This invention pertains to the art of mining, and more particularly to an accessory to be used in supporting the roofs of mines, particularly the roofs in the main entries of mines.

In mining operations, particularly coal mines, the roof has to be supported at regular intervals to prevent rock or slate from dropping down from the roof. In the main entries of mines through which the cars are hauled from various rooms and sub-entries to the mouth of the mine, particular care is given to the roof supports. The most common way of supporting the roof is to provide uprights at each side of the entry, and these uprights carry a cross member which bears against the roof of the mine. The cross member may be timber, but in larger and more extensive operations it is quite common to use mine rails, particularly second-hand or used rails, and in some cases structural steel for the cross pieces. It not infrequently happens that a mine locomotive or a string of loaded mine cars are derailed in moving through the entry. When this happens the uprights at the side of the mine are often knocked down by the derailed cars or by the normal movement of equipment through the mine. The invention contemplates the forming of niches in opposite walls of the mine of increasing depth in a lateral direction downwardly from the roof of the mine, and the bottoms of which are in most instances well above the floor of the mine. These niches are of a character which can be readily cut into the walls of the mine by a miner using a hand pick. Into these niches are set supports which are inclined from a vertical position, the supports having means at their upper ends for engaging and holding the roof supports. Being set into niches in the walls of the mine, these supports cannot be knocked out of place by the derailment of mine cars. Being set at an angle to a vertical position, the load is transmitted inwardly from the face of the supports to the coal so that the coal immediately under the supports is not likely to shear or break out. The supports are preferably so constructed as to enable them to be formed of short lengths of rail, structural forms, or timber.

The invention may be more readily understood by referring to the accompanying drawings in which—

Figure 1 represents a transverse section through the main entry of a mine;

Figure 2 is a perspective view of the bracket or clamp for connecting the roof supports to the side supports;

Figure 3 is a perspective view of a base member adapted to be used at the bottom of the side supports;

Figure 4 is an elevation of the member shown in Figure 2 viewed from the outermost end thereof;

Figure 5 is a longitudinal vertical section through the mid-plane of the section shown in Figure 2;

Figure 6 is a view similar to Figure 4 of a slightly modified construction;

Figure 7 is a view similar to Figure 5 of the modification shown in Figure 6;

Figure 8 is a view similar to Figure 5 showing another modification, and

Figure 9 is a schematic view illustrating the manner of cutting niches in the side walls according to the height of the side supports.

In the drawings, A indicates the roof of a mine over the main entry. B designates the two side walls, and C is the floor of the mine. In a typical coal mine the walls B would be of coal while the roof A would usually be slate or shale rock. The roof is supported by a series of roof supports 2 extending transversely across the entry against the roof. The drawings show but a single one of the supports, but they are located at regular intervals one behind the other along the length of the mine entry. The support 2 is illustrated as comprising a length of rail with the head of the rail bearing against the roof and with the flange of the rail being at the bottom.

According to the present invention, there is provided a fitting 3 which may be formed as an integral casting. It has a flat top 4. At each side of the inner end of the member 3 are upwardly and inwardly extending projections 6. The projections 6 extend inwardly and upwardly toward each other at an inclination corresponding generally to the inclination of the flange of the rail. There is a space 7 between the ends of the two parts 6, the width of this space or gap 7 being equal to the width of the web of the maximum
size rail 2, which the fitting will accommodate. At the opposite end or outer end of the casting 3 is an end wall 8 having an overhanging flange portion 9 with a central notch 10 therein, the central notch 10 being in line with the space or gap 3 and being of the same width. The arrangement is such that the member 3 may be slipped onto the end of a rail as shown in Figure 4. The flange of the rail will extend under the overhanging member 5 and under the overhanging extension 8, while the web of the rail will be received in the space 7 and the notch 10. The end wall 8 will abut against the end of the rail to prevent the bracket 3 from sliding more than a limited distance along the rail. The flange of the rail will rest on the flat top or deck 4 of the bracket. When the bracket or casting has been slipped onto the end of the rail, it cannot move inwardly on account of the end wall 8 con- tacting with the end of the rail. It cannot move vertically because of the flange being under the overhanging lugs 8 and the overhanging flange 5. It cannot move sidewise with respect to the rail to any appreciable extent because the width of the space between the two vertical portions 8a and the lugs 5 is just sufficient to accommodate the maximum size of rail with which the device can be used. The practice of the casting 3 would be made in a series of graduated sizes, one to ac- commodate rails between 30 and 50 pounds; another to accommodate rails between 60 and 80 pounds, and the third to accommodate rails of 90 pounds or over.

