

Aug. 18, 1959

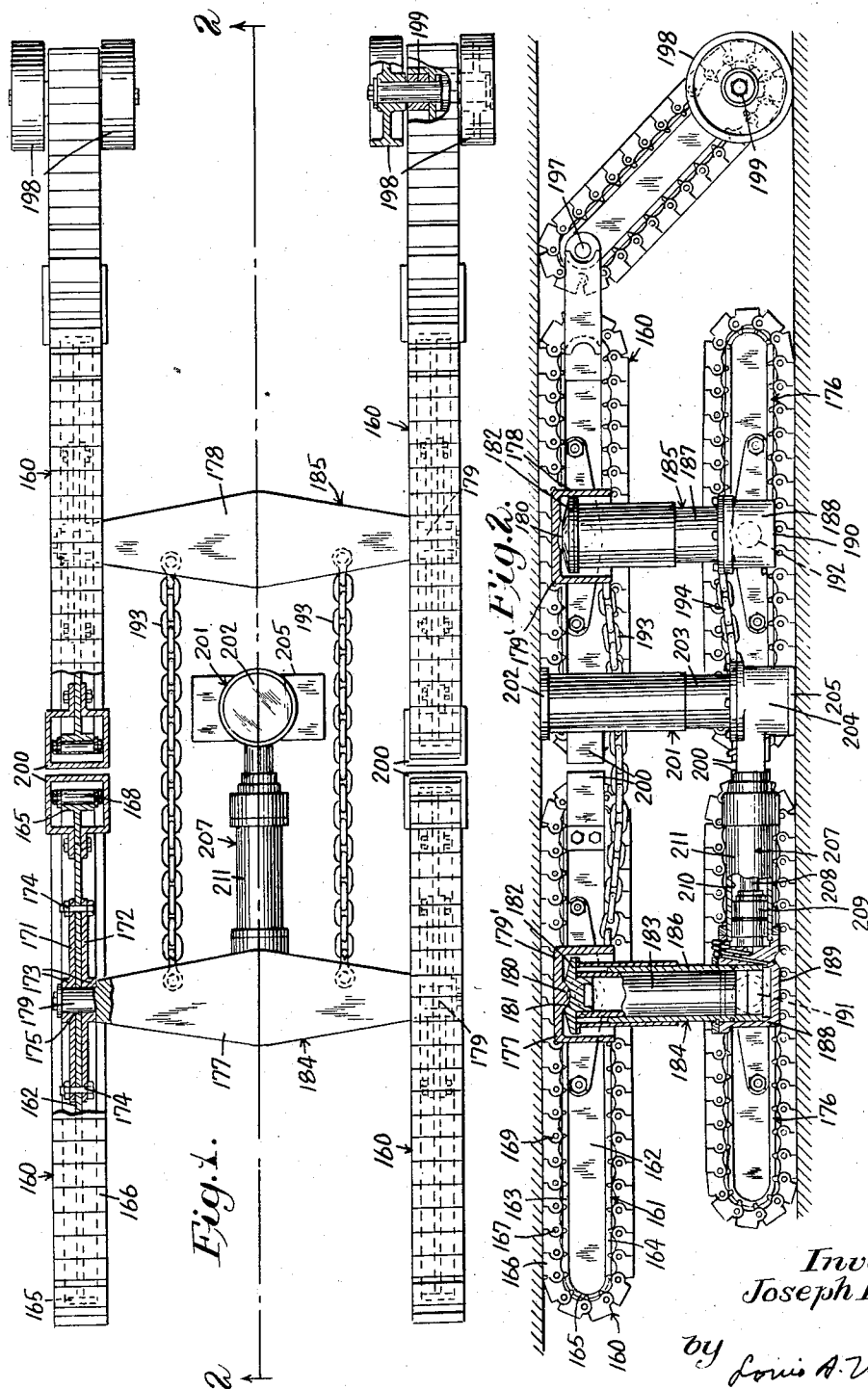
J. F. JOY

2,899,800

APPARATUS FOR MINE ROOF CONTROL

Original Filed May 1, 1948

3 Sheets-Sheet 1



Inventor
Joseph F. Joy.

by
Louis A. Maxson
Att'y.

