Jan. 30, 1968 A. D. ALLEN 3,365,893

MINE ROOF SUPPORTS

Filed Jan. 18, 1965 5 Sheets-Sheet 1

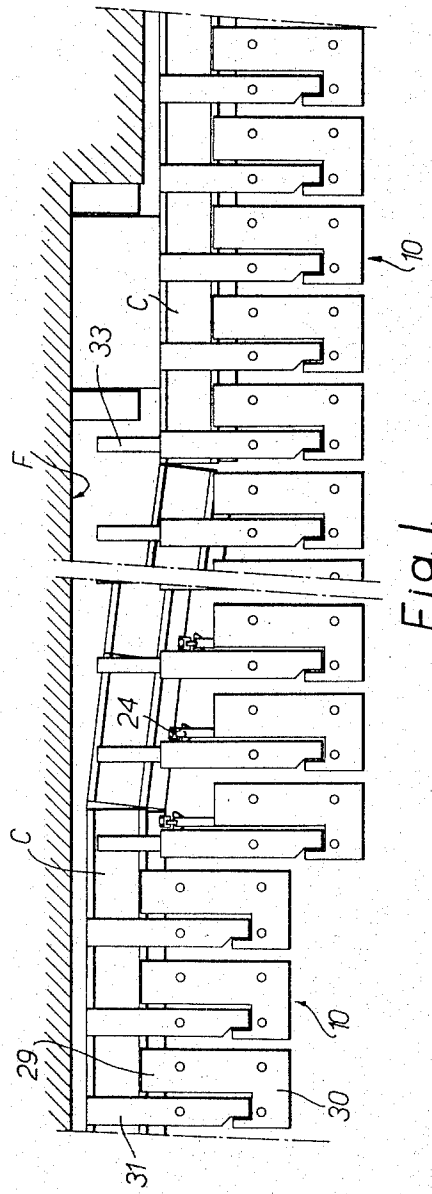

Fig. 1.

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MINE ROOF SUPPORTS

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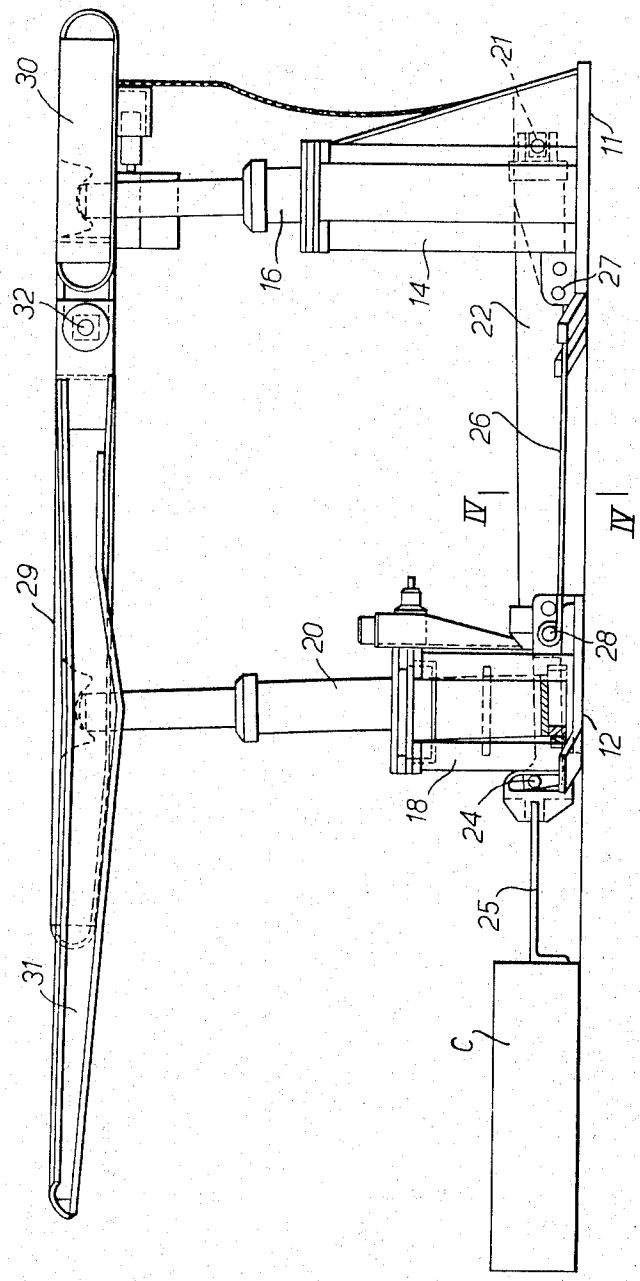

Fig. 2.

