April 7, 1936. J. R. B. NEILSON ET AL 2,036,490

SUPPORT FOR MINES AND THE LIKE

Filed Sept. 1, 1934

Fig. 1.

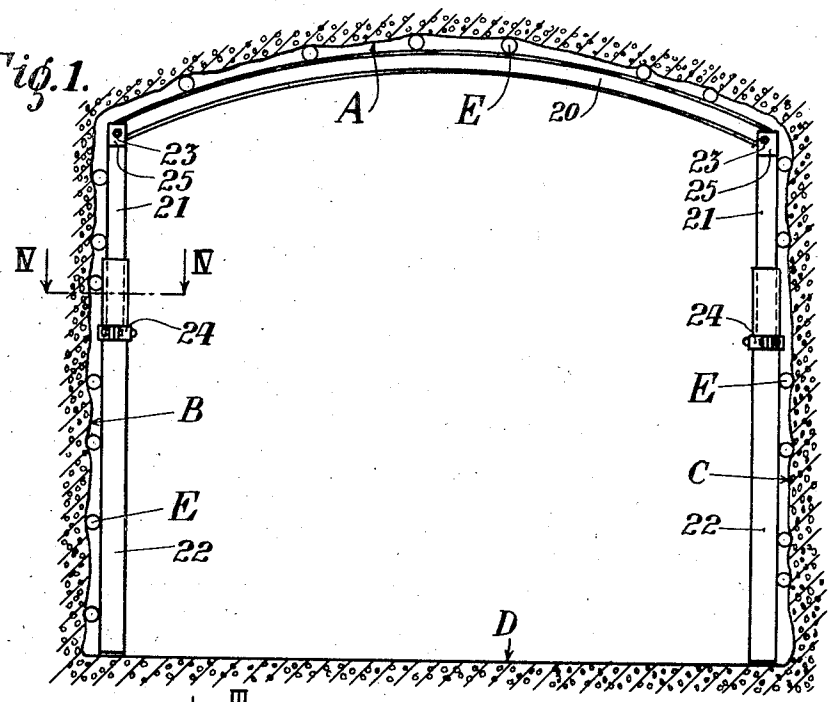


Fig. 2.

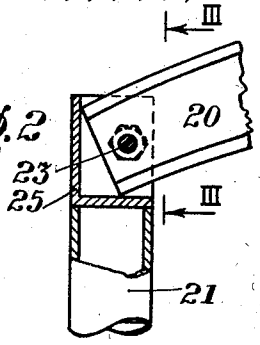


Fig. 3.

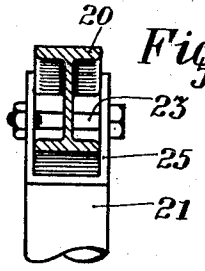


Fig. 5.

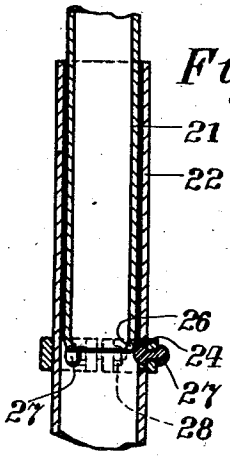
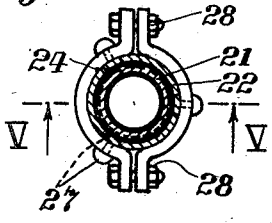


Fig. 4.



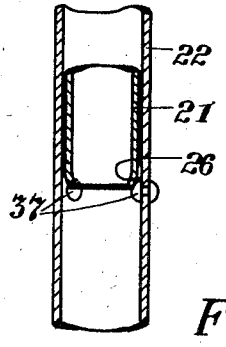


Fig. 6.

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SUPPORT FOR MINES AND THE LIKE

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12 Claims. (Cl. 61—45)

This invention relates to a support for the roofs of coal mines and other underground roadways and workings.

It is often found that the strata above an underground roadway settle down after the roadway has been cut, the settlement involving a downward movement of the roof. Desirably, the roof supports should adjust themselves to accommodate said downward movement.

An object of this invention is to provide an improved roof support having provision for the desired self-adjustment.

Another object of the invention is to provide an improved support comprising or including a strut consisting of telescopically related upper and lower tubes.

Another object is to provide one of a pair of telescopically related tubes composing a strut with projections serving normally to support the other tube and thereby prevent lengthwise contraction of the strut and acting to form longitudinal grooves or flutings (hereinafter termed "grooves") in the other tube if the strut is forced to contract in length.

Another object is to provide the lengthwise-contraction-preventing projections as formations on the outer of two telescopically related tubes composing a strut, said formations being located in the interior of the outer tube so as to engage with the inner tube and to form grooves therein when lengthwise contraction of the strut occurs.