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3 Sheets-Sheet 2

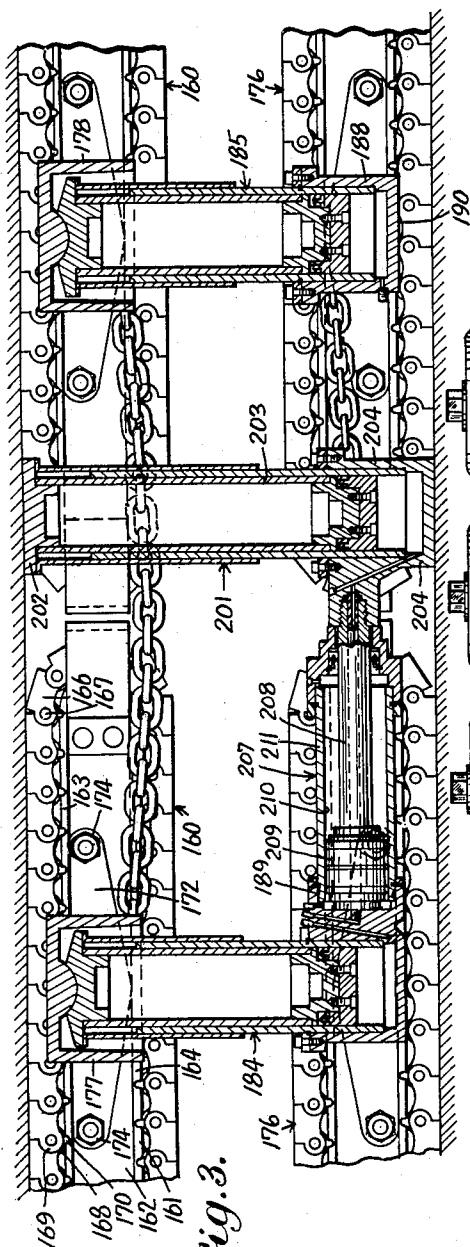


Fig. 3.

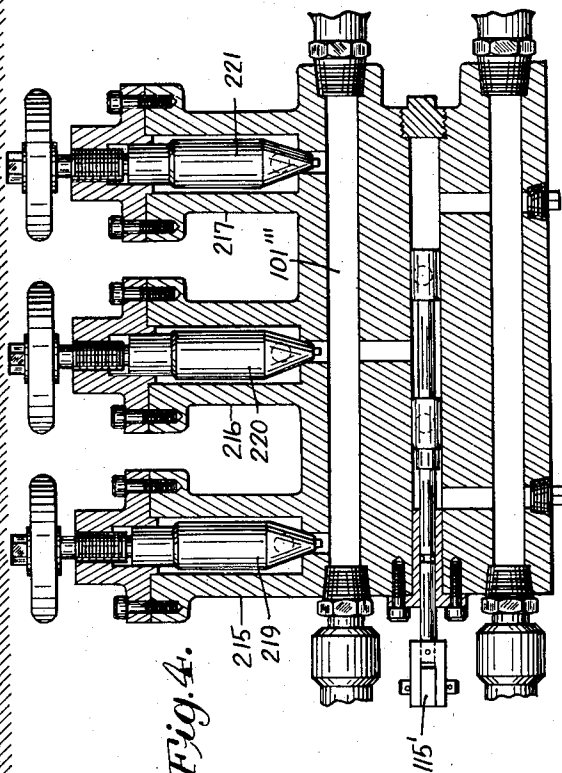


Fig. 4.

Inventor.
Joseph F. Joy.

by
Louis A. Maxson.
Atty.

Aug. 18, 1959

J. F. JOY

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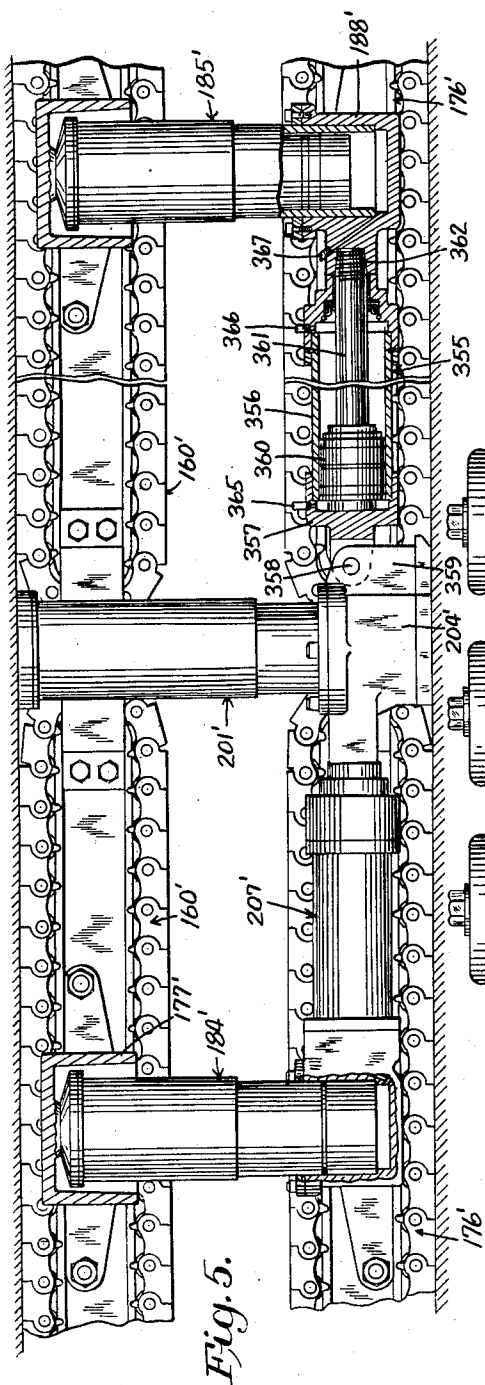


Fig. 5.