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MINE ROOF SUPPORTS

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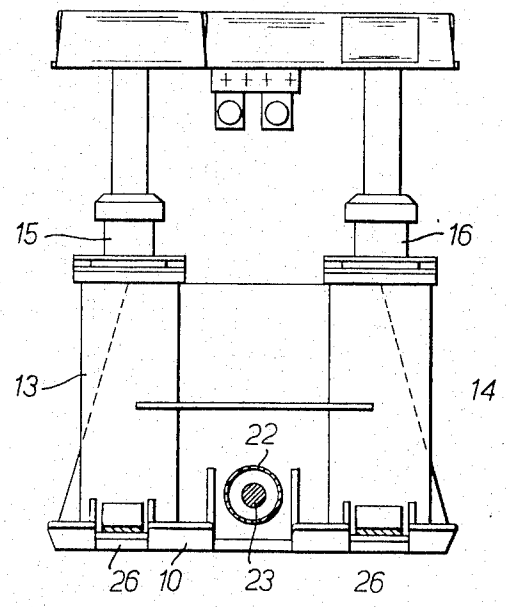

Fig. 3

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MINE ROOF SUPPORTS

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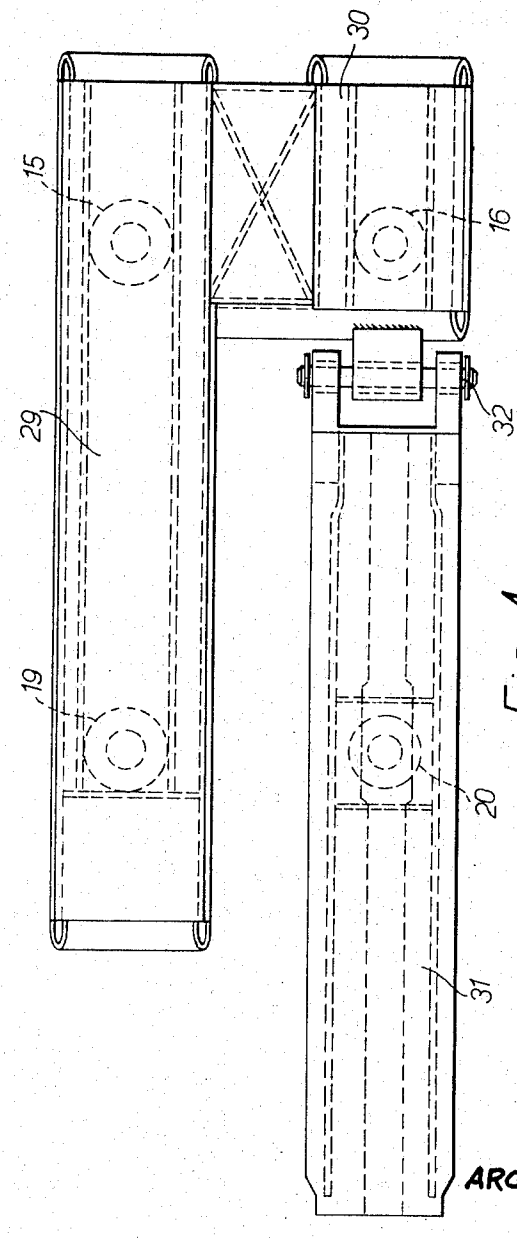

Fig. 4.

