W. A. BILGER AND A. C. WALKER.

LADDER AND PROCESS OF MANUFACTURING THE SAME.

APPLICATION FILED MAY 20, 1921.

1,422,654. Patented July 11, 1922.

FIG. I.

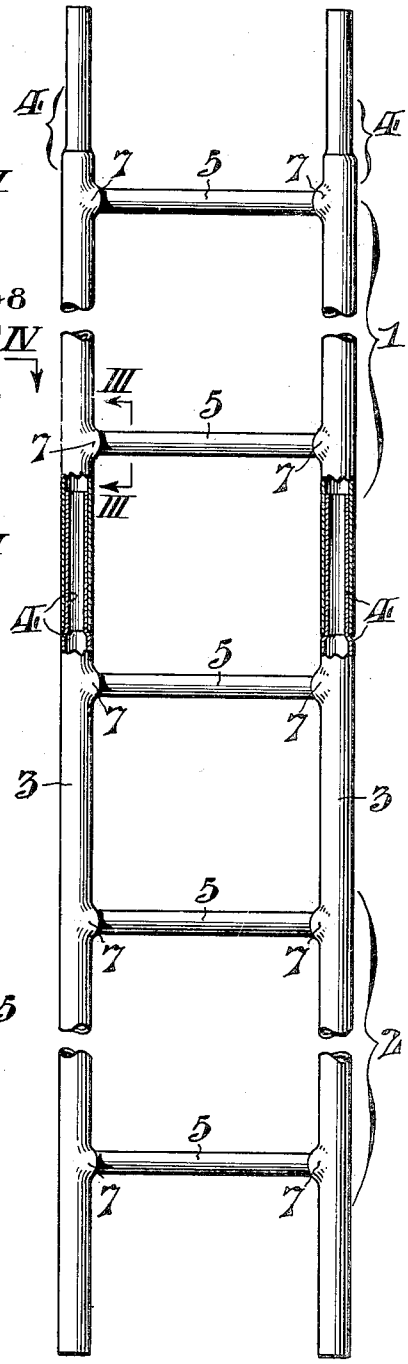


FIG. II.

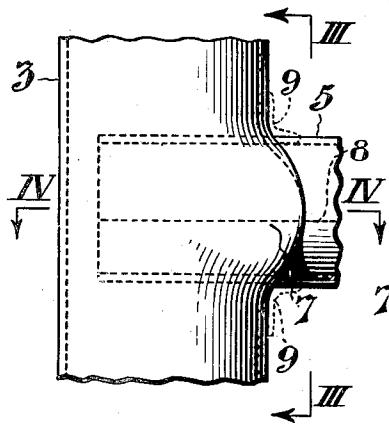


FIG. III.

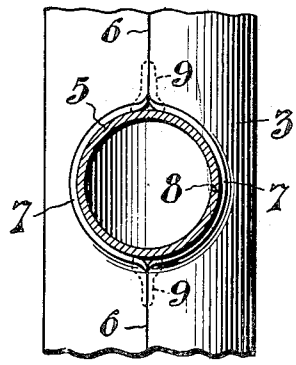


FIG. IV.

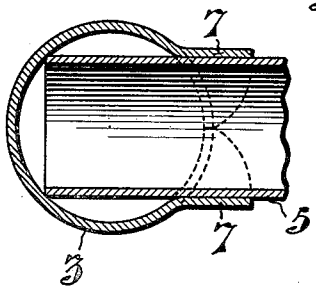
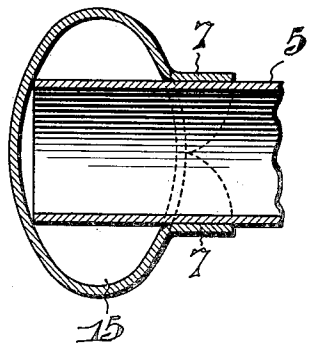


FIG. V.



WITNESSES:

John C. Bergner.

James H. Bell.

INVENTORS:
Walter A. Bilger &
Alan C. Walker,

BY Fenney & Fenney

ATTORNEYS.

UNITED STATES PATENT OFFICE.

WALTER A. BILGER AND ALAN C. WALKER, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNORS TO THE AMERICAN PULLEY COMPANY, OF PHILADELPHIA, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

LADDER AND PROCESS OF MANUFACTURING THE SAME.

1,422,654. Specification of Letters Patent. Patented July 11, 1922.

Application filed May 20, 1921. Serial No. 471,185.

To all whom it may concern:

Be it known that we, WALTER A. BILGER and ALAN C. WALKER, citizens of the United States, residing in Philadelphia, in the county of Philadelphia and State of Pennsylvania, United States of America, have invented certain new and useful Improvements in Ladders and Processes of Manufacturing the Same, whereof the following is a specification, reference being had to the accompanying drawings.

The invention relates to ladders, and more especially to ladders constructed of metal and to the art of manufacturing such structures.

The actual use of metal ladders constructed according to customary practice heretofore (either of pipe fittings, or of standard rolled metal shapes) has been exceedingly limited, owing to the excessive weight of such ladders, which rendered them too unwieldy for general purposes. This objection we have entirely overcome by constructing the constituent elements of the ladder (i. e., the side rails and the rungs) of comparatively thin sheet metal. According to our invention, suitable blanks of sheet metal may be shaped into tubular forms which will have the necessary stiffness and rigidity, and ladder elements and sections thus made may be assembled and secured together,—preferably by welding, so as to avoid the necessity for any special or separate fastening means which would add materially to the weight of the completed ladder structure.