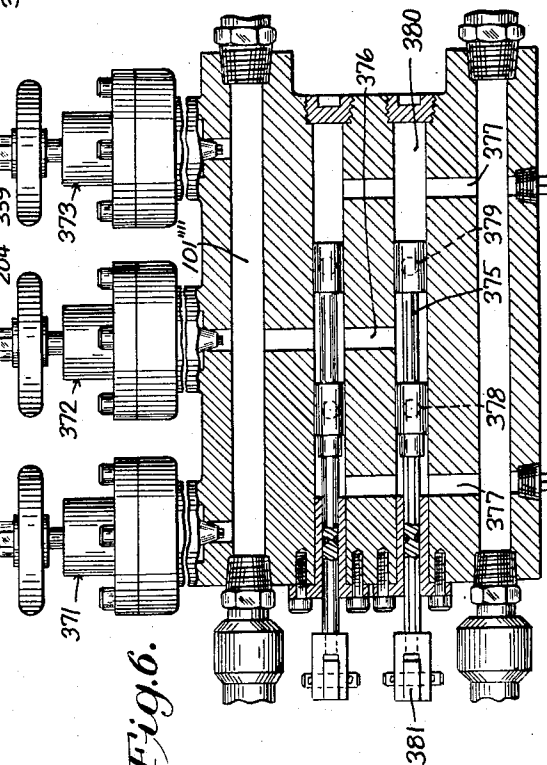


Fig. 6.

Inventor:
Joseph F. Joy.

by Louis A. Mayhew
Att'y.

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2,899,800

APPARATUS FOR MINE ROOF CONTROL

Joseph F. Joy, Pittsburgh, Pa., assignor to Joy Manufacturing Company, Pittsburgh, Pa., a corporation of Pennsylvania

Original application May 1, 1948, Serial No. 24,574, now Patent No. 2,714,505, dated August 2 1955. Divided and this application July 27, 1955, Serial No. 524,904

15 Claims. (Cl. 61—45)

My invention relates to apparatus for mine roof control, and more particularly to apparatus particularly adapted to roof control immediately back of a working face.

This application is a division of my application, Serial No. 24,574, filed May 1, 1948, now matured into Patent No. 2,714,505.

Roof control has heretofore been one of the most expensive, as well as troublesome, items with respect to mining. This is true because of the expense of the materials used, such as timbers, steel, brick, etc., and because so much of the materials used is lost as a result of roof subsidence as the working face advances. It is also true because of the large amount of labor involved in building cribs, setting timbers, etc. Accordingly the provision of an effective and rapidly adjustable means for effecting roof control, and one that is relatively secure against loss of its elements and which can be used many times, is a highly desirable thing. This is particularly so with the present tendency to increase the length of working faces, but it is not without its benefits even with short faces such as are common in room and pillar mining.

The present invention is in no sense limited to such a system, but its understanding may be facilitated by considering its application to an advancing system of longwall mining. Under this system, a working face is opened up and advanced into the solid seam away from the mine shaft or opening. Roadways leading to each end of the longwall face must be maintained open, both to afford openings of sufficient cross section for the requisite air circulation and to permit the transportation of coal from the productive face. These roadways are held open by roadway pack walls—permanent rock cribs so ruggedly constructed that the roadways will not be blocked as the result of roof subsidence. Between the roadway pack walls, and immediately to the rear of the working face, timber in the form of upright posts, and, just back of the posts, wooden or steel cribs are commonly provided to support the roof. Just back of the cribs, either partial or complete caving may be expected to occur. When the partial caving system is used, intermediate rock packs are located at regular intervals between the roadway packs, with the roof being permitted to subside, between the various pack walls, along the face. In the complete caving system, the strata overlying the mined out area opposite the face are permitted to cave in completely, in the areas between the roadway packs, except for the strip or space adjacent the face used for mining and working purposes.

Particularly with the system last mentioned it is important to resist roof subsidence immediately back of the longwall face, and to prevent subsidence or the like except along more or less definite lines in a relatively predetermined space relation to the face as the latter advances. Such a fracture line should be several feet (perhaps a dozen) back from the face, and this can not be certainly accomplished, even with the use of cribs as

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well as posts, with conventional methods; and, with such arrangements, losses of roof supporting timber are frequent, and at times the fracture line may get too close to the coal face, with resultant expense and time consuming labor.

It will be understood that when the roof commences to subside, the rock ordinarily breaks and falls in fragments of various sizes until the space between the bottom and the roof is completely filled, due to the fact that the broken rock occupies more space than the solid, and the roof is again supported. In some cases the bottom may heave, in addition to subsidence of the roof occurring, in which event the roof and bottom may converge towards a plane below the one and above the other.

It will be understood that in the absence of adequate control, there will be a convergence of the roof and bottom to a more or less degree immediately back of the coal face, and, the wider the face, the more rapidly this convergence may be expected to occur. This convergence is the natural result of the tremendous forces tending to close the space resulting from the removal of the coal seam, and, if the convergence be too inadequately resisted, a fracture of the roof at the coal line is likely to result, interfering greatly with the ordinary production of coal from the working face. With means such as I have provided in my present invention, it is theoretically possible to have the roof fracture just to the rear of the improved roof jacks, but of course the actual composition of the roof and floor strata will affect the results. For example, when fire clay, relatively soft shales or slates lie directly above the roof, there will be a great tendency to fill all of the space resulting from the coal removal, and when the floor is hard, the filling action may be due wholly to subsidence. This filling action may be due partially to subsidence and partly to floor heaving, when the floor is not rigid.

