 41 formed in the movable clutch section. The fork 40 is formed on the inner end of the transversely extending shaft 42, which is rotatably mounted in suitable bearings 43, bolted or otherwise secured to the outer face of the casing 15 of the motor B. The opposite end of the rod 42 has a hand crank 44 secured thereto. Thus it can be seen that by moving the crank 44 the movable clutch section 39 will be brought

into or out of engagement with the rigid clutch section 38 carried by the rotatable sprocket wheel 37. The extreme lower end of the vertical shaft 33 has keyed or otherwise secured thereto the relatively large gear wheel 45, which meshes with a relatively small gear wheel 46, which is keyed or otherwise secured to the armature shaft 16 of the motor B. Thus when the motor B is in operation, the shaft 33 will be operated therewith. The bearings 32 carried by the outer terminals of the arms 29 of the boom E rotatably supports the vertically disposed shaft 48 which has keyed thereto intermediate its ends a sprocket wheel 49 around which is trained the sprocket chain 50. The sprocket chain 50 is also trained around the sprocket wheel 37, so that upon the rotation of the shaft 33, the shaft 48 will be rotated therewith. The bearings 32 also carry the cross brace 51 which rotatably supports the shaft 52 for the cutter F. The inner end of the shaft 52 has keyed thereto the bevelled gear 53 which meshes with the bevelled gear 54 keyed to the shaft 48.

The cutter F which is particularly adapted for cutting soft coal includes a hub 55 carrying the radially disposed arms 56, which have formed on their side edges inturned guide flanges 57. The guide flanges 57 slidably support the T-shaped bars 58, the outer terminals of which carry the inwardly extending arms 59. Each of the arms 59 has secured thereto the arcuate rim sections 60, which have connected thereto the oppositely directed cutting teeth 61. The rim sections 60 are connected together by means of arcuate pieces of strap iron or the like 62 which are provided with a plurality of equi-distantly spaced openings 63, for the bolts 64. The provision of the plurality of openings 63 permits of the adjusting of the rim sections in relation to each other when the cutter is being adjusted to the size of the coal seam. The T-shaped bars 58 are adjustably held in position on the arms 56 by means of bolts 65, which are mounted in slots 66 formed in the arms 56. As clearly shown in Figure 1 of the drawings, the cutter F moves across the face of the coal seam and the cutting teeth 61 dig an arcuate channel in the coal face, which breaks the coal away and tends to throw the same toward the machine A. When necessary or desirable the bars 58 may be provided with inwardly extending teeth 67 which form means for breaking the coal away as the channel is being dug by the oppositely directed teeth 61. The teeth 61 extend beyond the inner and outer faces of the rim sections 60 so as to cut a channel relatively wider than the arms 59 and thereby prevent the binding of the arms in the channel.

The outer end of the shaft 52 extends through the hub 55 of the cutter F and is detachably secured thereto by a suitable nut or the like 68. Owing to the manner of mounting the arms 29 on the shaft 33, the boom E is permitted to swing in an arc of a circle as clearly shown in Figure 1 of the drawings. The swinging of the boom E in an arc of a circle permits a machine of less width than the room or stall to be used, and allows the finishing up of the sides of the room. In the initial positioning of the boom E the same is swung parallel to the beams 23 of the supporting structure D and is gradually moved around until the same becomes at right angles to the beam at which time the boom is moved laterally across the room and the entire face of the coal seam is acted upon by the cutter F. The means for swinging the boom E on the shaft 33 consists of a sector rack 69, which is secured to or formed integral with the upper bearing 31 of the arm 29 of the boom E. The sector rack 69 has meshing therewith a worm 70, which is rotatably carried by a bracket 71 adjustably mounted on the supporting bracket 72 bolted or otherwise secured to the upper surface of the casing 15 of the electric motor B. One end of the shaft 73 on which the worm 70 is secured has mounted thereon the operating hand wheel 74. Thus it will be seen that when the hand wheel 74 is rotated, the boom E will be swung on its pivot.

