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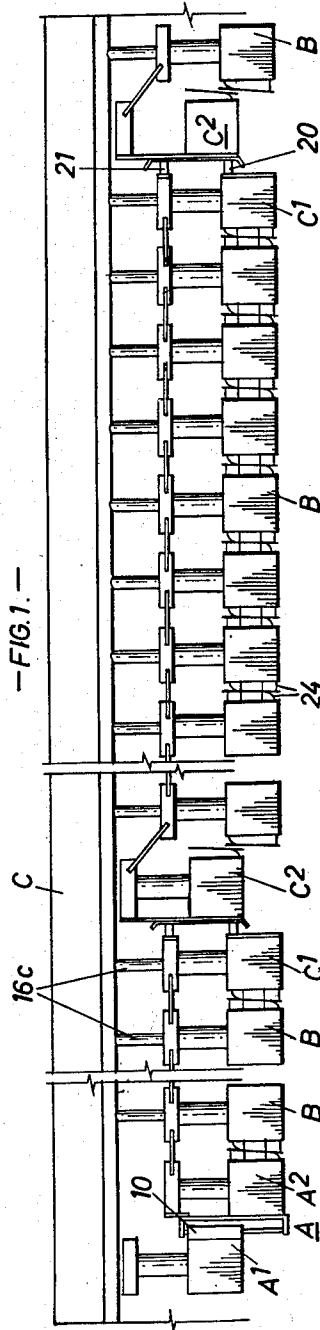
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3,159,003

ROOF SUPPORTS FOR MINES

Filed July 31, 1961

5 Sheets-Sheet 1



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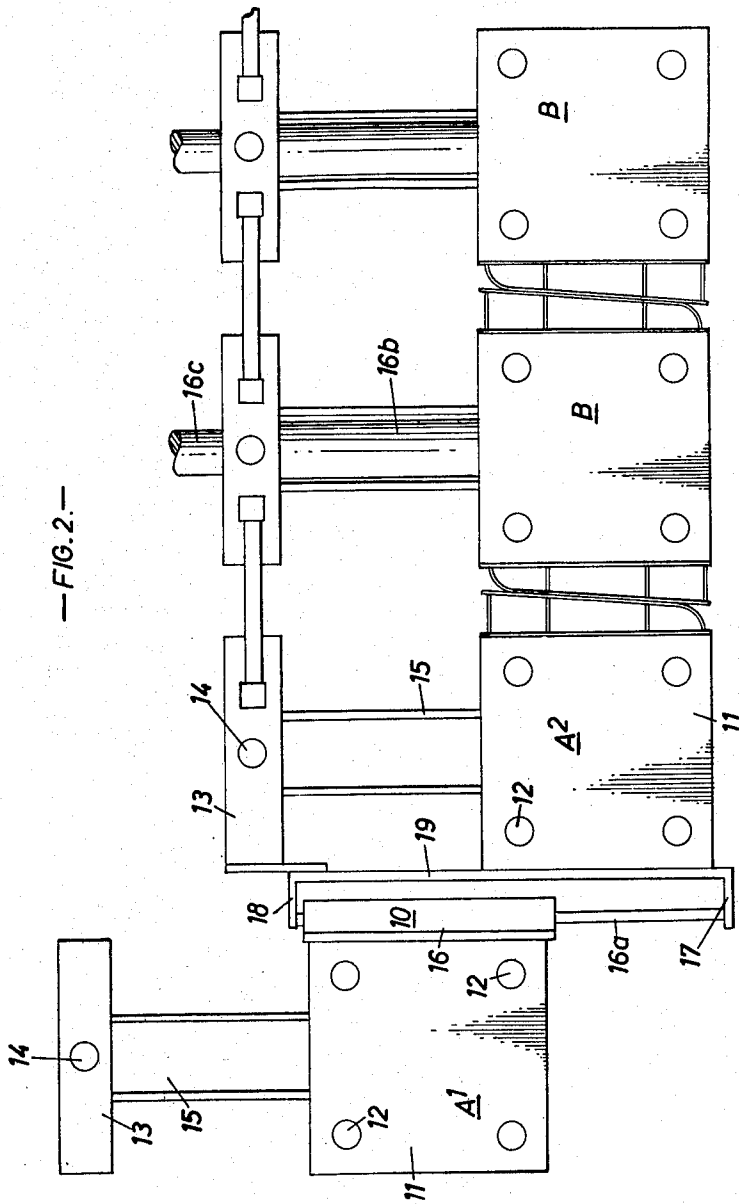
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5 Sheets-Sheet 2