In any event, it is important to provide equipment that will meet conditions (a) where a relatively sharp break may occur just to the rear of the jack devices arranged more remote from the face, (b) where there is a mutual gradual approach between the floor and the roof outwardly of the jacks, perhaps partially under direct control of the outer jacks, and (c) where there is approach of but one of the initially generally horizontal boundaries towards the other.

The principal object of this invention is to provide an improved and dependable means for resisting the closing of the gap caused in the earth's strata by the removal of certain layers thereof such as coal seams or the like, for the required length of time to permit the mining of said layers. A more specific object is to provide an improved roof supporting structure having means incorporated therein for facilitating its being progressively advanced along with the advance of a mine face, and desirably with but slight or no release of the resistance to roof subsidence. Another object is to provide an improved roof jack mechanism—one which shall permit jack adjustment without interruption of roof support. Another object is to provide an improved roof jack mechanism incorporating improved roof and floor engaging devices. A further object is to provide an improved roof jack mechanism incorporating spaced roof supporting jack devices and an intermediate abutment jack device. Other objects and advantages of the invention will hereinafter more fully appear.

In the accompanying drawings, in which two illustrative embodiments which my invention may assume in practice have been shown for purposes of illustration,

Fig. 1 is a plan view, and Fig. 2 a sectional view taken on the plane 2—2 of Fig. 1, with parts shown in elevation of an illustrative embodiment of my improved roof controlling apparatus.

Fig. 3 is a vertical sectional view showing on an enlarged scale details of construction of the adjusting cylinder and piston mechanism and of the jacks forming a part of the structure illustrated in Figs. 1 and 2.

Fig. 4 is a sectional view showing a control valve mechanism for the structure of Figs. 1, 2 and 3.

Fig. 5 is a view with parts shown in elevation showing a modification which the invention may assume in practice. Fig. 6 is a view partially in elevation and partially in section showing a control valve mechanism appropriate to the control of the apparatus of Fig. 5.

For the purpose of maintaining as effectively as possible a support for the roof and for avoiding the necessity for reducing the roof support during jack movement, I have illustrated in Figs. 1, 2 and 3, a form of my invention which is intended to permit jack movement without relief of the pressure of the jacks which are sustaining the load of the mine roof; and I do this by providing a jack which provides a firm abutment against which thrust can be exerted to effect movement of the roof supporting jacks, that is those jacks which have as their primary function roof support, and by relieving of pressure, to the necessary extent, the abutment providing jack when occasion exists for moving this latter jack forwardly to a new position. In this form all contacts, except in the case of the abutment jack, between the mine bottom and the jack structures and the mine roof and the jack structures is through apparatus which will not require sliding of mine roof and floor engaging means against a serious frictional resistance. In other words, I provide, as parts of the floor engaging and of the roof engaging devices which are to transmit the forces to the floor and to the roof, trackways upon which roller supported shoes are mounted, these trackways being made desirably of I-beam construction, with the flanges carried around semi-circles at the ends, with trackway engaging rollers supported on the pintles which connect floor and roof engaging, tread forming elements, and with the tread forming elements formed of simple shoe-like construction with side projections to keep them from slipping laterally off the flange portions of the I-beam trackways. Desirably, I may provide connections between the upper and lower pairs of frames which are associated with each of the roof supporting jacks so that there may be free pivoting about transverse horizontal axes in the case of the lower elements and, with respect to the upper elements, there may be, not only a longitudinal rocking possible, but also a lateral capacity for adjustment so that if the roof is not completely flat (that is not completely parallel to the mine bottom) this will not prevent the effective use of the jack structures. By providing an arrangement in which the forward jack (at least preferably the forward jack) is prevented from movement out of vertical positions by reason of the nature of its extensible connection with the abutment jack and by connecting the forward and rearward floor and roof engaging structures with each other as later described, a very effective arrangement, proof against any possible collapse under the roof pressure, but yet capable of some yielding in the event that the burden of the roof is excessive at a substantial distance from the face, will be made available.

We may now note the structure in more detail. Since, except in the matter of length, the structure of all of the devices for transmitting pressure to the floor or to the roof is essentially the same, it will suffice to describe a single one of these in detail; and accordingly there will be described the upper right hand (looking toward the face) roof-engaging element which is designated 160. This includes an elongated frame element 161 of rigid construction and consisting of a central vertical flange 162 having top and bottom flanges 163 and 164 which are joined by the semi-circular flange portions 165 at the ends of the vertical flange 162. About the periphery of the elongated frame element 161 there are adapted to travel a considerable number of tread or shoe elements