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MINE ROOF SUPPORTS

Filed Jan. 18, 1965 5 Sheets-Sheet 5

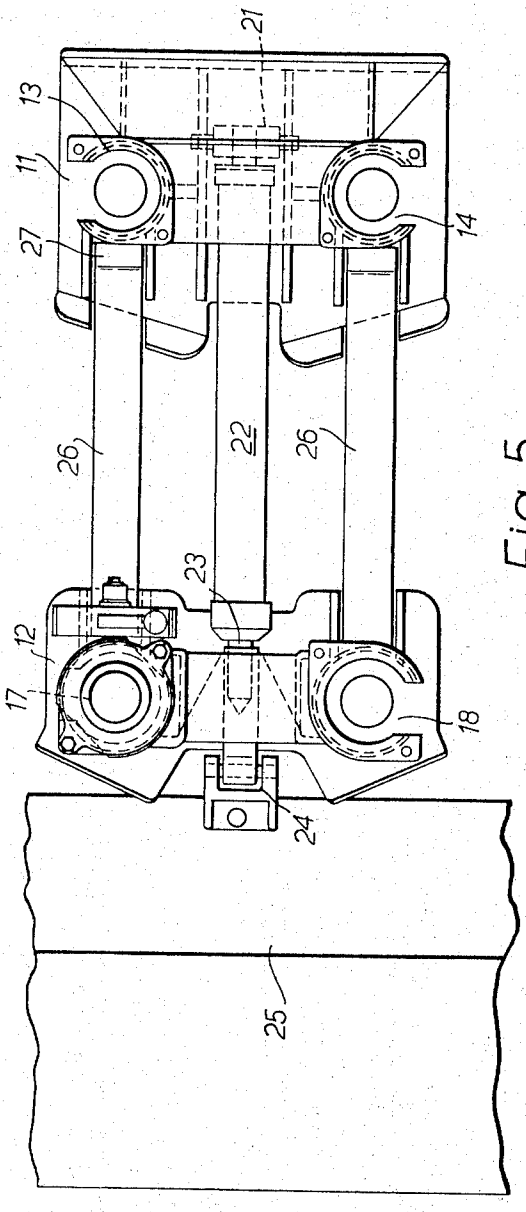

Fig. 5.

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United States Patent Office 3,365,893
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3,365,893

MINE ROOF SUPPORTS

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Claims priority, application Great Britain, Feb. 12, 1964, 5,848/64
9 Claims. (Cl. 61—45)

ABSTRACT OF THE DISCLOSURE

A mine roof support comprises a rectangular base and four extensible props mounted at the corners of said base and a roof-engaging structure mounted on said extensible props. The roof-engaging structure comprises an L-shaped part with rigid integral limbs stably mounted on three of the props and a cantilever bar resting on the remaining prop and pivotally connected to one limb of said L-shaped bar and extending alongside and beyond the other limb of said L-shaped part.

This invention is for improvements in or relating to mine roof supports.

The traditional method of setting roof supports in the longwall method of mineral mining, particularly coal mining, has been to hand-set three rows of props with chocks set at the waste edge. These props support roof-bars joined to each other by means of pinned joints which provided angular flexibility at setting.

In recent years powered or self-advancing roof supports have been developed and applied effectively. One such powered or self-advancing roof support comprises a plurality of hydraulically extensible props assembled in a base or structure and supporting, at their upper parts, a canopy or roof-bar structure. The frame also houses a horizontally disposed double-acting ram means. This ram means serves to push over the conveyor towards the coal face, as cutting of the coal proceeds, and then, by anchoring the ram means to the conveyor and retracting it, the support is advanced up to the conveyor after the props have been temporarily released from between floor and roof.

Even with powered or self-advancing supports the three-row system of props has generally been adopted because this system has been proved satisfactory by hand-operated methods and for other practical reasons.

It has been found in practice that for the canopy or roof-bar structure, a compromise between rigidity to give stability, and flexibility to give conformity to roof slope, is necessary. In the case of conventional manually set supports this compromise can be met by the person responsible for erecting the roof supports setting the roof-bars to conform to the roof slope in the first place. In the case of powered or self-advancing supports, however, this must be done automatically and heretofore much difficulty has been encountered in achieving satisfactory setting. Many proposals have failed in practice because this compromise has not been achieved.

Satisfactory results have been obtained with supports comprising a rear unit having four legs or props to give a stable and solid waste edge support and a forward unit comprising a roof-bar articulated to the rear unit, so as to be capable of conforming to the slope of the roof in the forward area, and resting on a single forward prop or leg.

Heretofore it has been found in practice and is required by certain inspection authorities, that there must be two rows of supports between a roof-bar hinge and the waste edge, otherwise instability arises. It is also necessary to have a row of supports adjacent to the conveyor and a travelling track or passageway for miners immediately to the rear of this. Heretofore, these requirements have only been met by powered or self-advancing supports constructed so that, in the support system, there are three rows of legs or props one behind the other.

An object of the present invention is to provide a roof-bar or chock canopy arrangement having the required compromise between flexibility and stability and which, at the same time, only involves two rows of props one behind the other. A support system having only two rows of props has the great advantage that it is carrying a much smaller area of roof and therefore the construction of the individual supports or chocks is less expensive.

