

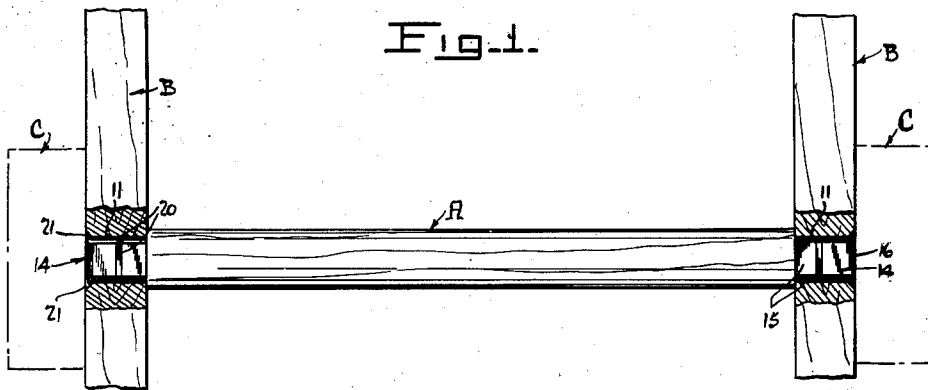
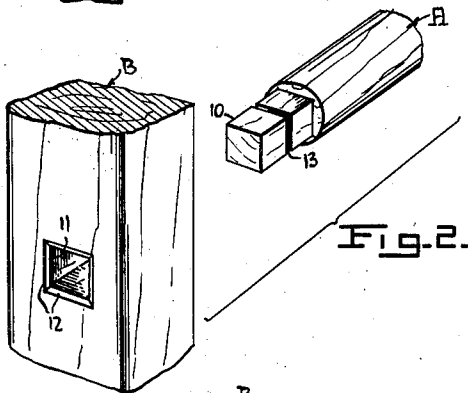
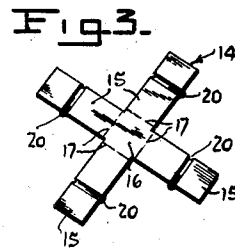
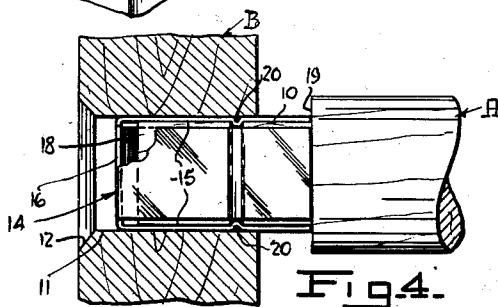
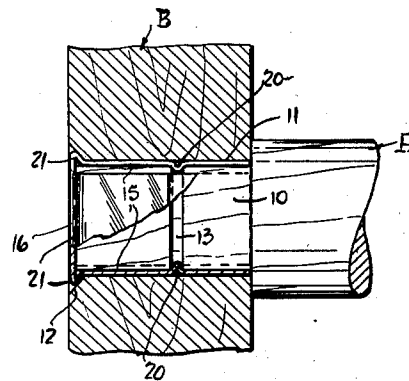
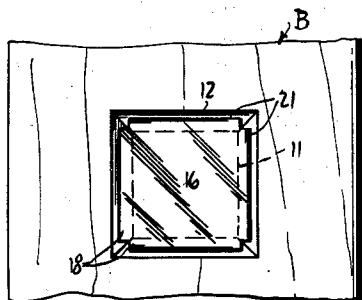
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LADDER RUNG FASTENING MEANS

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## UNITED STATES PATENT OFFICE

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## LADDER RUNG FASTENING MEANS

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1 Claim. (Cl. 228—58)

1

This invention relates to improvements in means for fastening ladder rungs in the stiles.

The primary object of my invention is to provide means for this purpose by which the rungs of a ladder may be securely fastened in the stiles as well as anchored against turning, in a manner such as to reduce the time and labor necessary in manufacturing the ladder.