166, which are connected together by pintles 167, which are surrounded by suitably hardened rollers 168, which roll on the flanges 163, 164, 165. The shoe elements 166 are of squared U-shape in cross section, and they have overlapping ear portions as may be seen at 169, and they have inwardly projecting points 170 adapted to engage the sides of the peripheral flanges 163, 164, 165 and to prevent the lateral movement of the shoes off of the flanges. It will be evident that this construction provides relatively long horizontal surfaces built up of a multiplicity of shoe elements for engagement, in the particular case described, with the mine roof; and the other similar elements, both roof-engaging and floor-engaging, provide a similarly effective engagement with the surfaces which they contact which permits the transmission of relatively large forces, though not too large forces, per square inch of contact, and yet permits, under longitudinally applied moving forces—furnished by means shortly to be described—there being effected bodily movement of the floor and roof engaging devices toward the face without having to reduce the pressure which exists in the jack cylinders which will also shortly be described. One thing more might be added at this point, and that is the fact that forward adjustment toward the face will be possible the more readily with this apparatus because the roof and the floor will tend to become closer to each other progressively as the distance from the face is increased. Theoretically, at least, it is possible that the cylinder and piston mechanisms may actually have to be used to hold back advance, the abutment jack being fixed in position and the fluid entrapped within the cylinder and piston mechanism extending from said jack to the forward jack being placed under pressure by the action of the pressures of the roof (or roof and floor) on the members which engage them.

Referring to Fig. 1, it will be noted that at opposite sides of the flange 162 there are mounted plates 171 and 172 each formed with a bearing collar 173, and it will be noted that these plates 171 and 172 are bolted to the element 161 as at 174, and that the flange 162 has a bore through it at 175 in alinement with the bores of the bearing collars 173. There is arranged similar structure in the case of all four top or roof engaging structures 160, and likewise in the case of the four mine bottom engaging structures 176. Between the pairs of roof engaging structures there are extended cross frames 177 and 178, each of these having bearing pins 179 received in the bearing sleeves 173 carried by the roof engaging elements 160 with which they are associated. Each of the frames 177 and 178 is provided with a box-like center portion 179' having a depending projection 180 curved like a portion of the surface of a ball or sphere and seating in a correspondingly shaped socket or recess 181 formed in a top member 182 carried by the piston structure 183 of the roof jacks which are respectively involved. To distinguish these jacks for further discussion, the forward roof jack, whose piston structure 183 supports the cross arm 177, will be designated 184, and the rear roof jack will be designated 185. There is also a cylinder member 186, in the case of the forward jack, and 187, in the case of the rearward jack. These cylinder members are mounted in cup-shaped portions 188 of cross frames 189 and 190 which carry pivot pins 191 and 192 respectively, by which they are pivotally connected to the floor engaging structures 176. Thus each floor structure is capable of some adjustment about horizontal transverse axes but not about longitudinally extending axes as is possible with the roof engaging structures 160. Since the rearward floor and roof engaging element should be permitted to undergo adjustments relative to the forward ones with which they make up pairs, but since the rearward elements have no means for advancing them except as they may be furnished with traction by the forward elements, suitable connections for effecting such traction without interfering with inde-

pendent adjustments is provided. These may assume various forms, but perhaps the easiest method is simply to provide chains 193 to connect the cross members by which the various floor and roof engaging elements are individually supported. For example, the transverse members 177 and 178 may be connected by pairs of chains 193, one chain at each side of the intermediate abutment providing a jack structure later described and, similarly, pairs of chains may connect the cross arms which rest at their opposite ends in the frames of the floor engaging structures, the latter chains being numbered 194.

Devices similar to the devices 160 and 176 are connected pivotally at 197 to the rear ends of the rearward roof engaging elements 160 and have heavy wheels 198 journaled on axles 199 at their lower rearward ends, and are adapted, in the event that the roof starts to collapse, to sustain the weight of the roof and to derive from the weight of the roof a thrust towards the face so that the roof will not pinch the apparatus in such a manner as to prevent its forward movement.

The adjacent ends of each pair of floor and roof engaging members will be provided with bumpers 200, as shown in Figs. 1 and 2, to prevent interference of the treads with each other in the event that, due to changing angular relations of the roof and floor to each other, there be a tendency of one element to override the other. These bumpers will also serve to transmit the moving forces to the rearward jack device 185 and the parts with which it is associated in the event that backing away from the face becomes desirable as will be frequently the case after the ends of shut-down periods, during which periods in some cases the entire roof supporting device will be moved just as close as possible to the face. It will also be possible to unhook the chains 193 and 194, and move up only the forward jack during a shut-down period.

The means for effecting movement of the roof jacks of this embodiment of the invention includes an expandible and collapsible hydraulic abutment jack device 201 which comprises a roof engaging pad 202 carried at the end of a piston structure 203, which is received in a cylinder structure 204 into which fluid pressure can be supplied to effect a firm engagement of a base pad 205 with the mine bottom and the roof pad 202 with the mine roof. This abutment jack has rigidly connected to it the piston mechanism of a hydraulically extensible and contractable cylinder and piston mechanism 207 whose potential feeding range is desirably such as to permit the effecting of an advance movement equal to the thickness of the slice of coal which is to be removed. The cylinder and piston mechanism 207 includes a piston rod 208 carrying a piston 209 which is received in the bore 210 of a cylinder 211 rigidly connected as at 212 with the member 189. Suitable means is provided for delivering fluid to the jack structure 201, to the jack 184, and to the jack 185, and also to the cylinder and piston mechanism 207; and a suitable valve arrangement for this purpose is shown in Fig. 4 and will later be described.