According to the present invention there is provided a mine roof support having an L shaped or like roof-bar structure or canopy stably supported on an extensible prop or props, so as to be applied thereby to a mine roof and a cantilever roof-bar pivotally connected to one limb of the L or like shaped structure so as to extend alongside the other limb, and supported forwardly of its pivot by a further extensible prop.

According to a further feature of the present invention there is provided a mine roof support comprising a base, at least four extensible props or legs mounted on said base at the corners of a four-sided figure (e.g. a rectangle) or polygon and a canopy or roof-bar engaging structure mounted on said legs or props, said canopy or roof-bar structure comprising a part stably mounted on at least three props or legs and a part resting on a single prop or leg and pivotally connected to said stably mounted part at a position to the rear of a forward supporting leg or prop of said stably mounted part of the canopy.

In preferred embodiments of the invention the part resting on a single leg or prop is pivotally connected to the stably mounted part of the canopy at a position well to the rear of a forward supporting leg or prop of the stably mounted part of the roof-bar engaging structure.

In one preferred embodiment of the invention the roof support comprises four legs or chocks located at the corners of a rectangle and the stably mounted part of the canopy or roof-bar engaging structure is in the form of an L. The other part of said canopy is a straight roofing-bar having its rear part "let" in said L (i.e. into the space between the stem and foot of the L), so that the canopy or roof-bar structure as a whole comprises a rectangular rear portion and a forwardly extended portion or bar at one side of said rectangular portion.

The word "stably" mounted or supported, where used in this specification in relation to a part of the roof-engaging structure or canopy, does not preclude some degree of articulation between the stably supported part and its props or legs to permit said part to adjust itself to roof irregularities. For example, there may be a concave-convex seating arrangement between the stably supported part of the canopy and the props or legs on which it is mounted.

The invention will be further described, by way of example, with reference to the accompanying drawings in which:

FIGURE 1 is a diagrammatic plan view showing one arrangement of supports at the coal face,

FIGURE 2 is a side elevation of one of the supports used in the arrangement shown in FIGURE 1,

FIGURE 3 is a front elevation partly in section on the line IV—IV of FIGURE 2,

FIGURE 4 is a plan view of the canopy of the support shown in FIGURES 2 and 3, and

FIGURE 5 is a further plan view of the support shown in FIGURES 2 and 3 but with the roof-bar structure or canopy removed.

Referring first to FIGURE 1, the support system comprises a plurality of individual chocks or supports **10** extending along the coal face F at the rear of the conveyor C.

Referring now to FIGURES 2, 3, 4 and 5, each support **10** comprises a rear base member **11** and a forward base member **12**. The rear base member **11** has sockets **13** and **14** in which are mounted hydraulically extensible legs or props **15** and **16**.

The forward base member **12** has sockets **17** and **18** in which are mounted hydraulically extensible legs or props **19** and **20**.

The props or legs may be permitted some degree of movement in their sockets **13, 14, 17, 18** by adopting, for example, the construction described in our British patent specifications Nos. 772,543 and 866,108.

Hingedly anchored at **21** to the rear base member **11** is the cylinder **22** of a double-acting hydraulic ram. The ram proper **23** (see FIGURE 5) of this hydraulic ram is hingedly connected as indicated at **24** to a longitudinally extending bracket, spill plate or anchoring member **25** on the conveyor C. It should be noted that the ram proper **23** works freely through the forward base member **12**.

The base members **11** and **12** are coupled together by means of links **26** hingedly connected to the rear base member **11** at **27** and hingedly connected to the forward base member **12** at **28**. This arrangement provides for relative movement between the rear base member and the front base member so that they can adapt themselves to irregularities in the floor.

The canopy or roof-engaging structure of each support **10** comprises a stably supported L-shaped part having limbs **29** and **30** rigidly connected together, at right-angles to one another, and a forwardly extending cantilever part **31**.

The canopy part **29, 30** rests stably on the legs **15, 16, 19**.

The cantilever part **31** of the roof-bar structure is hinged to the stably supported part **29, 30** at **32** and rests on the single leg **20**. It will be noted that the hinge **32** is set well back with respect to the legs **19** and **20**.

The cantilever member **31** may have a retractable and extensible extension bar **33** as shown in FIGURE 1.