On the under side of the casting 3 is an inclined face 11. The casting has a downwardly extending flange 12 at the front of the inclined face 11, and the inclined face 11 is provided with two spaced lugs 13 separated by a space 14 equal to the thickness of a rail web. The lugs 13, as shown in Figure 5 are spaced from the lip 12 a distance 15 equal to the thickness of a rail flange. The arrangement is such that a short length of rail 16 having its ends cut square can be set endwise against the inclined surface 11 in such a manner that one of the lugs 13 will be on each side of the web of the rail while the flange of the rail will rest on the flange 12 of the casting in the space 15. The lugs 13 will thus hold the rail section 16 from moving to the left as viewed in Figure 5. In Figure 5, while the flange 12 on the casting will prevent the rail from moving to the right as viewed in Figure 5. The two lugs 13 will prevent relative lateral movement of the casting 3 with respect to the end of the rail by reason of the fact that the lugs 13 straddle the web of the rail 16.

In addition to the casting 3 the invention con- templates the provision of a second casting 18 as shown in Figure 3 which is of a wedge shape having an inclined top surface 19 and having a hori- zontal base 19a. On the inclined top face 19 of the member 18 are integral upstanding lugs 20 spaced apart a distance equal substantially to the thickness of the web of a rail and of a length which is slightly less than the distance between the top of the flange of the rail 16 and the under side of the head portion of the rail 16. The manner of using the invention may be readily understood by reference to Figure 1.

The miner cuts niches D at opposite places in the two walls B, these niches being of laterally increasing depth so that they are deepest in a direction normal to the plane of the wall at their base. The cross piece 2 which has previously been cut to length is then fitted at each end with one of the castings 3. The vertical depth of the niches D depends upon the length of the upright supporting rails 16. Lengths of rails 16 which have been cut to the desired length are then applied to the under surface of the niches D, with the head or ball of the rail turned toward the wall and the flange turned toward the entry, and each of the uprights 16 is fitted to one of the base castings 18, i.e., set in the bottom of each niche. At the time that the cross rail 2 is put into place, the roof will not be smooth as illustrated in the drawings, but will be more or less irregular and perhaps arched, so that there is adequate clearance for the assembly to be effected. As a matter of actual practice, wedges are used at the present time between roof supports and the roof, and such wedges may be used when the cross rails are supported in accordance with this invention. Once the cross member 2 has been assembled on the two side supporting members, the structure cannot become disengaged at the base of the wall D because of the base plates 18. The members 16 being set at an angle to a vertical position, transmit the load or the pressure from under the roof of the mine in a gen- erally diagonal direction with respect to the side walls B so that there is a horizontal component of pressure away from the wall B into the solid mass of coal as well as a vertical component. This eliminates any danger of the coal spalling or breaking out under pressure immediately under the base members 16 as would be the case if the members 16 were set in a vertical position.