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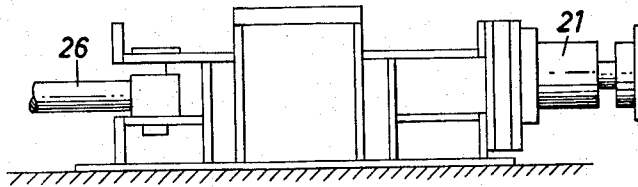
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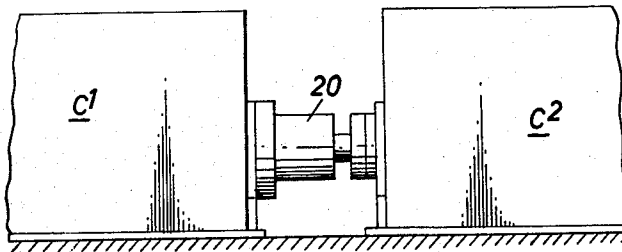
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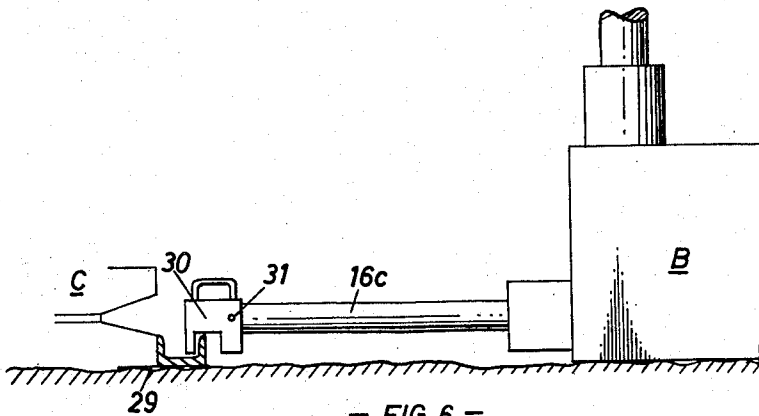
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- FIG. 4. -



- FIG. 5. -



- FIG. 6. -

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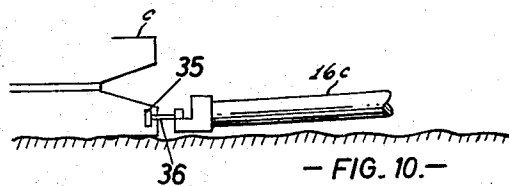
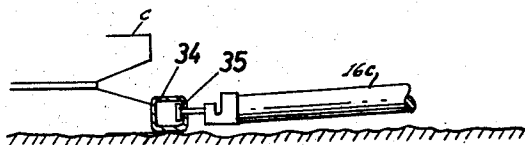
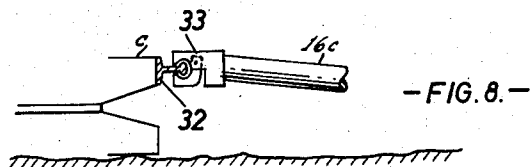
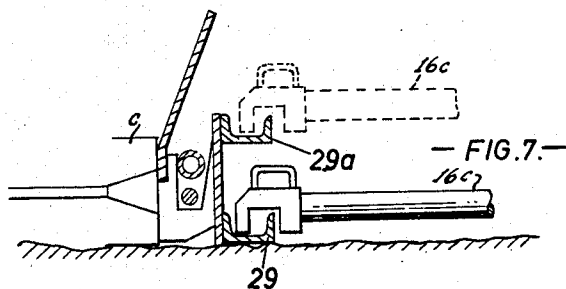
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ROOF SUPPORTS FOR MINES

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5 Sheets—Sheet 5



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3,159,003

ROOF SUPPORTS FOR MINES

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Claims priority, application Great Britain, Aug. 31, 1960, 29,964/60

7 Claims. (Cl. 61—45)

This invention is for improvements in or relating to roof supports for mines and the like. The invention is particularly concerned with roof supports for use in mining systems or methods of the kind in which, after a cut has been made, a row of such supports is advanced towards the coal face. Such supports frequently also serve to push, or form abutments for pushing, a conveyor over towards the coal face. In one known system of this kind the advance movement of the supports is effected by hydraulic ram devices associated with such supports. For instance, after pushing over the conveyor the latter may serve as an anchorage or abutment to which the ram devices can temporarily be attached and the supports drawn forward by the operation of said ram devices. Alternatively the supports may be of the kind known as "walking supports." In this case each support is in two or more parts, each part when secured between floor and roof serving as an abutment or anchorage to enable the hydraulic devices to act to move the other part forwardly.

