H. S. THOMPSON.

LADDER.

APPLICATION FILED JAN. 19, 1912.

1,036,932.

Patented Aug. 27, 1912.

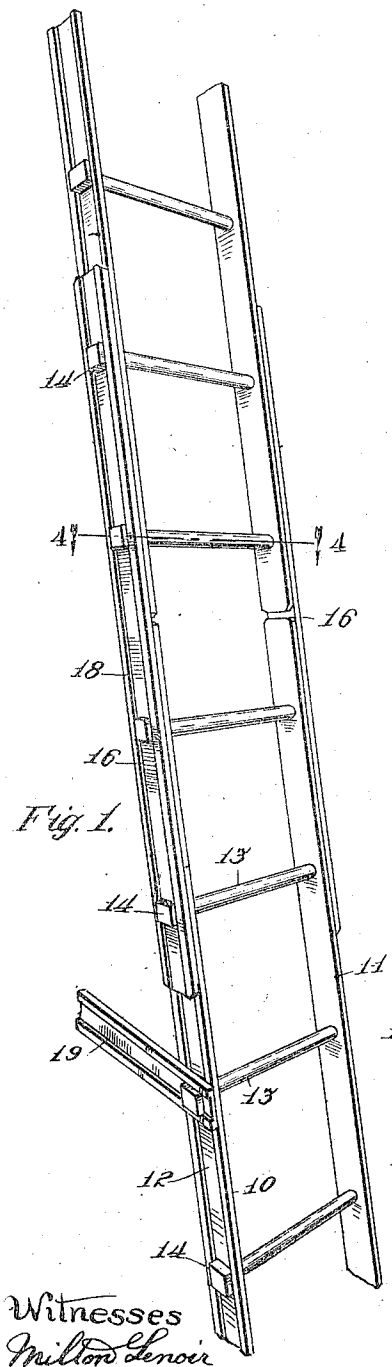


Fig. 1.

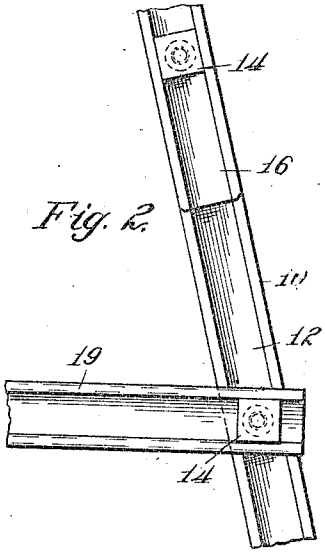
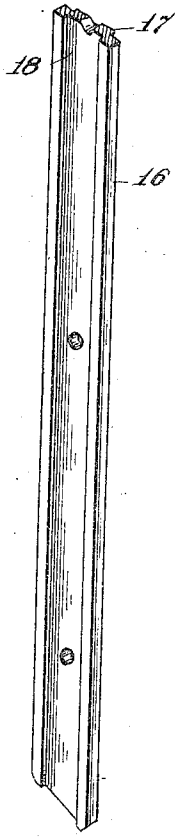


Fig. 2.

Fig. 3.



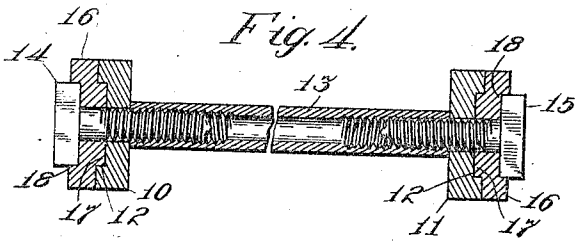


Fig. 4.

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UNITED STATES PATENT OFFICE.

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LADDER.

1,036,932. Specification of Letters Patent. Patented Aug. 27, 1912.

Application filed January 19, 1912. Serial No. 672,109.

To all whom it may concern:

Be it known that I, HENRY S. THOMPSON, a citizen of the United States, and resident of Beacon, county of Marquette, and State of Michigan, have invented certain new and useful Improvements in Ladders, of which the following is a specification, and which are illustrated in the accompanying drawings, forming a part thereof.

The object of the invention is to provide a metallic knock-down ladder especially adapted for use in mines and having various advantages, as hereinafter pointed out.

The invention consists in a ladder having its rungs secured to the side rails by means of bolts, and includes also various details of construction as hereinafter fully pointed out and as illustrated in the accompanying drawings, in which—

Figure 1 is a detail perspective of the ladder; Fig. 2 is a detail side elevation thereof; Fig. 3 is a detail in perspective of a splice bar adapted for use in uniting a plurality of sections of the ladder; and Fig. 4 is a sectional view on the line 4—4 of Fig. 1.