To move the boom E and the cutter F transversely of the machine A and across the room or stall a transversely extending shaft 75 is rotatably mounted in suitable bearings carried by the inverted U-shaped supporting bracket 20 and this shaft has rotatably mounted thereon the relatively small and relatively large drums 76 and 77. The outer faces of the drums 76 and 77 have rigidly secured thereto the rigid clutch sections 78 and 79 which are adapted to be engaged by the movable clutch sections 80 and 81, which are splined or feathered on the shaft 75. Each of the clutch segments 80 and 81 are provided with annular grooves 82 in which are rotatably mounted forked members 83 and 84. The forked members 83 and 84 are pivotally mounted intermediate their ends upon suitable supporting brackets 85 which are secured to the inner faces of the legs 20 of the supporting frame D. The outer ends of the forks 83 and 84 have pivotally connected thereto the connecting rod 86 which has its outer terminal pivotally secured to the lower end of an operating lever 87 which is pivotally mounted intermediate its ends upon a supporting bracket 88. By operating the lever 87 one of the sliding clutch sections 80 or 81 may be moved into engagement with one of the rigid clutch sections 78 or 79, while the other slidable clutch section is moved out of engagement with the other

rigid clutch section. The sliding clutch sections 80 and 81 may be held in a neutral position out of engagement with both of the rigid clutch sections 78 and 79. The shaft 75 intermediate the drums 76 and 77 has rigidly secured thereto the worm wheel 89, which has meshing therewith the worm 90 which is secured to the armature shaft 16 of the motor B directly below the relatively small gear wheel 46. The relatively small drum 76 has wound thereon a cable 90′ which has its opposite end secured to the frame D adjacent to the outer end thereof. Thus it will be seen that when the movable clutch section 80 is moved into engagement with the movable clutch section 78, the cable 90′ will be wound upon the drum 76 and thus the frame D carrying the motor B and the boom E and cutter F will be slowly drawn over the upper surface of the tracks 28. A cable 91 is wound around the relatively large drum 77 and has its terminal secured to the opposite end of the frame D from the cable 90′ and when it is desired to move the motor B with the boom E and cutter F to its initial position, the lever 87 is operated so as to move the movable clutch section 80 out of engagement with the rigid clutch section 78 and move the sliding clutch section 81 into engagement with the rigid clutch section 79, which will rotate the drum 77 and wind the cable 91 thereon and slide the frame D to its original position. The drum 77 is formed relatively larger than the drum 76, so that the machine, i. e., the motor B, the boom E and the cutter F will be returned to its initial position at a relatively high rate of speed, and when the cutter is in operation, the same will be drawn relatively slowly over the upper surface of the track 28. It will of course be obvious that when the two drums are mounted upon the shaft 75 only one is engaged by its clutch at any time and therefore the cable may be wound upon either one of these drums and the second drum will be free to rotate so that the cable can unwind at the proper rate of speed. By the provision of the worm 90 and the gear wheel 46 on the armature shaft 16 of the motor B, the cutter F will be rotated and slid laterally simultaneously.

Arranged directly in front of the lower supporting frame D and parallel therewith is the lateral conveyor G which includes a casing 92, which is secured to the upper surface of the runner bars 25. The casing 92 of the lateral conveyor G includes upper and lower pairs of spaced beams 93, which support the upper wall 94, the bottom wall 95, the rear wall 96 and the side walls 97. The front wall is left open, as clearly shown in Figure 3 of the drawings so that the coal thrown by centrifugal force from the cutter F will be permitted to enter into the housing or casing 92. The inner faces of the upper and lower pairs of longitudinally extending beams 93 are provided with guide grooves 98, in which are slidably mounted the sprocket chains 99. The sprocket chains 99 have secured thereto the transversely extending flights or scraper blades 100, and these sprocket chains 99 are trained around sprocket wheels 101 rotatably carried by the housing 92 adjacent to the terminals thereof. Thus it will be seen that when the coal is brought into the housing 92, the flights or blades 100 of the lower run of the conveyor will engage the coal and move the same toward one end of the conveyor. An inclined platform 102 is secured to the front face of the laterally extending conveyor G and extends from the surface of the room or stall to the open front portion of the housing 92. The terminals of the runners 25 are bevelled at this point so as to conform to the inclination of the platform 102.

The terminals of the platform 102 are curved arcuately as at 103 for a purpose which will be hereinafter more fully described.