It is the almost universal present practice, to my knowledge, to fasten the rungs in the ladder stiles by means of nails which are driven through one edge of the stiles and into round tenons on the rung ends, which are disposed in appropriately bored holes in the stiles. The nails thus serve not only to keep the stiles from spreading but to lock the rungs from turning in the round holes in the stiles. However, the nailing operation requires considerable time and labor and in addition, the nailing is found to weaken the stile or cause it to split about the nails as time goes on. Furthermore the production of ladders by this method is hindered by the fact that the ladder must remain in the bench, or the machine in which the stiles and rungs are assembled and the stiles pressed toward each other onto the ends of the rungs, while the entire nailing operation on all rungs is carried out. The bench, it may be noted, has opposed jaws and members which in operation engage outer sides of the stiles and press them inward, causing the ends of the rungs to enter the holes in the stiles, and holding the entire structure in assembled relation while the rungs are fastened.

In accordance with my invention, and as an object thereof, I provide fastening means which eliminates the nailing operation entirely while providing a fastening of equal or greater strength, and which permits the rungs to be fastened in response only to the pressing or clamping action of the bench jaws as they force the stiles into the rung ends. Thus it will be evident that the ladder is completely assembled immediately as the stiles are forced home and the ladder need not remain in the bench while being nailed, thus effecting a substantial saving in the time required for assembly.

These and other more detailed and specific objects will be disclosed in the course of the following specification, reference being had to the accompanying drawing, in which—

Fig. 1 is a fragmentary sectional view of a ladder rung and associated stiles, indicating the manner in which the latter are pressed home on the rungs, and showing my improved fastening means in use.

2

Fig. 2 is a perspective view of adjacent portions of a ladder rung and stile prepared in accordance with my invention.

Fig. 3 is a perspective view of one form of fastening means for use in connection with the stile and rung as shown in Fig. 2.

Figs. 4 and 5 are similar enlarged sectional details illustrating successive steps in the fastening of the rung in the stile.

Fig. 6 is a fragmentary outside elevation of a ladder stile having a rung fastened therein in accordance with my invention.

Referring now more particularly and by reference characters to the drawing, A designates a rung of a ladder and B the stiles between which the rung is placed and secured. The rungs when properly fastened are held against turning and cooperate to hold the stiles B in properly assembled spaced relation. Ordinarily the rungs, which are themselves ordinarily circular in cross section, are provided for this purpose with reduced round tenons at each end which enter complementarily shaped openings bored in the stiles, and as pointed out, the tenons are anchored in these openings by driving nails through an edge of each stile into the tenon along a line radial thereto. While being thus nailed the ladder is held in a horizontal position in an assembling machine, called a bench, and which includes a series of jaws or clamps C, a pair of which is shown at (Fig. 1), operative to engage outer sides of the stiles B to force them over the rungs and clamp them in place with the ladder properly shaped and assembled.

In accordance with my invention I provide each rung A with a tenon 10 at each end which is of a cross sectional shape other than round and which is fitted into a correspondingly shaped opening 11 in the stile so that the rung cannot turn, and the necessity for nailing on this account is eliminated. To then hold the rung against endwise displacement with respect to the stiles, or conversely to hold the latter against spreading, I provide fastening means in the form of a ferrule or ferrule-like member which is fitted over the tenon 10 and which is upset or expanded during the assembly operation in such manner as to securely lock the rung and stiles together.

As seen in Fig. 2 each tenon 10 is preferably square in cross section and this shape is advantageous not alone for locking the rung against rotation but for strength also since a tenon of a cross sectional area at least as great as that of the usual round one may thus be obtained. The open-

3

ings 11 in the stiles are of the same shape but are slightly larger, and are provided around outer ends or edges with enlargements such as the bevels or shoulders indicated at 12. In accordance further with my invention the tenon 10 is provided intermediate the ends with an encompassing groove indicated at 13, extending entirely around its four sides.

To fit the tenon 10 I provide the ferrule member indicated generally at 14 which is formed from a sheet metal blank of suitable gauge and material and is initially flat and cruciform in shape as seen in Fig. 3. The ferrule has four sides or arms 15 which are joined by and extend from a center portion 16 and these sides are bent in the same direction along lines 17 so that they will fit over and substantially cover the four sides of tenon 10. The length of the sides 15 is, however, such that the center portion 16, now forming the closed end of the substantially tubular ferrule-like member thus formed, initially stands in spaced relation to the end of the tenon 10 as indicated at 18 in Fig. 4, while the other or open end of the ferrule butts against the shoulder 19 at the junction of the tenon and rung A. The sides 15 are formed with transversely extending pressed ribs or beads 20 so located and shaped as to extend and fit inwardly into the groove 13 on all four sides of the tenon 10, and while so positioned, to lock the ferrule against endwise displacement from the tenon.