The side rails or bars 10 and 11 of the ladder are of steel, and for some of the purposes of the invention are channeled in their outer faces, as shown at 12. The rungs 13 are preferably tubular for the purpose of lightness, but in any event are apertured from their ends, and the ends of the bore or the end apertures are threaded, the one with a right hand and the other with a left hand thread. The ends of the rungs abut against the inner faces of the side rails, and bolts 14, 15, correspondingly threaded, are inserted through suitable apertures in the side rails. The heads of these bolts are preferably square and are adapted to fit within the channel 12, and the bolts are thereby prevented from being turned.

In connecting up a rung the bolts are screwed in until their heads are practically in contact with the side bars and are brought into position to enter the channels thereof. The bolts being now held against rotation, a pipe wrench is applied to the rung and the bolts are thereby drawn up tightly.

The ladders are provided with as many rungs as may be desirable, and are made of any preferred length. When it is found that a longer ladder is required than the length in which they are ordinarily made, two ladders may be united by placing the lower ends of the side rails of one against the upper ends of the side rails of the other. The bolts securing one or more of the rungs of each section are removed and splice bars 16 are applied to the outer faces of the side rails. These bars are apertured to receive the bolts, their apertures being spaced apart the same distance as the apertures in the side rails of the ladder sections. The bolts being now inserted, are drawn up in the same manner as has been described, thus securely binding the two sections of the ladder together.

When the channel form of side rail is used the splice bars are made with a longitudinal rib 17 for entering the channel, and are themselves channeled in their outer faces, as shown at 18, to engage and hold the heads of the bolts. Braces may also be secured to the ladder by means of the rung bolts. A portion of a brace bar is shown at 19, and preferably has the same cross-sectional form as the side rails. The bar is apertured to receive one of the rung bolts, and is secured to the ladder by first removing the bolts from one of the rungs, then inserting one of these bolts through the brace bar and the side rail of the ladder, whereupon the rung is tightened up in the manner already described, the head of the bolt securing the brace entering the channel in the outer face thereof. The brace bars may, of course, be of any suitable length and may be straight or may be bent, as necessary to bring their outer ends into engagement with the framing or other structure to which they are to be secured.

The ladder thus constructed has various advantages, among which are the following:—It is of the knock-down type, that is to say, it may be readily assembled and taken apart in the position where it is intended to be used, no blacksmithing or machining being required. The various parts may be made up in quantities and shipped to the user before assembling, and the number of parts necessary to build up a ladder of the desired length having been carried to the place of use they may be put together by an unskilled laborer. The rungs being secured in place by means of stud bolts, the use of nuts being avoided, the threaded portions are entirely covered and protected against moisture, thereby preventing a tend-

ency to rust and making it possible to separate the ladder into its elements even after long use, these elements being in no wise injured by the operation and being capable of being reassembled for use elsewhere. This is a consideration of importance in the operation of mines, for the reason that heretofore it has been found that when the use of a mine shaft has been discontinued it has not been profitable to attempt to withdraw the ladders for use in other shafts.

It is of importance that all mining appliances shall be so constructed as to eliminate the danger of accidents so far as possible. The use of round rungs in metal ladders has heretofore been hazardous because of their tendency to turn and permit the foot of the user to slide off, with great liability that he will fall and be injured. By the use of the right and left screw threads and the employment of bolts which are held against turning, this danger may be entirely eliminated. In assembling the ladder the left hand threaded end of the rung is placed at the left side, so that in turning up the rung it is turned outwardly or in the direction it will tend to turn as the foot of the user is applied to it. The rung being turned up tightly in assembling it cannot, of course, be turned by the foot of the user, but the pressure incident to use will tend to hold it tightly in place.

In building up a ladder of two or more sections by the use of splice bars of such form that they have an interlocking engagement with the side rails, and by securing these splice bars by means of the rung bolts, the ladder is even stronger at the place where spliced than in other portions, and economy of material is secured. The item of economy is also secured by the use of brace bars, as described, or at least a bar having in its outer face a recess for receiving the head of the attaching bolt.

I claim as my invention—

1. In a ladder, in combination, a pair of channeled side rails having bolt holes, rungs having their ends abutting against the inner faces of the rails and having oppositely threaded apertures in their ends, and bolts securing the rungs to the side rails, the heads of the bolts being polygonal and fitting within the channels of the rails.

2. In a ladder, in combination, a plurality of ladder sections, each section comprising a pair of channeled side rails, rungs having their ends abutting against the inner faces of the rails, and bolts securing the rails to the rungs the heads of the bolts being polygonal and fitting within the channels of the rails; and splice bars connecting the side rails of adjacent sections and being secured thereto by means of bolts securing the rungs of each section, each splice bar having a longitudinal rib for entering the channels of the side rails to which it is applied and having a channel in its outer face for receiving the bolt-head.

3. In a ladder, in combination, a pair of side rails having bolt holes, rungs having their ends abutting against the inner faces of the rails and having oppositely threaded apertures in their ends, and bolts having polygonal heads for securing the rungs to the side rails, and a brace bar secured to the outer face of one of the side rails by one of the rung-securing bolts, such brace having a channel in its outer face for receiving the bolt-head.

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