It will be observed, in view of the rigid connection of the piston rod 208 with the base of the abutment jack device 201 and the rigid connection of the cylinder 211 of the cylinder and piston mechanism 207 with the jack 184, that the extension of the jack 201 into firm contact with the mine roof and mine bottom will not only prevent the tipping of this jack but will also prevent the tipping of the jack 184 irrespective of any change in angular relation of the roof and floor engaging devices 160 and 176 to the jack 184. The provision of the abutments 200 and of the chains 193 and 194 prevents the assumption by the rearward pair of roof engaging devices 160 and floor engaging devices 176 of any positions in which the jack 185 may be able to collapse by a swinging movement. In summary, so long as the jack 201 remains erect, there can be no collapsing of the jack mechanisms 184.

or 185 except through opening of relief valves associated with them, or through the deliberate venting of fluid from them.

It will be evident, referring to the relative position of the parts shown in Fig. 2, that if the jack 201 be caused to exert pressure between the floor and the roof and if fluid be supplied to the bore 210 of the cylinder 211 of the cylinder and piston mechanism 207 to the left of the piston 209, the entire series of floor and roof engaging jacks will be moved toward the left in Fig. 2, that is, toward the face, and this movement, except in the event that the roof pressure has become literally terrific—more than enough to cause the automatic venting of fluid from the jacks as hereinafter described—will be possible without any necessity for reduction in the pressure exerted by the jack mechanisms 184 and 185 against the roof and floor. Also, by venting fluid from the abutment jack 201 while fluid remains under pressure in the jack 184, the jack 201 may be moved, in preparation for a new feeding movement of the roof supporting jacks, by supplying fluid in an appropriate manner to the cylinder and piston mechanism 207.

It is to be noted that the support jacks 184, 185 and the abutment jack 201 are arranged in the central longitudinal vertical plane between the pairs of floor and roof engaging devices.

With reference to the fluid control structure associated with the arrangements of Figs. 1 and 2, it may be observed that the only difference between this construction and that which was shown in Fig. 10 and following Figures of the parent case hereinabove identified, consists in the provision of three valves for controlling the supply of fluid to three jacks, to wit, 184, 185 and 201. Thus, there are three housings 215, 216 and 217, each containing a controlling valve, these latter being respectively numbered 219, 220 and 221, and each being of the same character as the controlling valves of said Fig. 10 mentioned, to which reference may be had, and each having similar operating mechanism. Each of the housings contains a chamber in which its valve is movable, and each chamber communicates through a port with the passage 101" which corresponds to the passage 101" of said Fig. 10. The valve 219 controls the admission of fluid to the jack 184. The valve 221 controls the admission of fluid to the jack 185, and the valve 220 controls the admission of fluid to the abutment jack 201. As all of the remaining structure, except in mere matters of proportion, is essentially the same as is shown in said Fig. 10 and has been fully described, it is unnecessary to go into further detail other than to state that through conduit means not shown the chamber within the boss 215 communicates with the space below the piston of the jack mechanism 184, the chamber within the boss 216 communicates with the space below the piston in the cylinder structure 204, and the chamber within the boss 217 communicates with the space below the piston in the cylinder member 187.

In view of what has heretofore been said, no substantial further description of this embodiment of the invention can be called for. Manipulation of the lever 115' determines which end of the cylinder and piston mechanism 207 has fluid supplied to it and which end is vented, and all that is required to render this device effective to perform its designed function is to time the admission to the several jacks and to the cylinder and piston mechanism 207 in a manner which is completely obvious from what has been previously said.

Figs 5 and 6 show a modification of the structure of Figs. 1 to 4, Fig. 6 showing the controlling valve mechanism and Fig. 5 a somewhat different arrangement of the jack mechanisms. Because of the similarity in construction, with that of the form heretofore described the forward jack mechanism may be identified as 184' and the abutment jack mechanism as 201' and the rearward jack mechanism as 185'. The abutment jack mechanism

201' and the jack mechanism 184' and the cylinder and piston mechanism 207' connecting them are essentially identical with the corresponding parts in the embodiment of the invention shown in Figs. 1, 2 and 3. The chains 193 and 194 are not used, however, to connect the rearward jack mechanism 185' through its roof and floor engaging devices 160' and 176' with the arm mechanisms 177' of the jack 184'. Instead, a cylinder and piston mechanism 355 is provided. This consists of a cylinder 356 having a forward head 357 pivotally connected as at 358 to a rearwardly projecting portion 359 of the cylinder member 204'. Within the bore of the cylinder and piston mechanism 355 is a suitably packed piston 360 having a piston rod 361 of rugged construction and rigidly connected at 362 to the member 188' of the jack device 185'. Suitable connections 365 and 366 are provided for the delivery of fluid to and the venting of fluid from the opposite ends of the cylinder 356, and a connection 367 is provided for the supply of fluid to and its release from the jack device 185', such connection corresponding to the bottom connection for the jack 185 of Figs. 2 and 3. It will be understood that by increasing the length of the rearward members 160' and 176' and locating the pistons 360 in the rearward ends of their cylinders when the members 160' and 160' (and the members 176' and 176') are close together, another mode of walking could be provided, in that the front and rear jacks could then both be advanced while the abutment jack is stationary, instead of advancing the front jack, advancing the abutment jack, and then advancing the rear jack.