In the case of inclined seams or roadways there is a tendency for the supports as they are released from the supporting position between floor and roof, to slide laterally down the incline. One object of the present invention is to provide supports and a system of operation thereof whereby this objectionable tendency is overcome without at the same time interfering to any material extent with the advancing of the supports at the appropriate times.

According to the present invention there is provided a roof support having means adapted for engagement by a neighbouring support to hold the latter against lateral movement without interfering with the required forward movement of such neighbouring support.

According to a further feature of the present invention there is provided a mine roof support comprising two elements or parts adapted to be secured between floor and roof and to be advanced in turn one with respect to the other, one of said elements or parts having a member which slidably engages a member on the other element or part so that when one of said members is secured between floor and roof it will hold the other member when the latter is released, against lateral movement.

One preferred form of support provided in accordance with the present invention comprises two elements or parts each adapted to be secured between floor and roof and a pressure fluid ram device adapted to advance each part in turn, said ram device having its cylinder secured to one of said elements or parts and its piston or ram proper secured to the other element or part so that said cylinder and piston serve to guide movement of one support part relatively to the other, one of said support elements or parts having an abutment or the like adapted to be engaged by a neighbouring support so as to hold or restrain said neighbouring support against lateral movement.

Preferably the abutment has an inclined face and there is a similarly inclined abutment on the neighbouring support, these abutments abutting snugly together face to face when the supports are in line and secured between floor and roof. The arrangement is such, however, that immediately a support starts to be advanced the inclined abutting faces part one from the other so that there is no interference with such advancement. In other words, there is no possibility of one support becoming "iron bound" with its neighbour.

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Embodiments of the invention will now be described, by way of example, with reference to the accompanying drawings wherein:

FIGURE 1 is a plan view of a portion of the coal face, and the layout of the supports associated therewith,

FIGURE 2 is a plan view in greater detail of the supports at one end of the coal face,

FIGURE 3 is a plan view in greater detail of the supports at an intermediate position along the coal face,

FIGURE 4 is a fragmentary view of FIGURE 3 in the direction of the arrow IV,

FIGURE 5 is a fragmentary view of FIGURE 3 in the direction of the arrow V, and

FIGURES 6 to 10 inclusive show various arrangements for attaching the hydraulic rams of the supports to a conveyor so that they are operative first to push over the conveyor to the newly exposed coal face and then, using the conveyor as an anchorage, to pull the supports forwardly and up to the conveyor.

The system shown in the drawings comprises a master chock A at the lower end of the inclined seam, slave or intermediate chocks B and sub-master support arrangements comprising chocks C1 and C2.

The master chock A comprises two elements or parts A1 and A2 operatively associated one with the other by means of a hydraulic ram device 10.

The part A1 comprises a rear frame 11 and four hydraulically extensible props 12 and a forward frame 13 and a hydraulically extensible prop or leg 14. The two parts are rigidly connected together by the member 15.

The part A2 so far as the construction of its roof propping members are concerned is similar to that just described with reference to the part A1 and like reference numerals have been used to designate like parts.

The ram device 10 comprises a cylinder 16 attached to the support part A1 and a piston or ram proper, the piston rod 16a of which is connected at its ends to lugs 17 and 18 on a bracket 19 attached to the rearward and forward parts 11 and 13 of the support element A2.

The piston rod ends run or engage in vertical guides in the lugs 17 and 18 so as to provide some flexibility or "float" between the support parts A1 and A2.

The intermediate supports B are also similar in construction to the supports A1 and A2, so far as their roof propping components are concerned, and here again like reference numerals have been used to designate like parts. The members 15 of the intermediate supports house double-acting hydraulic rams each of which comprises a cylinder 16b and a piston rod or ram proper 16c.

The sub-master chocks C1 and C2 are also similar, so far as their roof propping components are concerned, to the chock A1 and A2.

The chock C1 is provided with two short stroke single-acting hydraulic rams 20 and 21 adapted to apply a guide plate 22 to a guide plate 23 on the neighbouring chock C2.

The supports or chocks above described are provided with abutment plates or members 24 having inclined faces 25 which, when the chocks or supports are in their operative position and in line, abut snugly one against another.

The chocks, with the exception of the two constituting the sub-master arrangement, are coupled together by telescopic links 26, the ends of which are pivotally attached to the supports or chocks as indicated at 27 and 28.