In the modification shown in Figures 6 and 7, provision is made for an adjustment in a hori- zontal direction between the posts and the bracket or flange which engages the roof support. In these figures 21 designates a member having an end wall 21a to engage against the end of the roof brace and having parts 22 and 23 to engage over the flange of the cross rail. On the under side of the member 20 are extending flanges 24 with rib portions 25. These flanges provide a guideway to receive a flanged block 26. The under surface of the member 21 and the top sur- face of the block 26 are serrated so that when they are pressed together they will slide on the other. The guideway provides sufficient clearance, however, that when there is no pres- sure applied between the members 20 and 26, the member 26 can be moved clear of the serrated surface on the member 20 and be inserted along the guideway. The member 25 has spaced pro- jections 27 corresponding to the projections 13 in Figures 4 and 5 to engage a supporting rail similar to the rail 16 as illustrated in dotted lines, for example, in Figure 7. Block 26 has a depend- ing flange 28, the function of which corresponds to the flange 12 of Figure 5.

Instead of using a piece of rail for the support 16 it may in some cases be desirable to use a short piece of timber or pipe or some other kind of support. Figure 8 illustrates a modification in- tended for this purpose where a piece of rail is used in place of pieces of rail 16. In this figure 30 designates a casting generally similar to the cast- ing 3 of Figure 2 and is provided with an end wall 31 to engage against the end of the cross piece, 76:
and it is provided with overhanging portions 32 and 33 to engage over the flange of a rail or structural member similar to the elements 9 and 6 respectively of the device shown in Figure 2. The under side of the casting 30 is provided with a projection 34 to extend into the end of a piece of pipe 35 which would correspond in function to the member 16 illustrated in Figure 1. The bottom of the pipe 35 rests on a wedge shaped block 36 having a projection 37 to enter the bottom of the pipe. By having a flange, such as 34' on the member 33, it can also be fitted over the end of a piece of timber.

In different mines and under different circumstances the member 16 or any other support at the ends of the cross member 2 may be of a length different from that used in some other installation. Figure 9 illustrates diagonally the manner in which the niches D are formed for side supports of different heights. The inclination at the rear of the niche D will be approximately the same irrespective of the height of the post or other support 16, and the bottom of the niche must always be of an area sufficient to receive the head or base block 18. Where very short side supports are used, the top of the niche is recessed further, whereas with longer posts the niche at its top terminates in the plane of the side wall. Figure 9 illustrates the idea of forming niches of different vertical heights to accommodate posts of different lengths. The niches can be easily cut into the side walls of the mine by a miner using a pick so that no special tools are required.

Frequently the supporting assembly is actually used at only one end of the cross rail, the other end of the rail being merely entered into a hole cut into the other side wall just under the roof in a manner familiar to those skilled in mining. While I have shown and described specifically certain detailed embodiments of my invention, it will be understood that this is by way of illustration and the various changes and modifications may be made in the construction of the parts within the contemplation of my invention and under the scope of the following claims. Various modifications have been shown. These are merely typical illustrations of ways in which my invention may be embodied, as it may be embodied in various other forms.

I claim:

1. A fitting for connecting a mine roof support with an upright comprising a generally wedge-shaped body having a horizontal top surface with overhanging flanges at the sides and at the end thereof arranged to receive the end of a flanged roof support, the undersurface of the fitting being inclined and being flat to provide a bearing surface for the lower end of an upright support and having projection thereon arranged to fit about the upper end of an upright support for connecting the fitting and support against relative movement in a plane transverse to the axis of such support.

2. A fitting for connecting a mine roof support with an upright comprising a generally wedge-shaped body having a horizontal top surface with overhanging flanges at the sides and at the end thereof arranged to receive the end of a flanged roof support, the undersurface of the fitting being inclined and having projections thereon arranged to fit about the upper end of an upright support for connecting the fitting and support against relative movement in a plane transverse to the axis of such support, said fitting comprising two superimposed parts the lower of which is of wedge form and carries the said projections to engage the upright, the upper part resting on the lower and having the said flanges to engage the roof support, the contacting faces of the two parts being interfitted to enable one part to be adjusted in the direction of the length of the roof support with which the fitting is engaged.

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