The roof support may consist of a cross roof-bearing beam and side struts connected to the beam ends, each of said struts consisting of telescopically related tubes provided with projections, as aforesaid. If and when the strata above the roadway settle down to such an extent as to impose an unduly heavy load upon the cross beam, the latter presses downwards upon the struts and forces them to contract lengthwise a small amount, thereby relieving the load on the cross beam. Any recurrence of excessive load will be at once followed by a further short self-adjustment of the struts; and this procedure will continue automatically until finally the strata above the roadway adopt a condition of equilibrium. As each support throughout the length of the roadway adjusts itself in accordance with the load which it sustains, the resistance of all the struts to the overhead strata will be substantially uniform.

No adjustments need be made by the workmen cutting out the roadway and erecting the supports, because the struts can be pre-set to a determinate length and to withstand a determinate load; i. e. to have a determinate lengthwise-contraction-resisting strength.

The roof-bearing beam may be of camber form and may rest at its ends in seats on the strut tops. Thus, the roadway to be cut is much more nearly rectangular in cross-sectional shape than is the case with arched roadways, so that a greater effective cross-sectional area can be obtained, and this with less cutting. Further, the cross-beam has no joints between its ends, so that its strength is unimpaired; whereas, arch-girders for arched roadways are made in halves jointed together, such arch-girders each consisting of a semi-circular upper portion, midway of which the joint is located, and short straight end portions which in certain constructions are fitted with adjustable stilts.

The invention will now be described, by way of example, with reference to the accompanying drawing, in which:—

Fig. 1 is a section of an underground roadway and shows a support including struts according to the invention.

Fig. 2 is a sectional view to a larger scale of the connection between one end of the roof-bearing beam and the adjacent side strut.

Fig. 3 is a section on the line III—III of Fig. 2.

Fig. 4 is a section, also to a larger scale, on the line IV—IV in Fig. 1 and shows one construction of the means for preventing lengthwise contraction of a telescopic side strut.

Fig. 5 is a section on the line V—V of Fig. 4.

Fig. 6 is a view corresponding to Fig. 5 but showing a modification.

Referring to Fig. 1, the roof of the underground roadway is denoted by A, the faces or walls by B, C, and the floor by D. The cross roof-bearing beam is denoted by **20**, and each of two telescopic side struts by **21**, **22**, the upper member **21** of each strut being connected at **23** to the adjacent beam end, **24** denotes generally a device which serves to prevent telescopic collapse—that is, lengthwise contraction—of the members **21**, **22** constituting each strut. Longitudinal roadway-supporting members E are arranged between the beam **20** and the roof A, and between the struts **21**, **22** and the faces B, C.

The beam **20** is of camber form to suit the shape of the roof A.

It will be noted that the cross-sectional shape of the roadway approximates more closely to rectangular shape than underground roadways heretofore made, these latter roadways approximating to semi-circular shape.

Each strut consists of upper and lower tele-

scopically related tubes, the upper tube 21 being a loose sliding fit in the lower tube 22. The cambered beam 20 is an H-section girder; but if desired it also may be tubular. As shown best in Figs. 2 and 3, each beam end fits into and rests upon an angular seat 25 secured to the top of the adjacent upper tube 21. The connection 23 consists of a removable bolt passing through the sides of the seat 25 and the web of the beam 20.

The construction of the means shown in detail in Figs. 4 and 5 for preventing lengthwise contraction of each telescopic strut will now be described. As shown, the bottom end of the upper tube 21 is inwardly bevelled at 26. When the tubes are assembled, the bevelled end 26 abuts against inward projections consisting of the rounded heads of a number (say three) of circumferentially spaced rivets 27 which extend from the ring 24 through holes in the lower tube 22. The ring 24 shown consists of a clamp made in two halves bolted together at 28 so as to embrace the tube 22.

If desired, a reinforcing thrust ring might be shrunk and/or welded on the lower tube immediately below the ring 24. Further, round-ended screws or round-headed bolts might be used instead of the rivets 27. Further, the ring 24 might be replaced by a one-piece ring split at one place and bolted tightly against the tube 22.

In the use of a support having tubular struts interconnected in the manner above described, the incidence of an excessive load upon the roof-bearing beam 20 forces the upper tube 21 of each strut downwards past the rounded projections 27, which deform the tube 21 by forming longitudinal grooves in it, and in so doing these projections strongly and uniformly resist lengthwise contraction of the strut.

The lengths of the tubes 21, 22 and the location of the ring 24 are predetermined to suit the height of the roadway; and the dimensions of the parts are predetermined to give a definite resistance to lengthwise contraction of the strut.

If desired, as shown in Fig. 6, a number of rivets 37, or round-headed bolts, might be provided directly on the outer tube 22, thereby avoiding the use of an external support such as the clamp 24 shown in Figs. 4 and 5.

The setting of the telescopic struts can take place at some stage prior to the transport of the parts to the underground roadway; so that no adjustments need be made by the workmen cutting out the roadway and erecting the supports. The erection of the supports merely involves positioning the struts and jointing each pair thereof to the respective camber beam. Thus, the supports can be easily and quickly erected; and they can also be easily and quickly dismantled, if required.

When the roadway is completed, if the strata above the roadway should settle down—as is usual—to such an extent as to impose an unduly heavy load upon the supports, each cross-beam 20 presses downwards at its ends upon the tubes 21 and forces them farther into the lower tubes 22. That is to say, the struts automatically contract lengthwise, with the result that the load on the cross-beam is proportionately relieved.

