J. J. ROBY.

MEANS FOR SUPPORTING THE ROOFS OF MINE ENTRIES.

APPLICATION FILED DEC. 9, 1912.

1,229,323.

Patented June 12, 1917.

2 SHEETS—SHEET 1.

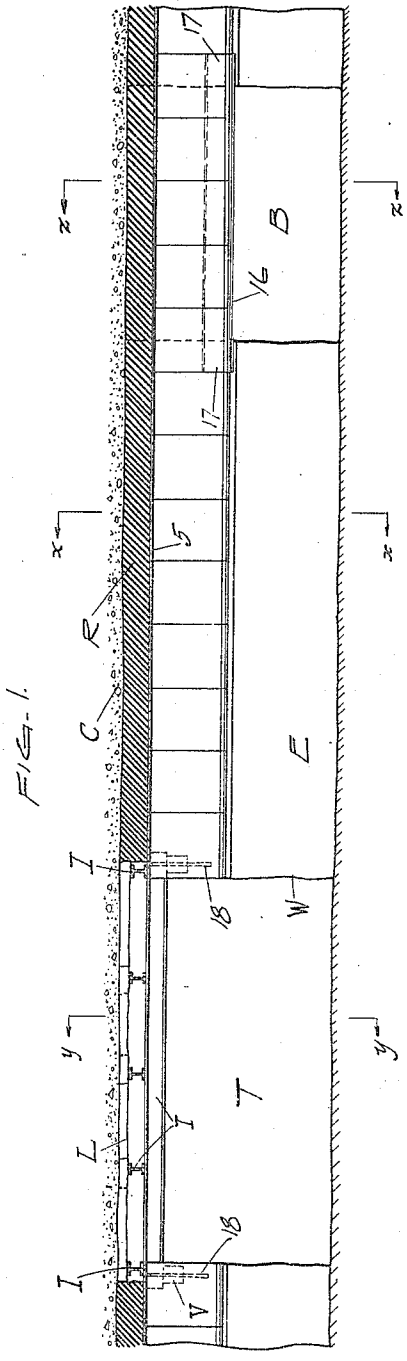


FIG. 1.

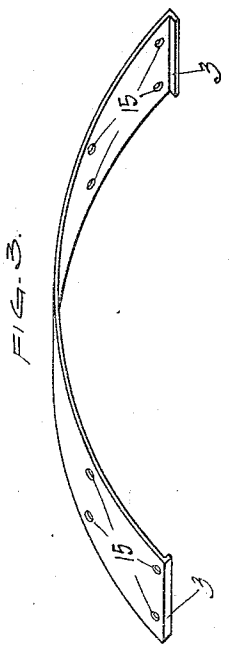


FIG. 3.

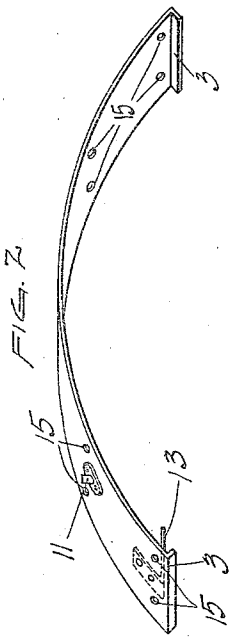


FIG. 2.

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2 SHEETS—SHEET 2.

FIG. 4.

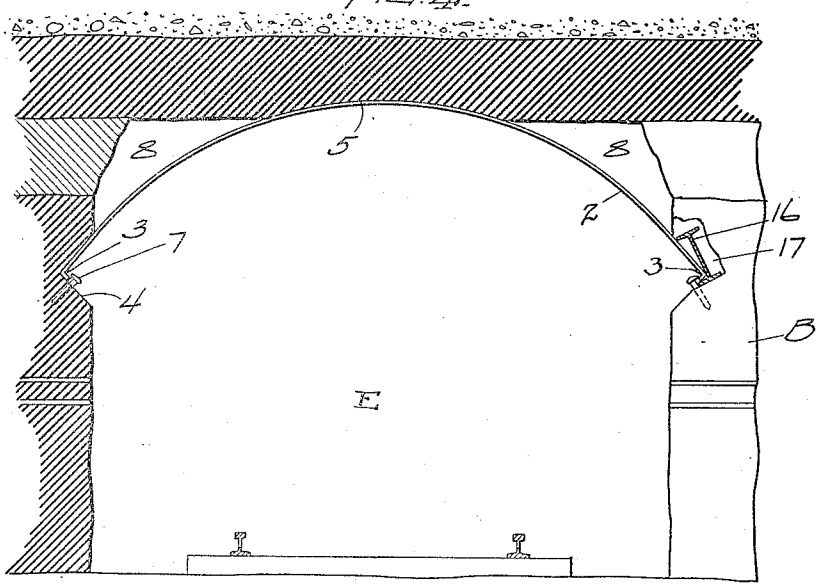


FIG. 5.