To advance the conveyor C after the coal cutter or plough has traversed the coal face in the usual way, the ram **23** is advanced. Following this the hydraulic legs or props **15, 16** and **19, 20** are temporarily released from between floor and roof and the ram **22, 23** is retracted so that the support is drawn forwardly towards the conveyor. The legs are then re-secured between floor and roof.

In FIGURE 1 the supports **10** on the left-hand side have been advanced and those towards the right-hand side are in process of advancing or "snaking" the conveyor C.

The members of the roof-bar structure or canopy may rest on the upper parts of the props or legs by concave/convex seatings in the usual way so as to permit of some relative movement between the roof-bars and the legs. This allows the roof-bar members to adjust themselves to roof irregularities. For the same reason the hinge joint **32** may be relatively loose or slack.

With the roof-bar or canopy construction above described the L-shaped canopy part **29, 30** gives the required rigid or stable structure, whilst the part **31** supported only by the leg **20**, is capable of conforming to the roof slope

and providing the necessary flexibility in the canopy. A further advantage of this canopy arrangement, as compared with the canopy arrangements of supports as heretofore available, is that an overlapping effect is achieved between the stable and rigid portion **29, 30** of the canopy and the flexible or adjustable part **31**. In other words, the two parts of the canopy are to some extent in side-by-side relationship and together engage a rectangular area of the roof. At the same time the part **31** extends forwardly of this area to provide roof support over the conveyor C and in the area immediately to the rear thereof.

With the construction according to the present invention the requirement for two rows of supports between the roof-bar hinge and the waste edge may at least in some circumstances, be waived. The manner in which the L-shaped member **29, 30** is supported ensures a stable support to which the forwardly extended roof-bar **31** can be hinged whilst at the same time permitting of the use of only two rows of props in the system.

I claim:

1. A mine roof support having a substantially L shaped roof-engaging structure with rigid integral limbs, extensible prop means for stably supporting said roof-engaging structure and a roof bar pivotally connected to one limb of said roof-engaging structure so as to extend alongside the other limb, and supported forwardly of its pivot by a further extensible prop means, whereby within the area cumulatively supported by said rigid roof-engaging structure and said roof bar pivotally attached thereto, a compromise between rigidity to give stability and flexibility to give conformity to roof slope is achieved.

2. A mine roof support comprising a base structure, at least four extensible props mounted on said base structure at the corners of a four-sided figure or polygon and a roof-engaging structure mounted on said props, said roof-engaging structure comprising an L-shaped part with rigid intergral limbs stably mounted on at least three props and a roof bar part resting on the remaining prop or props and pivotally connected to said stably mounted part at a position to the rear of a forward supporting prop of said stably mounted part of the roof-engaging structure.

3. A mine roof support comprising four extensible props located at the corners of a rectangular framework and a roof-engaging structure having a stably mounted part in the form of an L with rigid integral limbs positioned on three of said props and a roof-bar positioned towards it forward end on the remaining prop and having its rear part let into the space between the stem and foot of the L and pivoted thereto so that the roof-engaging structure as a whole comprises a rectangular rear portion and a forwardly extended roof bar portion at one side of said rectangular portion.

4. A mine roof support comprising a base structure having a forward base member and a rearward base member articulated together by link means and a substantially L shaped roof-engaging structure with rigid integral limbs stably supported on extensible prop means, mounted on said base structure, so as to be applied thereby to a mine roof, and a roof-bar pivotally connected to one limb of said roof-engaging structure so as to extend alongside and beyond the other limb, and supported forwardly of its pivot by a further extensible prop means mounted on said base structure.

5. A mine roof support as claimed in claim **1** wherein the roof-bar is pivotally connected to the stably mounted roof-engaging structure at a position well to the rear of a forward supporting prop of said stably mounted roof-engaging structure.

6. A mine roof support as claimed in claim **1** wherein the pivotal connection between the stably mounted roof-engaging structure and the roof-bar is relatively loose to allow said structure and bar to adjust themselves to roof irregularities.

7. A mine roof support as claimed in claim **4** and having a pressure-fluid operated ram for pushing over a conveyor and subsequently advancing the support, wherein

one element of said ram is pivotally attached to one of the base members of said base structure and the other element of said ram operates freely with respect to the support and is adapted for connection to said conveyor.

8. A mine roof support as claimed in claim 1 wherein the roof bar which is pivotally connected to one limb of the L shaped roof engaging structure extends beyond the other limb of said structure.

9. A mine roof support as claimed in claim 2 wherein said roof bar part extends beyond said stably mounted part.

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