We claim:

1. An underground roadway support comprising a cross roof-bearing beam, side struts each comprising telescopically related upper and lower tubes one of which is slidable within the other, seats provided at the tops of the upper tubes and adapted to receive the ends of said beam, pivotal connections between said seats and the beam ends, internally projecting means provided in the outer tubes, and inturned end portions on the inner tubes, said projecting means being adapted to contact with said inturned end portions and support the inner tube against sliding movement within the outer tube until the struts are subjected by said beam to an excessive load.

2. An underground roadway support comprising a cross roof-bearing beam, side struts each comprising telescopically related upper and lower tubes one of which is slidable within the other connections between the upper tubes and the beam ends, clamps embracing the outer tubes, and inner-tube supporting means provided on said clamps and projecting into the interior of the outer tubes through openings therein, said supporting means abutting against the adjacent end of the inner tubes and acting to prevent lengthwise contraction of the struts until said struts are subjected by said beam to an excessive load.

3. An underground roadway support according to claim 2 wherein the inner tubes are formed with inturned ends which abut against the inwardly projecting means on the clamps.

4. For underground workings, a roof-supporting strut comprising telescopically related tube structures one of which is slidable within another and internally projecting formations constituting parts of the outer tube structure, said formations serving to support the inner tube structure and normally prevent lengthwise contraction of the strut and said formations being adapted to produce longitudinal grooves in the inner tube structure if and when the strut is forced to contract in length.

5. For underground workings, a roof-supporting strut according to the preceding claim 4, wherein the inner tube structure therein mentioned comprises mainly a tube with an inturned end adapted to bear against the internally projecting formations of the outer tube structure.

6. An underground roadway support comprising a cross roof-bearing beam, side struts each comprising telescopically related upper and lower tubes one of which is slidable within the other, connections between the upper tubes and the beam ends, and a plurality of projections on the internal wall of each outer tube, said projections being adapted to abut against the adjacent ends of the respective inner tubes and prevent lengthwise contraction of the struts until said struts are subjected by said beam to an excessive load and said projections being adapted to produce longitudinal grooves in the inner tube when such lengthwise contraction occurs.

7. An underground roadway support comprising a cross roof-bearing beam, side struts each comprising telescopically related upper and lower tube structures one of which is slidable within the other, connections between the upper tube structures and the beam ends, and projecting formations which are located in circumferentially spaced relationship on, and between the ends of one of said tube structures, and against which formations the other tube structures abut, said formations being adapted to prevent lengthwise contraction of the struts until said struts are subjected by said beam to an excessive load and said formations being adapted to form longitudinal grooves in said other tube structures if and when the struts are forced to contract lengthwise.

8. For underground workings, a roof-support-

ing strut comprising telescopically related tube structures and projecting formations which are located in circumferentially spaced relationship on, and between the ends of one of said structures, said formations serving to support the related tube structure and normally prevent lengthwise contraction of the strut and said formations being adapted to produce longitudinal grooves in said related tube structure if and when the strut is forced to contract in length.

9. For underground workings, a roof-supporting strut comprising telescopically related outer and inner tube structures, the outer structure comprising a tube, a reinforcement member embracing said tube and formations on said member projecting internally through openings in the tube, and the inner structure comprising a tube slidable within the outer tube and provided with an end formed to bear against said formations, which are adapted to prevent lengthwise contraction of the strut until said strut is subjected to an excessive load and also adapted to produce longitudinal grooves in the inner tube if and when the strut is forced to contract in length.

10. An underground roadway support comprising upright side struts, and a roadway support supported by its ends by said struts, said truts each embodying tubular sections one of which telescopes with the other, means within and supported by one of the sections and disposed a substantial distance from the end of the last said section to provide an abutment for the end of the other telescoped section to prevent endwise contraction of the struts under normal strain, the said means also operating when an abnormal load is exerted lengthwise upon the strut sections, to form longitudinal grooves in said other section, when the struts are forced to contract lengthwise.

11. An underground roadway support comprising upright side struts, and a roadway support supported by its ends by said struts, said struts each embodying tubular sections one of which telescopes with the other, means within and supported by one of the sections and disposed a substantial distance from the end of the last said section to provide an abutment for the end of the other telescoped section to prevent endwise contraction of the struts under normal strain, the end of said other section which engages the abutment being inwardly beveled, the said means also operating when an abnormal load is exerted lengthwise upon the strut sections, to form longitudinal grooves in said other section, when the struts are forced to contract lengthwise.

12. An underground roadway support comprising upright side struts, and a roadway support supported by its ends by said struts, said struts each embodying tubular sections one of which telescopes with the other, means within and supported by one of the sections and disposed a substantial distance from the end of the last said section to provide an abutment for the end of the other telescoped section to prevent endwise contraction of the struts under normal strain, the said means also operating when an abnormal load is exerted lengthwise upon the strut sections, to change the cross sectional configuration of the said other section, when the strut sections are forced to contract lengthwise.

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