The system above described is operated as follows to advance the line of chocks or supports:

Firstly, the props 12 and 14 of the master chock part A1 are lowered and then the ram 10 is operated so as to advance the part A1 into the position shown in FIGURES 1 and 2 of the drawings. It will be appreciated that during this movement the part A1 is guided by the hydraulic device 10 and is prevented from sliding down

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the gradient inasmuch as it is anchored by said hydraulic device to the part A2 which is still secured between floor and roof. After the part A1 has been advanced to the position shown in FIGURES 1 and 2 its props 12 and 14 are extended again so as to secure it firmly between floor and roof. The props 12 and 14 of the part A2 are then lowered and by operating the hydraulic ram 10 in the reverse direction this part is brought forward into line with the part A1. Here again, the hydraulic ram device 10 ensures parallel movement of the part A2 with respect to the part A1 and of course prevents the part A2 sliding down the gradient.

The intermediate chocks B are then advanced in turn in known manner by means of their hydraulic ram devices. The rams 16c of the latter are first advanced so as to push over the conveyor C as shown in FIGURE 1 and then, using the conveyor as an anchorage, pressure fluid is applied to the opposite sides of the rams so that the rams proper 16c are retracted into their cylinders and the supports are advanced towards the conveyor.

FIGURES 6 to 10 inclusive show various arrangements for anchoring the rams 16c to the conveyor C in such a manner that the supports B and their rams are displaceable longitudinally with respect to the conveyor.

In the arrangement shown in FIGURE 6 a channel-section member 29 is attached to, and extends longitudinally of the conveyor, and each ram 16c is provided with a hook-like member 30 pivoted to the ram at 31 and adapted to engage the channel 29. The pivotal connection 31 enables the hook-like member 30 to be swung clear of the channel 29 when required.

FIGURE 7 shows an arrangement similar to that just described with reference to FIGURE 6 except that there are two channel-section members 29 and 29a on the conveyor which provide for the connection of the ram 16c to the conveyor at two different levels.

In the arrangement shown in FIGURE 8 a rail-like member 32 extends longitudinally of the conveyor and the rams 16c are provided with jaws 33 adapted slidably to engage said rail.

In the arrangement shown in FIGURE 9 a square section member 34 is attached to, and extends longitudinally of the conveyor and is slotted along its length to receive headed bolt-like members 35 attached to the rams 16c.

FIGURE 10 shows an arrangement similar to that shown in FIGURE 9 except that the conveyor itself is slotted longitudinally as indicated at 36 to receive the headed bolt-like members 35.

It will be appreciated that the just-described arrangements allow for relative movement between the conveyor and the means operatively attaching the rams to it so that conveyor movement cannot damage the chocks or supports or hamper operations.

It will be appreciated that after each intermediate chock has been moved forward its legs or props 12 are extended so as to secure it firmly between floor and roof and it then serves as an abutment for preventing the next intermediate chocks sliding down the gradient when it is being advanced.

Immediately a succeeding intermediate support B starts to advance a clearance develops between its abutment plate 24 and the abutment plate 24 of the support immediately preceding it down the gradient. Thus, there is no possibility of the intermediate supports becoming jammed or "iron bound" one against another. The telescopic link 26 is fully closed when a chock has been fully advanced and serves to line it up correctly at right-angles to the conveyor and with its abutment plate 24 snugly up against the abutment plate 24 of the preceding support. In other words, when the forward legs or props 14 are in line the telescopic links or attachments 26 are closed and give a fixed dimension between them after the manner of a top dead-centre arrangement. It will be noted that the wedging action afforded by the inclined abutment plates or members 24 is opposed to the gradient.

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The sub-master chock arrangement C1, C2 is not an essential feature of the arrangement above described but is provided in certain circumstances so that more than one man can operate the system where speed of advance of the face is important and there is not sufficient time for one man to operate the whole line of supports.

To advance a line of supports above a sub-master support arrangement the rams 20 and 21 of the sub-master chock C1 are retracted, thus allowing the neighbouring chock C2 to be drawn forward or advanced up to the coal face. When this chock has been advanced the rams 20 and 21 are extended again to position it correctly and said chock C2 is then secured between floor and roof so that its abutment plates 24 become operative to support the next intermediate chock as it is advanced and so on right through the series.

It will be appreciated that the guide means between the chock elements A1 and A2 need not necessarily be a hydraulic ram arrangement but could be a simple guiding means, each of the support elements A1 and A2 having its own hydraulic ram for advancing the conveyor and drawing it up thereto.