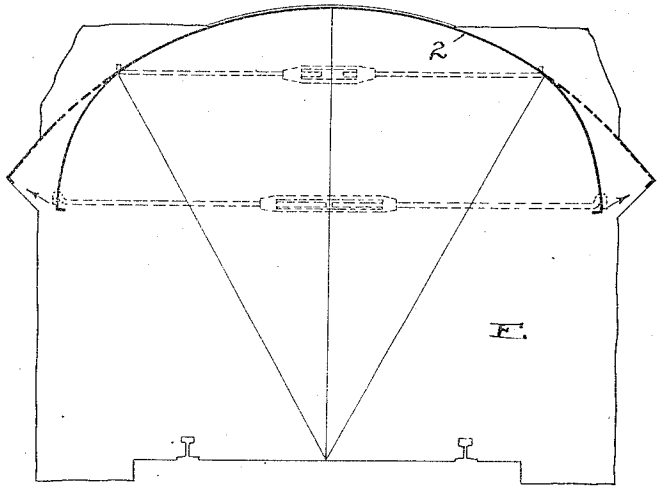
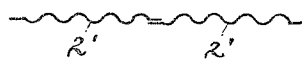


FIG. 6.



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UNITED STATES PATENT OFFICE.

JAMES J. ROBY, OF CLEVELAND, OHIO.

MEANS FOR SUPPORTING THE ROOFS OF MINE-ENTRIES.

1,229,323. Specification of Letters Patent. Patented June 12, 1917.

Application filed December 9, 1912. Serial No. 735,867.

To all whom it may concern:

Be it known that I, JAMES J. ROBY, citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Means for Supporting the Roofs of Mine-Entries, of which the following is a specification.

My invention comprises a new and improved means of supporting the roofs of mine entries, substantially as herein shown and described and more particularly pointed out in the claims.

In all coal mines known to me, the means to support the roof of an entry involves the use of cross beams, uprights or posts, and lagging. My object is to provide an arched roof support made of metal, preferably of sheet steel, and to construct the entry in a particular way to seat said arched support, thereby eliminating the need of beams, posts or lagging in the entries except at turnouts as hereinafter described. The use of cross beams, posts and lagging requires cutting into both rock and coal by hand labor. If this is not done, ten to twelve inches of valuable head-room in the entry must be sacrificed for these supports. The more frequent practice is to provide no support until after the natural roof falls down; this fall usually occurs after deterioration sets in through exposure to air. Repeated falls of the roof fill the entry, delay mining operations, and result in accidents. Then before a roof of cross beams, posts and lagging can be erected to remedy matters it is still necessary to cut away a certain amount of the solid strata—principally rock—at the sides of the entry.

Following my method and using my invention no beams, posts and lagging are required. Installation preferably takes place before the roof is damaged by exposure to air, thereby forestalling breaks and falls in the roof and possible injury to persons. There is no delay in mining operations as the work of installation can proceed without disturbing the natural strata in the roof or sides of the entry. This means that no cutting or removal of stone is required, all cutting being in the coal wall which renders such work easier and swifter of execution. There is also no loss or sacrifice of head room in the entry as originally driven. The preparatory cutting steps in the side walls of the entry may be accomplished by a machine with a minimum of labor; and erection of the roof-support also involves little labor or time. There are no posts which can be displaced to cause accidents; no posts or lagging to decay, repair or replace. The arched construction gives a side bracing effect against the solid ribs of coal and distributes the down pressure uniformly to the best advantage, whereas the old way throws all the load directly downward on posts resting on a small portion of the coal rib which is apt to shear off and weaken the support.

In the accompanying drawings, Figure 1 is a longitudinal section through a mine entry constructed according to my invention. Fig. 2 is a perspective view of one of the sheet-steel arch members having trolley-wire and feed-wire supporting means affixed thereto, and Fig. 3 is a perspective view of a plain form of arch member.

Fig. 4 is a cross section on line *z*—*z*, Fig. 1, at a break-through in the entry. Fig. 5 is a diagrammatic view illustrating one way of erecting the arch members, and Fig. 6 illustrates an overlapping arrangement and also a corrugated form of my improved roof-support.