The scraper blade H is carried by the boom E and arranged directly in rear of the cutter F and is adapted to engage all of the loose coal cut by the cutter and push the same up the inclined platform 102 and into the housing 92. The scraper blade H is arranged at an incline to the boom E as clearly shown in Figure 1 of the drawings so that the cut coal will be gradually moved up the platform and into the housing 92. The scraper blade H carries brackets 105, which are slidably mounted on depending arms 106, carried by the boom E. The arms 106 are spaced from each other so that the scraper blade will be supported adjacent to each end thereof. When the boom E and cutter F have been moved to the end of a cut in the room or stall and when it is desirous to move the boom E and the cutter F to its initial position, the blade H is raised above the upper surface of the floor of the room, so that any loose lumps of coal which have not been moved into the casing 92 will not be engaged by the scraper on its return movement and pushed to the far side of the room. The means for raising the scraper blade H consists of cables 107, which are trained around suitable guide pulleys 108 carried by the boom. The cables 107 are wound around a drum 109 rotatably mounted on the upper surface of the sector rack 69 and this drum is provided with a hand crank 110. It can be seen by moving the hand crank 110 the cables 107 can be wound off or on the drum and thus the blade can be raised or lowered on the arms 106.

Arranged at one end of the lateral conveyor G is the longitudinally extending con-

veyor I, which is adapted to convey the coal cut from the lateral conveyor G to the entries or headings and to the pit cars. The longitudinally extending conveyor I consists of a plurality of troughs 111, which are preferably formed of sheet metal or the like of substantially U-shaped form in cross section. Owing to the resiliency of the sheet metal, the sides of the troughs may be readily compressed so that the troughs may be placed together. In joining the troughs together, the same may be bolted or secured together in any manner that may be desired, and the troughs carry depending arms 112, which are rockably supported by the concaved upper surface of the supporting brackets or cross ties 113, which are secured to the floor of the room or stall. A trough section 114 is permanently carried by the outer end of the housing 92 for the laterally extending conveyor G. One end of the housing 92 of the laterally extending conveyor G is inclined upwardly as at 115 and terminates in a hopper 116 below which is disposed the permanently carried trough section 114. The laterally extending conveyor G, the inclined platform 102 and the channel beams 23 and the tracks 28 of the lower supporting structure D can be made in sections and joined together as shown at 117. This facilitates the transportation of the machine and the positioning of the same in a room or stall of the mine. Machines used simply for digging headings or entries may be made in one section if so desired. The permanently carried section or trough 114 carries adjacent to its outer end a pair of parallel spaced angle irons 118, which extend transversely across the trough and the same has secured to their terminals the upwardly extending flexible arms 119. The arms 119 have their upper ends attached to braces 120 secured to the sides of the housing 92 of the laterally extending conveyor G. This trough section 114 is adapted to be oscillated back and forth so that the coal falling thereon from the hopper 116 will be slid down the longitudinally extending conveyor to the pit car. After each cut is made from the face of the coal seam, the whole machine is bodily moved over the floor of the room by the means K which will be hereinafter more fully described, and as the machine is moved bodily over the floor of the room it is necessary to lengthen the longitudinally extending conveyor I. This is accomplished by providing a telescoping section 121, which is adapted to fit in the permanently carried section 114. In placing the telescoping section 121 in the permanently carried section 114, the sides thereof are flexed inwardly. The inner faces of the permanently carried section 114 adjacent to its upper edge is provided with a plurality of equi-distantly spaced teeth 122, which extend below the entire length of the section. The telescoping section 121 has formed on its outer side edges adjacent to the inner end thereof the teeth 123, which are adapted to engage the teeth 122. To firmly hold the teeth 123 formed on the outer side edges of the telescoping section 121 in engagement with the teeth 122, which are formed on the permanently carried section 114, a clamp structure 124 is provided, which includes a pair of pivotally connected arms 125, which carry feet or jaws 126, which are adapted to engage the inner faces of the telescoping section 121. The upper ends of the arms 125 carry operating handles 127, and by moving the handles, the feet or jaws 126 may be brought into or out of engagement with the side of the telescoping section 121. When the handles 127 are in direct alignment with each other, the jaws or feet 126 are spread so as to force the teeth 123 into engagement with the teeth 122, and the same are held in this position by means of a removable pin 128, which is adapted to engage in the aligned openings formed in the arms 125.