Preliminary to the assembly of the ladder each rung is provided at each end with a ferrule member folded over its sides to bring the locking ribs 20 into the grooves 13. The ladder is then assembled in the bench in the usual manner with the stiles B at greater than usual spacing and the rungs A disposed at intervals therebetween, ready to enter the openings 11 in the stiles. As the bench jaws C now are moved together the stiles are pressed onto the rungs, the ferrules 14 entering and nicely fitting the openings 11 so that the sides 15 cannot spread and release the locking engagement between the ribs 20 and grooves 13. As the stiles are forced home the closed ends of the ferrules completely penetrate the openings 11 and the ferrule, being initially larger than the thickness of the stiles (Fig. 4), it will be apparent that said closed ends 16 will come to bear on inner faces of the bench jaws C before the ferrules are entirely home in the stiles. Thus as the stiles are pressed fully onto the rungs the pressure exerted upon the closed ends of the ferrules can only result in the spreading or upsetting of these ends, causing them to swell into the space provided by the aforesaid enlarged outer ends 12 of the openings 11 as indicated at 21 in Figs. 1 and 5. What occurs is that the sides 15 buckle or expand outwardly at their junctions with the center or closed ends 16 of the ferrules as will be clearly apparent in Figs. 5 and 6, the outer ends of the ferrules are thus enlarged so that they cannot pull through the openings 11. The outer ends of the ferrules remain substantially flat and flush with outer sides of the stiles as shown and are pressed home into the wood so that the stiles cannot move with respect to the rungs.

4

It will be clearly evident that this entire fastening operation is completed instantly as the stiles B are pressed fully home on the ends of the rungs, and that the ladder may then be immediately removed from the bench to make way for the next, without requiring that the bench operation be held up while a number of nails are driven. The application of the ferrules to the rungs, prior to assembly, may be carried out very rapidly by proper machinery and once formed onto the tenons the ferrules will remain in place until assembly due to engagement of the ribs 20 with the grooves 13.

Obviously I might employ a tubular ferrule, that is, one in which the sides form a complete enclosure for the tenon or might use a two-sided U-shaped member (eliminating an opposed pair of the sides 15) and such variations are considered to lie within the scope of my invention. The cross sectional shape of the tenons might also be other than square as here shown, for example triangular, octangular, or even oval and any such shape would obviously serve to prevent rotation of the rungs and when fitted with a properly shaped ferrule could be locked in the stiles in exactly the same manner as hereinabove described.

It is understood that suitable modifications may be made in the structure as disclosed, provided such modifications come within the spirit and scope of the appended claim.

Having now therefore fully illustrated and described my invention, what I claim to be new and desire to protect by Letters Patent is:

The combination with a ladder stile having an opening marginally enlarged at its outer side and a ladder rung having a tenon adapted to penetrate said opening out to the enlarged outer end thereof, of a ferrule member having a center portion and arms turned therefrom to operatively embrace the tenon, and the junctions between the center portion and arms of the ferrule member being buckled outwardly into the enlarged outer end of the opening to lock the tenon therein.

EDWARD T. JOHN.

#### REFERENCES CITED

The following references are of record in the file of this patent:

#### UNITED STATES PATENTS

| Number    | Name     | Date          |
|-----------|----------|---------------|
| 985,761   | Ogden    | Feb. 28, 1911 |
| 1,001,265 | Graham   | Aug. 22, 1911 |
| 1,531,916 | Flintjer | Mar. 31, 1925 |
| 2,318,776 | Haug     | May 11, 1943  |
| 751,765   | Webb     | Feb. 9, 1904  |
| 843,989   | Bauer    | Feb. 12, 1907 |
| 523,898   | Knox     | July 31, 1894 |
| 635,185   | Regan    | Oct. 17, 1899 |
| 1,791,688 | Sparks   | Feb. 10, 1931 |
| 378,650   | Bigelow  | Feb. 28, 1888 |
| 2,271,266 | Kost     | Jan. 27, 1942 |

#### FOREIGN PATENTS

| Number | Country | Date          |
|--------|---------|---------------|
| 7,648  | British | Mar. 30, 1898 |