It will be observed that tipping of the jack device 184' is impossible because its cylinder and the cylinder of the abutment jack 201' are prevented from moving out of parallelism. Collapse, through tilting movement, of the jack device 185' is prevented by reason of its connection through the cylinder and piston mechanism 355 to the base of the jack 201'. It will be evident that if, through pressure to which the mine floor is subjected, there should be a tendency for the floor to be forced upward slightly in its portion beneath the jack device 185', this will be possible, without disturbing anything, because of the pivotal connection between the jack 185' and the abutment jack 201', for such connection permits the jack 185' to be moved out of a position substantially perpendicular to the mine bottom. This structure therefore possesses certain advantages in simplicity over the construction of Figs. 1, 2 and 3.

The valve mechanism of Figure 6 does not need detailed description. Manually controlled valve mechanisms 371, 372 and 373, with in-built relief valves, are provided for controlling the admission of fluid to the jack device 184', the abutment jack device 201', and the jack device 185'. These control the communication of the jacks which they respectively control with a fluid supply connection 101'''. In addition to the valve device for controlling the supply of fluid to the cylinder and piston mechanism 207', which valve device corresponds to the control for the cylinder and piston mechanism 207 shown in Fig. 4, and which therefore will not need further description, there is provided another valve device 375 of the two-spool type for controlling communication of the connections or conduits 365 and 366 with a passage 376 supplied with hydraulic fluid under pressure, and with exhaust passages 377, 377, the conduits 365 and 366 communicating with ports 378 and 379 opening through the wall of a chamber 380 in which the valve device 375 is reciprocable by a suitable manual control lever mechanism 381. The present modified form of the invention and its mode of operation and control will require no further description in view of the general similarities to structures of Figs. 1 to 4.

While there are in this application specifically described two forms which the invention may assume in practice, it will be understood that these forms of the same are shown for purposes of illustration, and that the invention may

be modified and embodied in various other forms without departing from its spirit or the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. In a jack mechanism, a plurality of spaced roof supporting jacks including a first and a second roof supporting jack and an abutment jack located between said first and second roof supporting jacks, a cylinder and piston mechanism comprising a telescopically arranged cylinder and piston with a piston rod, said cylinder rigidly connected to the first of said roof supporting jacks and said piston rigidly connected to said abutment jack, and a second cylinder and piston mechanism comprising a telescopically arranged cylinder and piston with a piston rod, said latter cylinder pivotally connected to said abutment jack and the piston rod of said second cylinder and piston mechanism rigidly connected to the second roof supporting jack.

2. In a jack mechanism, a plurality of spaced roof supporting jacks including a first and a second roof supporting jack and an abutment jack located between said first and second roof supporting jacks, two cylinder and piston mechanisms, each comprising cylinder and piston rod elements, said elements of one of said cylinder and piston mechanisms rigidly connected to the first of said roof supporting jacks and to said abutment jack, and said elements of said other cylinder and piston mechanism one rigidly connected to the second of said roof supporting jacks and the other connected on a horizontal axis by pivotal connecting means to said abutment jack.

3. In a jack mechanism, a plurality of spaced roof supporting jacks including a first and a second roof supporting jack and an abutment jack, a cylinder and piston mechanism having a cylinder rigidly connected to one of said roof supporting jacks and a piston rod rigidly connected to said abutment jack, and means connecting the second to the first of said roof supporting jacks for movement of the second with the first independently of said abutment jack.

4. In a jack mechanism, a plurality of spaced roof supporting jacks including a first and a second roof supporting jack and an abutment jack located between said first and second roof supporting jacks, a cylinder and piston mechanism having a cylinder rigidly connected to one of said roof supporting jacks and a piston rod rigidly connected to said abutment jack, and means connecting the second to the first of said roof supporting jacks for movement of the second with the first including flexible tie elements.

5. In a jack mechanism, a plurality of spaced roof supporting jacks including a first and a second roof supporting jack and an abutment jack located between said first and second roof supporting jacks, a cylinder and piston mechanism having a cylinder rigidly connected to one of said roof supporting jacks and a piston rod rigidly connected to said abutment jack, means connecting the second to the first of said roof supporting jacks for movement of the second with the first including flexible tie elements, and means for limiting the minimum distance apart of said roof supporting jacks.

6. In a jack mechanism, a plurality of spaced roof supporting jacks and an intermediate abutment jack, said roof supporting jacks each comprising endless tread type floor and roof engaging elements and cross arms connecting the same, a cylinder and piston mechanism for effecting advance of one of said roof supporting jacks and having a cylinder rigidly connected to said one of said roof supporting jacks and a piston rod rigidly connected to said abutment jack, means for operatively connecting the second of said roof supporting jacks for movement with the first including flexible tie elements extending between said cross arms, and abutment means carried by the adjacent ends of said floor and roof en-

gaging elements for limiting the minimum distance apart of said roof supporting jacks.