The operating means J for the laterally extending conveyor G and the longitudinally extending conveyor I includes a single motor 129, which may be of any type, and the armature shaft 130 thereof extends outwardly from both sides thereof. The motor 129 is bolted or otherwise secured to a suitable bed plate 131 connected to the upper surface of the channel beams 23 at one end thereof. One end of the armature shaft 130 has keyed or otherwise secured thereto a bevelled gear wheel 132 which meshes with a bevelled gear 133 keyed to a shaft 134 rotatably mounted in suitable bearings 135 secured to the upper surface of the channel beams 23. The inner terminal of the shaft 134 has keyed thereto a sprocket wheel 136 which is in direct alignment with the sprocket wheel 137 keyed to a shaft 138, which extends transversely through the housing 92 of the laterally extending conveyor G. This shaft 138 supports the sprocket wheels 101 arranged at one end of the housing. The sprocket wheels 136 and 137 have trained around the same the sprocket chain 139. Thus it will be seen that when the motor 129 is in operation the shaft 138 will be rotated therewith, thus moving the conveyor through the housing 92. The opposite end of the armature shaft 130 of the motor 129 has a crank arm 140 secured thereto which in turn carries the pitman 141. The outer end of the pitman 141 has secured thereto a pair of spaced nuts 142, and an ear 143 carried by the transversely extending bar 144 bolted or otherwise secured to the permanently carried section 114 of the longitudinally extending conveyor I is arranged between the

nuts 142. Between the nuts 142 and the ear 143 are arranged the springs 145 which are coiled around the rod 141. Thus it will be seen that when the motor 129 is in operation the permanent section 114 of the conveyor will be oscillated back and forth which in turn will transmit its motion to the other sections 111 of the conveyor. Thus the laterally extending conveyor G and the longitudinally extending conveyor I are operated simultaneously. Owing to the spring connection 145 of the pitman rod 141 with the permanently connected section 114 all sudden jars and strains are taken off of the pitman rod and permanently carried section 114.

All of the moving portions of the machine such as gear wheels, sprockets wheels and chains are adapted to be housed in suitable housings or casings as clearly shown in the drawings. It is to be understood that any particular type of casing or housing may be used that is desirable or practical according to the character of the moving parts to be housed. The means K for moving the machine bodily over the floor of the room of the mine when a new cut in the face of the seam is desired to be made includes a plurality of equi-distantly spaced anchors or jacks 147 each of which includes an adjustable pointed bar 148 for digging into the roof of the mine and the forked pointed lower members 149 for digging into the floor of the mine. Each of the jacks 147 have collars 150 secured thereto which pivotally support nuts 151 in which are threadably mounted the longitudinally extending screws 152. The inner terminals of the screws 152 carry bevelled gears 153, which mesh with the bevelled gears 154 secured to the transversely extending shaft 155. The transversely extending shaft 155 is provided with a plurality of universal joints 156. These joints also permit the shaft to be taken apart when desired. The shaft 155 is rotatably supported by bearings 157 which are carried by the tracks or runners 25 One end of the shaft 155 has secured thereto a ratchet lever 158. By operating the ratchet lever 158 back and forth, the shaft 155 is adapted to be rotated by a step-by-step movement, which in turn will rotate the screws 152. This will thread the screws 152 out of the nuts 151 and thus move the machine bodily over the floor of the mine. The anchors or jacks 157 also form means for preventing creeping movement over the floor of the mine when the cutter is in operation.

In Figures 10 and 11 is illustrated a form of cutter L which is particularly adapted for use in cutting hard coal and this cutter includes a vertically extending shaft 160 which is rotatably mounted in the bearings 32 formed on the terminals of the arms 29 of the boom E. The outer terminals of the shaft 160 has feathered thereon the wheels 162. The wheels 162 carry inwardly extending hubs 163 and it can be seen that owing to the formation of the hub the wheels 162 may be extended beyond the terminals of the shaft. The hubs are secured in adjusted position on the shaft 160 by set screws 164. The rims of the wheels 162 carry the outwardly extending cutting teeth 165. These teeth extend beyond the faces of the wheels so that the channels being cut thereby will be of greater width than the wheels so that the wheels will not bind therein. These wheels are adapted to cut channels adjacent to the upper and lower surfaces of the room, as it has been found by experience that this is the preferred and most practical method of breaking the coal away from the face of the coal seam as the coal adheres to the mine at these points. By adjusting the wheels, any height of coal seam can be acted upon and the cutters can also be adjusted according to the impurities found in the coal. In some instances, it has been found necessary to provide pickers to break the coal away from the face between the channels being dug and to provide for this contingency oscillating picks 166 are provided. The picks 166 include shanks 167 and heads 168. These shanks and heads are connected by superposed leaf springs 169, so as to prevent the breaking of the picks when hard impurities are found in the coal. The shanks 167 have their inner ends provided with bearings 170 which are rotatably mounted on a shaft 171 which is mounted in suitable bearings 172 formed on the arms 29 of the boom E. The forward ends of the arms in advance of the shaft 171 also carry rotatable cranks 172, which carry links 173, which are connected to the shanks 167 intermediate their ends. The cranks 172 are operatively connected to the shaft 160 by intermeshing gear wheels 173'. The shaft 160 is rotated the same as the shaft 48 in the form shown in Figures 1 and 2 of the drawings. The heads 168 of the picks 166 carry cross heads 175, which in turn carry the picking teeth 176. The connecting links 173 are connected to a shaft 174 which is connected to the shanks 167 of the pick. Thus it will be seen that when the shaft 160 is rotated from the motor B the picks will be oscillated back and forth and brought into engagement with the face of the coal and break the same off.