In many coal mine districts the cutting of an entry in the workable seam of coal is limited in height to the thickness of the seam, which may be about four or five feet, and the entry is usually made about eight feet in width. A stratum of slate,—called draw-slate, is usually found above the seam, and a second narrow seam of coal of poor quality, called roof-coal, lies above the draw-slate beneath a thick stratum of conglomerate. The workable seam is undercut and then blasted down and in this operation the draw-slate also comes down or is so broken that it is also necessarily removed; but the narrow seam of coal above remains intact and forms a natural roof for a greater or less period of time, say a year. Exposure to the air has a deteriorating effect on the roof-

coal while other causes also contribute to its disintegration and ultimate fall. When a fall occurs a considerable amount of conglomerate comes with the roof-coal. These falls are dangerous and delay mining operations as the material blocks up the entry and must be removed. An artificial roof for the entry is therefore absolutely necessary, but is seldom installed until delay and damage has resulted. The artificial roof which was heretofore supplied then required removal of the draw-slate at either side of the entry at a point above the workable seam to provide recesses for short wooden uprights or posts upon which cross-beams were placed at the requisite elevation to give head room in the entry. These cross-beams occupied the space formerly filled by the roof-coal, and short pieces of timber, called lagging, placed in bridging position upon these cross-beams served to support the conglomerate above. An arrangement of this kind is shown in Fig. 1, in connection with my invention at a turnout or transverse passage T for entry E. In this view the workable seam of coal is designated by W, the roof-coal by R, and the conglomerate by C, and the old type of roof support is represented by the short uprights or posts V seated at the side of the entry, the cross-beams —I— resting on these posts, and the lagging L supported by the said cross-beams.

Now describing my invention, the entry E is constructed its full length with an artificial roof formed of metal plates 2 curved to a radius best suited to withstand the load, see Fig. 5. These plates when in place rest at their angularly-bent ends 3 within two V-shaped channels 4 cut by hand or machine in the workable seam of coal at either side of the entry. The channels are about three feet above the floor and parallel therewith, and cutting of the channels may take place while the entry is being driven, or this work may be accomplished at any time thereafter but before a fall of the roof-coal occurs. Indeed the preferred way is to follow up entry-driving operations as soon as convenient, one object being to roof-in the roof-coal and seal it from the air as soon as possible, thereby preserving its natural strength.

With this end in view and with the further object of providing the most effective bracing results for the roof, a third channel 5 of curved formation is cut into the seam of roof-coal R longitudinally of the entry at its center, whereby the plates 2 may be solidly seated and wedged in place at three points, that is, at both sides and also the roof-center of the entry. The reversely-inclined slopes of the V-shaped channels 4 permit the ends 3 of the metal plates 2 to be entered and seated therein by flexing the plates substantially as shown in full lines, Fig. 5. Turn-buckle connections, such as shown in dotted lines in this figure, or any other equivalent means, may be used to bend the plates and also to spread them if necessary. However, the plate itself possesses sufficient spring to effect seating thereof in the entry. The preferred way is to roll the plates to a fixed curvature of greater radius than the plate is to assume eventually. The plates are then easily handled in erecting operations and have sufficient spring to fit them in place.

The weight carried by the plates is directed downward and outward in view of their arch formation and the plates may be of any thickness to meet any given need. Only a lateral pressure or pull inwardly toward the center of the entry will displace the plates from the channels 4, but spikes 7 may be set in the bottom slope of these channels to further fix the plates in place. Buckling of the plates into the corner spaces 8 of the entry is prevented by filling this space with loose material taken from the entry.

The plates 2 may be provided with openings or slots 15 at either end to permit attachment of turn-buckle rods in erecting or dismantling operations. Any one or a series of these plates may thereby be quickly and conveniently taken down if the need should arise, and when taken down, the roof-coal is still in place for temporary protection. Abandoned and untraveled entries may thus be stripped of these plates for use elsewhere.

In general, the entry E communicates at intervals with an adjacent entry by transverse passages B, called break-throughs which are used temporarily for the circulation of air when the entry is being driven, see Figs. 1 and 4. In erecting the arched roof these transverse passages are bridged at their ends by flanged beams 16 seated in pockets 17 in the workable seam of coal in line with channels A, and the plates 2 engage within and against the toes or flanges of these beams in the same manner as in the channels 4. If desired, the plates may be bolted to said beams 16.

What I claim is:

1. Method of supporting a roof of a mine gallery consisting of providing a flexible member, maintaining the arc of the crown of the member at its normal curvature, flexing the ends of said member to permit of entry into steps formed in the side walls of the gallery and allowing said ends to spring into said steps whereby the crown is maintained in close contact with said roof.

2. The herein described method of supporting the roof of a mine entry, consisting

in cutting channels in the side walls of the entry, arching a flexible plate to a fixed curvature, flexing the ends of said plate inward, seating the arched plate against the roof of the entry, and springing the ends of said plate outward into said channels and in wedged position against said side walls to maintain the plate in constant close contact with said roof.

In testimony whereof I affix my signature in presence of two witnesses.

JAMES J. ROBY.

Witnesses:
E. M. FISHER,
R. B. MOSER.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."