7. A mine roof supporting jack mechanism, comprising upper and lower mine floor and roof engaging devices, each device including a support providing a guideway and an endless tread guided for free circulation in an orbital path along said guideway thereby to provide movable floor and roof engaging surfaces of large area, an upright extensible jack device connected between said floor and roof engaging devices for adjusting the latter in supporting relation between the floor and roof, and a power operated device connected to said upright jack device for moving the latter and said floor and roof engaging devices horizontally while said floor and roof engaging devices are maintained in supporting relation with the floor and roof, said endless treads circulating freely in their guideways as said jack device and said floor and roof engaging devices are moved horizontally as aforesaid.

8. A mine roof supporting jack mechanism, a front jack device, a rear jack device, each of said jack devices having upper and lower mine floor and roof engaging means, each of which includes a support providing a guideway and an endless tread guided for free orbital movement along said guideway thereby to provide a large movable contact area, an abutment jack located between said front and rear jack devices, power operated means between said front and rear jack devices and said abutment for moving the said front and rear jack devices step by step in a horizontal direction while said front and rear jack devices are maintained in supporting relation with the mine roof, said endless treads of said floor and roof engaging means circulating freely in their guideways as said front and rear jack devices and said floor and roof engaging means are moved horizontally as aforesaid.

9. In a mine roof supporting jack mechanism, a pair of mine floor supported endless tread equipped bases, a cross frame extending between said bases and provided with pivotal connecting means therewith for rocking movement of said bases in vertical planes relative to said cross frame, a cylinder and piston type hydraulic jack device supported on said cross frame, and, supported on said jack device for engagement with the mine roof, a further pair of endless thread equipped frames, a transverse frame provided with pivotal connecting means at the ends thereof with said last mentioned frames for rocking movement of said last mentioned frames in vertical planes relative to said transverse frame, and a universal ball type mounting for said transverse frame on the top of said jack device.

10. In a mine roof supporting jack mechanism, a pair of mine floor supported endless tread bases, a frame extending between said bases and provided with pivotal connecting means therewith substantially midway of the length thereof for rocking movement of said bases in vertical planes relative to said cross frame, a cylinder and piston type hydraulic jack device supported on said frame, and, a pair of endless tread equipped frames supported on said jack device for engagement with the mine roof by a transverse frame provided with pivotal connecting means at the ends thereof with said last mentioned frames to permit rocking movement of said last mentioned frames in vertical planes relative to said transverse frame, and a universal ball type mounting for said transverse frame on the top of said jack mechanism, said endless tread equipped frames projecting forwardly a substantial distance beyond the forward ends of said floor supported bases.

11. In a mine roof supporting jack mechanism, front and back pairs of carriages adapted for endless tread movement over the mine bottom, hydraulic extensible jack devices supported on said carriages adjacent their

midpoints, pairs of roof engaging carriages supported on the upper ends of said jack devices and movable into engagement with a mine roof, means for effecting advance of one of said pairs of carriages including an extensible floor and roof engaging jack and an extensible and collapsible cylinder and piston mechanism operatively connected to one of said first mentioned jacks, and means operatively connecting the carriages of at least one of said pairs with each other so that advance of one of said pairs will effect advance of the other.

12. In a mine roof supporting jack mechanism, a mine roof engaging means and a floor engaging means having rolling contact respectively with the floor and roof, an upright jack device arranged between and operatively connected to said roof engaging means and said floor engaging means for maintaining said roof engaging means and said floor engaging means in respective floor engagement and roof supporting position, and an extensible jack device selectively fixed to said roof and said floor by anchor jack means for moving said upright jack device relative to said roof and said floor to roll said floor and roof engaging means along the roof and floor while remaining in supporting engagement with the roof and the floor.

13. A mine roof supporting mechanism comprising, a plurality of spaced roof supporting means having a first and a second roof supporting means with an anchoring means located therebetween, a telescopic mechanism having one portion rigidly connected to the first of said roof supporting means and another portion rigidly connected to said anchoring means, and a second telescopic mechanism having one portion pivotally connected to said anchoring means and another portion rigidly connected to the second roof supporting means.

14. A mine roof supporting mechanism comprising, upper and lower mine floor and roof engaging devices each device including a support providing a guideway for supporting means which circulate freely in an orbital path along said guideway to provide movable floor and roof engaging surfaces of large area, an upright extensible device connected between said floor and roof engaging devices for adjusting the latter in supporting relation between the floor and roof, a power operated device connected to said upright extensible device for moving the latter and said floor and roof engaging devices horizontally while said floor and roof engaging devices are maintained in supporting relation with the floor and roof, and said supporting means circulating freely in their guideways as said extensible device and said floor and roof engaging devices are moved horizontally as aforesaid.

15. In a mine roof supporting mechanism, a plurality of spaced roof supporting devices including a first and a second extensible roof supporting means and an extensible abutment means, a telescopic mechanism having one portion rigidly connected to one of said roof supporting means and another portion rigidly connected to said abutment means, and means connecting the second to the first of said roof supporting means for movement of the second with the first independently of said abutment means.

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