If so desired any suitable or preferred type of shields 177 may be provided for the cutters so as to prevent the throwing of the coal all over the room. In Figure 12 is illustrated a still further modified form of cutter which is particularly adapted for mining very soft coal such as lignite and in

this form the cutter includes a drum 180 which is rotatably carried by an annular guide ring 181, which is carried by the boom E. The outer periphery of the drum 180 has secured or formed integral therewith a ring gear 182 which has meshing therewith a gear wheel 183. This gear wheel 183 is secured to a counter shaft 184 which is rotatably carried by the bracket 185 which supports the ring 181. The inner end of the shaft 184 has secured thereto a bevelled gear 186 which is adapted to mesh with the bevelled gear 187 which corresponds to the gear 54 on the shaft 58. The outer edge of the drum is provided with oppositely directed cutting teeth 188 which are adapted to cut an arcuate channel in the coal seam and tear the coal therefrom.

In operation of the improved coal mining machine, the machine A is moved into the room or stall of a coal mine, and the anchor or jacks 147 are adjusted so as to hold the machine against movement. The wheel 74 is then turned so as to swing the boom E parallel with the tracks 28 and position the cutter parallel with the side walls of the room. The motor is then started and the hand wheel 74 is gradually turned so as to feed the cutter F in a circle until the boom is positioned at right angles to the track 28. The scraper blade H travels around the width of the room and forces the lumps of coal over the platform 102 and towards the open front of the housing 92 of the lateral conveyor G. The lever 87 is then operated so as to move the movable clutch section 82 into engagement with the rigid clutch section 78 carried by the drum 76. This will cause the cable 90′ to be wound upon the drum 76 and pull the supporting frame G over the upper surface of the tracks, which moves the cutter F over the face of the seam as the same is rotated and thus effectively cut a layer of coal from the entire face of the seam. When the cutter reaches the end of the seam or near the side of the room, the hand wheel 74 is again rotated so as to swing the boom E and thus permit the cutter F to finish the cut at the opposite side of the room or stall. As the cutter is moved across the face of the room the scraper H follows directly behind the same and pushes the coal up the platform 102 into the lateral conveyor G as heretofore described. When the layer of coal has been broken away from the face of the seam and it is desired to position the cutter for a new cut, the crank 110 of the drum or windlass 109 is rotated so as to move the scraper blade H up on the arms 106. This will move the scraper H above the floor of the mine and the lever 87 is operated so as to move the clutch section 80 out of engagement with the clutch section 78 and move the clutch section 81 into engagement with the clutch section 79. This will wind the cable 91 up on the drum 77 and pull the supporting standard or frame D back to its initial position. The boom E is then swung parallel with the tracks 28 as heretofore described and the lever 158 is actuated so as to rotate the screws 152, which will push the whole machine bodily into the room toward the face of the coal seam so that a new cut can be made.

As the coal is forced up the platform 102 and into the casing 92 the flights or scrapers will engage the coal and force the same from the casing toward the hopper 116 where the same will drop into the longitudinally extending conveyor I. The longitudinally extending inclined conveyor I is oscillated by the means as hereinbefore described, which will move the coal down the longitudinally extending conveyor toward the entries or headings to the pit cars.

From the foregoing description, it can be seen that an improved coal mining machine is provided, which is especially adapted for cutting or digging coal from the face of a coal seam in a room or the like and automatically transporting the cut coal to the entries to the pit cars.

Changes in details may be made without departing from the spirit or scope of the invention; but,

I claim:

1. In a coal mining machine a transversely extending frame, a conveyor arranged on the frame, a boom mounted for sliding movement in the rear of said conveyor, a cutter carried by the outer end of the boom, and means carried by the boom for moving the coal out towards the conveyor.