I claim:

1. Self-advancing mine roof support means for cooperation with an anchorage extending along a coal face, comprising first and second roof supports, each of said supports including a forward element having at least one hydraulically extensible roof supporting leg, a rear element affixed to the forward element and also having at least one hydraulically extensible roof supporting leg, and a double acting hydraulic ram means, each said ram means including a cylinder secured to its respective support and a ram having means for attachment to the anchorage, whereby the ram can be advanced to push forward the anchorage toward the coal face and then retracted to pull the support towards the repositioned anchorage and coal face, laterally arranged wedge-like devices on the rear elements of said first and second supports, said wedge-like devices having abutting, oppositely inclined faces with respect to the axes of their respective rams to determine the spacing apart of said rear elements when the supports are secured in roof supporting condition, and telescopic link means pivotally connecting the forward element of the first support to the forward element of the second support and the length of which, in the fully collapsed condition, determines the spacing apart laterally of the forward elements of the supports, the arrangement being such that, when the first support is released from roof supporting condition and advanced, said wedge-like devices part immediately one from the other to avoid interference with such advancement, said wedge-like devices and link means being operative as the second support is advanced to position the second support correctly in relation to the first support and the coal face.

2. Self-advancing mine roof support means according to claim 1, in combination with a third and neighboring support, said second support being provided with a laterally acting hydraulic ram means on the side opposite its wedge-like device, and a guide member on said laterally acting ram means for engagement with said third support.

3. Self-advancing mine roof support means according to claim 1, wherein said means for attachment of each ram to the anchorage comprises a clamping member having a slot extending laterally of the associated ram axis, whereby the rams and associated supports are slideable longitudinally with respect to the anchorage.

4. Self-advancing mine roof support means for cooperation with an anchorage extending along a coal face, comprising first, second and third self-advancing mine roof supports, each of said supports comprising a forward element having at least one hydraulically extensible roof supporting leg, and a rear element affixed to the forward element and also having at least one hydraulically

extensible roof supporting leg, hydraulic ram means for advancing the first and second supports having a piston and cylinder connected one to the first support and the other to the second support, said piston including a piston rod which protrudes from opposite ends of said cylinder and has its ends connected respectively to the forward and rear elements of the connected support, double acting ram means for advancing the third support, including a cylinder secured to said third support and a ram having means for attachment to the anchorage, whereby the ram can be advanced to push forward the anchorage toward the coal face and then retracted to pull the support towards the repositioned anchorage and coal face, laterally arranged wedge-like devices on the rear elements of the second and third supports, said wedge-like devices having abutting, oppositely inclined faces with respect to the axes of their respective rams to determine the spacing apart of the rear elements of said second and third supports when the supports are secured in roof supporting condition, and telescopic link means pivotally connecting the forward element of the second support to the forward element of the third support and the length of which, in the fully collapsed condition, determines the spacing apart laterally of the forward elements of the second and third supports, the arrangement being such that, when the second support is released from roof supporting condition and advanced, said wedge-like devices part immediately one from the other to avoid interference with such advancement, said wedge-like devices being operative as the third support is advanced to position the third support correctly in relation to the second support and the coal face.

5. Self-advancing mine roof support means according to claim 4 in combination with a fourth and neighboring support, said third support having laterally acting hydraulic ram means on the side opposite its wedge-like device, and a guide member on said laterally acting ram means operative to engage said fourth support.

6. Self-advancing mine roof support means according to claim 4, wherein said means for attachment of each ram to the anchorage comprises a clamping member having a slot extending laterally to the associated ram axis, whereby the rams and associated supports are slideable longitudinally with respect to the anchorage.

7. Self-advancing mine roof support means for cooperating with an anchorage extending along a coal face, comprising first and second roof supports, each of said

supports having a forward portion and a rear portion, each of said portions having at least one hydraulically extensible roof supporting leg, hydraulic ram means for advancing said first and second supports respectively upon releasing their roof supporting legs, said ram means including cylinders secured to the supports and rams having means for attachment to an anchorage, whereby the rams can be advanced to push forward the anchorage toward the coal face and then retracted to pull the supports toward the repositioned anchorage, laterally arranged wedge-like devices on the rear portions of said first and second supports, said wedge-like devices having abutting, oppositely inclined faces with respect to the axes of their respective rams to determine the lateral spacing of said rear portions when the supports are secured in roof supporting condition, and telescopic link means pivotally connecting the forward portion of the first support to the forward portion of the second support and the length of which, in the fully collapsed condition, determines the spacing apart laterally of the forward portions of the supports, the arrangement being such that, when the first support is released from roof supporting condition and advanced, said wedge-like devices part immediately one from the other to avoid interference with such advancement, said wedge-like devices and link means being operative as the second support is advanced to position the second support correctly in relation to the first support and the coal face.

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