Other objects and attendant advantages of our invention will become apparent from the detailed description which follows:

In the drawings, Fig. I is an elevation of a sectional ladder conveniently embodying our invention, portions thereof being broken away and shown in section for the sake of showing certain details of construction more clearly.

Fig. II is a fragmentary detail view on a larger scale, showing a portion of the ladder at the region of juncture of a rung with one of the side rails.

Fig. III is a detail section taken as indicated by the line III—III in Figs. I and II.

Fig. IV is a cross section along the plane of the arrows IV—IV in Fig. II.

Fig. V is a view, similar to Fig. IV, of a slightly modified form of our invention.

The composite ladder structure shown in Fig. I is made up of counterpart sectional units comprehensively indicated by the numerals 1, 2. Each of these sections 1 and 2 comprises tubular side rails 3, 3, and uniting rungs 5, 5 which interconnect said rails at suitable uniform intervals. Portions of the side rails 3, 3 at one end of each ladder section are reduced and shouldered as shown at 4, 4, and thus rendered capable of being telescopically inserted within the ends of the side rails of an adjacent ladder section.

The tubular side rails 3, 3 of the ladder sections are preferably constructed from blank sheet metal strips bent, in any approved manner, to that cross sectional configuration. In the finished tubes, the edges of the blanks meet along a longitudinal seam 6. Either prior to or in the course of the bending operation, these edges are indented at intervals to provide laterally projecting offsets 7, 7 which when the bending operation is completed match up at opposite sides of the longitudinal seam 6, as shown in Fig. III, and together constitute apertured bosses in which the rungs 5 are afterward received. In the present instance, the offsets 7, 7 are made arcuate in order to conform to the circular cross sectional configuration of the cylindrical rungs shown; but it is evident that they may be any other desired shape, depending upon the form of the rungs which are to be received in the bosses.

Like the side rails 3, 3, the rungs 5, 5, are preferably tubular and formed from sheet metal strip blanks so bent that their edges meet along a longitudinal seam as indicated at 8 in the drawings. The ends of the rungs are inserted in the apertured bosses of the side rails 3, 3 as far as permitted by their engagement with the inner wall of said rails as suggested in Fig. IV.

The ladder elements 3, 3 and 5, 5 may be secured to each other in any approved way. In order to avoid adding any appreciable weight to the completed ladder structure by the union, we prefer to weld the elements together. For this purpose, it is best to form the welds within the crotches or angles between the rails and rungs, over regions

indicated in dotted lines at 9 in Figs. II and III. This results not only in uniting said elements, but also in permanently joining the edges of adjacent portions of the seam 6 at each side of the rungs.

Referring now, to the modification of our invention in Fig. V, it will be noted that the structure there represented is, in the main, precisely the same as the first described form except that the side rail indicated at 15 is oval in cross section instead of circular as before.

From the foregoing, it will be readily seen that ladders constructed according to our invention may be made so light as to compare favorably with those ordinarily made of wood, thus rendering them just as capable of general use as the latter.

While we have herein shown and described an oval cross sectional configuration for one of the ladder elements as suggestive of variation, it is obvious that various other shapes, either of the side rails or the rungs, may be employed without departing from the spirit of our invention.

Having thus described our invention, we claim:

1. A metallic ladder comprising tubular side rails, each provided at intervals with pairs of spaced integrally formed lips, projecting outward, and a series of tubular rungs respectively inserted into the tubular rails between opposed pairs of lips and welded thereto.

2. A metallic ladder comprising tubular side rails formed of blank sheet metal strips with their edges meeting in a seam extending longitudinally along the inner side of the side rails, said edges being complementarily indented at opposite sides of said seam to provide them with integral laterally extending offsets by expansion of the metal outwardly forming spaced lips to receive therebetween the ladder rungs, and tubular rungs having their ends inserted into the tubular side rails and between corresponding bosses of said side rails and welded to said bosses.

3. The process of manufacturing metallic ladders which consists in forming tubular side rails from blank strips of sheet metal having their opposite longitudinal edges notched at intervals; inserting the ends of the ladder rungs in the receiving apertures formed along the seam of the tubular side rails by registering notches; and welding the side rails and the rungs together in the crotches between them.

4. The process of manufacturing metallic ladders which consists in forming tubular side rails from blank strips of sheet metal having their opposite longitudinal edges complementarily offset, laterally and outwardly at intervals to form pairs of spaced segmental lips, inserting the ends of the ladder rungs into the side rails and between opposed pairs of spaced lips to connect the side rails, and finally uniting the diverging edges of the lips by welding to form rung embracing bosses.

5. The process of manufacturing metallic ladders which consists in indenting strips of metal at intervals along both edges to form segmental lips, bending said strips transversely to form tubular side rails with the lips in opposition to form pairs, uniting said side rails by inserting the ends of tubular rungs into the side rails and between opposed pairs of lips, and finally welding the rungs and the lips to form an integral structure.

6. The process of manufacturing metallic ladders which consists in indenting strips of sheet metal along both longitudinal edges at spaced intervals to form segmental lips, flexing said strips transversely to form tubular side rails and to bring the lips in opposition to form pairs, connecting a pair of such side rails by inserting the ends of tubular rungs into the hollows of the side rails and between opposed pairs of spaced lips, and finally uniting the ends of the rungs to the lips by welding to form rung embracing bosses.

In testimony whereof, we have hereunto signed our names at Philadelphia, Pennsylvania, this 10th day of May, 1921.

WALTER A. BILGER.
ALAN C. WALKER.

Witnesses:
HORACE THEBLE,
EDNA M. MASSEY.