2. In a coal mining and loading machine, a frame, tracks carried by the frame arranged transversely thereof, a transverse conveyor carried by the frame in front of said tracks, an inclined platform arranged in front of said transverse conveyor, a second frame slidably mounted on the tracks, a boom secured to said second frame, a cutter rotatably carried by said boom, means for rotating the cutter and a scraper arranged in rear of said cutter and arranged to engage said platform.

3. In a coal mining and loading machine, a frame, a pair of spaced transversely extending tracks carried by the frame, a support slidably mounted on the frame, a motor secured to the support, a hinged boom carried by the motor, a cutter carried by the boom, means operatively connecting the cutter with the motor, a shaft carried by the support, means for rotating the shaft from the motor, a relatively small drum rotatably mounted on the shaft, a relatively large drum rotatably mounted on the shaft, a cable having one end secured to the relatively small drum and its opposite end

secured to one end of the frame, a second cable having one end secured to the relatively large drum, and its opposite end to the opposite end of the frame, the drums having rigid clutch sections secured thereto, movable clutch sections feathered on said shaft, and means for simultaneously operating said movable clutches.

4. In a coal mining and loading machine, a frame, a support on the frame, a conveyor arranged transversely of the frame, a pair of tracks arranged transversely of the frame in rear of said conveyor, an inclined platform arranged in front of said conveyor, a support slidably mounted on said tracks, a motor secured to the support, a boom hingedly secured to the motor, a cutter rotatably carried by the boom, means operatively connecting the cutter with the motor, and a scraper blade carried by the boom and arranged to move in rear of said cutter and over said inclined platform, said scraper blade being arranged at an angle to the conveyor.

5. In a coal mining and loading machine, a frame, a pair of tracks arranged transversely of the frame, a casing having an open side arranged transversely of the frame in front of said tracks, an endless conveyor belt arranged in said casing, an inclined platform carried by the casing and arranged to extend from the open front side thereof to the floor of the mine, a support slidably mounted on the tracks, means for sliding the support of the tracks, a motor carried by the support, a boom hingedly carried by the motor, a rotatable cutter carried by the boom, means operatively connecting the motor with the cutter, and a movable scraper blade arranged in rear of said cutter and arranged to engage the floor of the mine and said inclined platform.

6. In a coal mining and loading machine, a frame, a conveyor arranged transversely of the frame, a rotatable cutter, means for sliding the cutter on the frame, a sliding scraper blade arranged in rear of the cutter, and means for raising and lowering the scraper blade.

7. In a coal mining and loading machine, a frame, a conveyor arranged transversely of the frame, a sliding cutter arranged on the frame, a scraper blade carried by the cutter and arranged in rear thereof, arms carried by the cutter, means slidably securing the scraper blade to the arms, a drum, and cables connecting the drum and the scraper blade.

8. In a coal mining and loading machine, a frame, a plurality of runner bars carried by the frame, a cutter member carried by the frame, a plurality of adjustable anchors arranged in rear of the frame, screws carried by the anchor, means operatively connecting the screws with the frame, and means for simultaneously rotating the screws.

9. In a coal mining machine, a transversely extending frame, a conveyor arranged on the frame, a pair of guide tracks carried by the frame and arranged in rear of the conveyor, and a boom mounted for sliding movement along the track, a cutter head rotatably carried by the outer end of the boom, and a scraper blade carried by the boom arranged for moving the coal cut toward and from the conveyor.

10. In a coal mining machine, a transversely extending frame, a conveyor carried by the frame, a pair of guide tracks secured to the frame in rear of the conveyor, a boom mounted for sliding movement along the tracks, a rotatable cutter head carried by the outer end of the boom, an inclined platform carried by the frame arranged to extend toward the said conveyor, and a scraper blade carried by the boom and arranged to engage said inclined platform.

11. In a coal mining machine, a transversely extending frame, a conveyor carried by the frame, a pair of guide tracks secured to the frame in rear of the conveyor, a boom mounted for sliding movement along the tracks, a rotatable cutter head carried by the outer end of the boom, an inclined platform carried by the frame arranged to extend toward the said conveyor, and a scraper blade carried by the boom and arranged to engage said inclined platform, and means for raising and lowering said scraper blade on the boom.

RICHARD TH. QUAAS.