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C. F. HAMMOND ET AL

COMBINED STEP AND WALL OR EXTENSION LADDER

Filed Dec. 4, 1925

Fig.1.

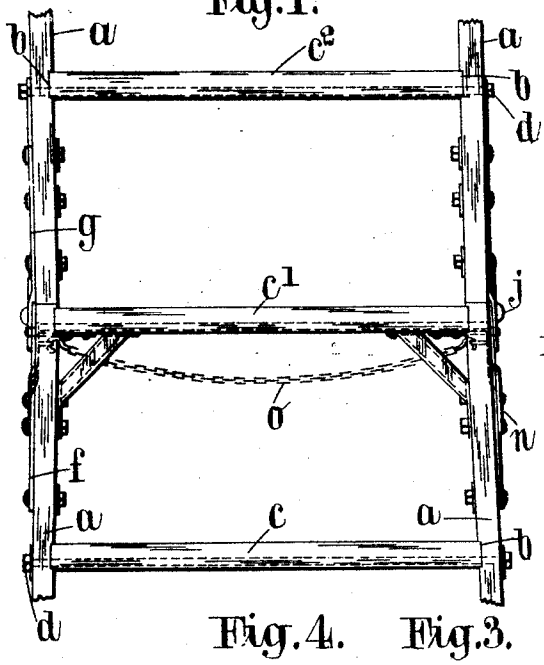


Fig.2.

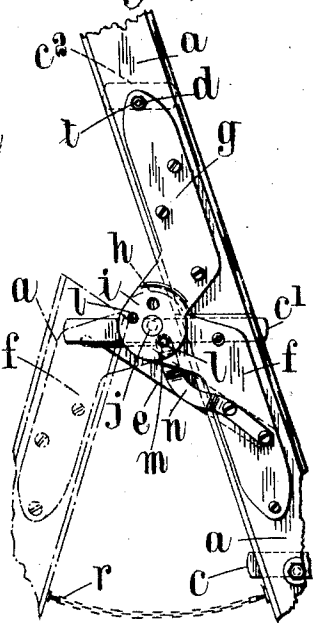


Fig.4.

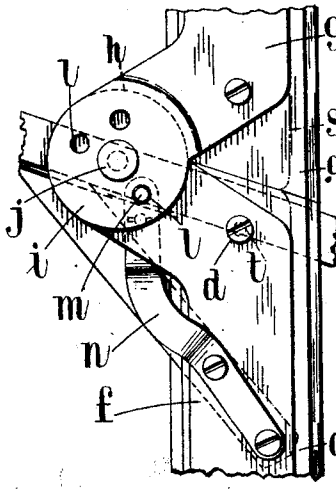


Fig.3.

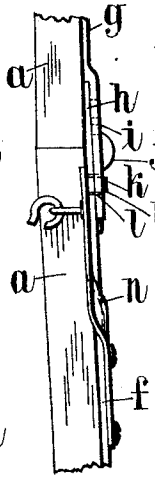
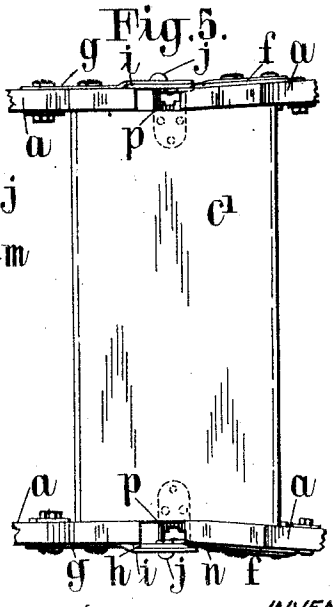


Fig.5.



INVENTORS
Cecil F. Hammond
William Shackleton
BY
James L. Norris
ATTORNEY

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UNITED STATES PATENT OFFICE.

CECIL FEATHERSTONE HAMMOND AND WILLIAM SHACKLETON, OF LONDON, ENGLAND.

COMBINED STEP AND WALL OR EXTENSION LADDER.

Application filed December 4, 1925, Serial No. 73,210, and in Great Britain December 11, 1924.

This invention relates to improvements in combined step- and wall- or extension-ladders of the kind in which the two ladders or ladder sections are hinged together at one end and provided in the neighbourhood of the hinges with automatically operating locking means for use when the ladders are used as self-supporting steps and when the ladders are extended to form a wall-ladder. The invention comprises improved means for effecting the locking and unlocking of the hinge joint, improved means for securing the rungs or treads to the side rails or stringers and for tying also the side rails together and various details of construction which will be hereinafter set forth.

According to this invention, the combination step-ladder, comprising two ladder sections hinged together by means of hinges with flat or disc-like joint parts placed flatly together, is provided with spring supported bolts or catches adapted to project for locking purposes through holes in the said flat or disc-like parts of the hinges, the bolt in each case being guided in a hole in the inner joint part and being movable in a direction substantially transverse to the ladder into and out of one or another of a plurality of holes in the outer joint part. Each bolt or catch is mounted so as to be movable longitudinally, for example, it may be carried by a flat or leaf spring, at or near one end of the spring which is bolted or otherwise secured at its other end to a stringer of the ladder or steps, the two springs at their free ends being provided with handles or gripping devices or connected by a chain or cord for withdrawing the bolts from the holes in the outer joint parts of the hinge members. On the other hand, the bolts may be guided in the outer hinge members and the holes forming the locking sockets for the bolts may be in the inner hinge members. Each hinge member is or may be provided with a slanting stop or extension piece near the hinge, as in a rule joint, to prevent the hinges from opening too far when the two ladder portions or sections are opened out in line with each other to form a wall- or extension-ladder. One of these stops may be at an obtuse angle to the strap of the hinge and the other stop is then at an acute angle and these angles may coincide with the inclinations of the adjoining ends of the two ladder portions or they may be both at substantially, a right angle.

In the accompanying drawing:

Figure 1 is a front view, and

Figure 2 a side view of adjacent parts of a combination ladder showing a hinge connection between them, in accordance with this invention, the ladder sections being in line for use as a wall ladder.

Figures 3 and 4 are corresponding views respectively, drawn to a larger scale, of parts of the hinge connection.

Figure 5 is a plan view of the parts shown in Figure 2 with the ladder sections in position for use as a step ladder.

As shown, the stringers or sides a of a suitable length, width and thickness, are each provided with a number of shallow rectangular grooves b at a suitable angle to receive the ends of the treads c, c^1, c^2 so that all the treads shall be substantially horizontal when the ladder is in use as a wall-ladder. In the middle of each stringer and near the bottom of each of the grooves is bored a hole to receive a long bolt or tie d. The lower part or section of the ladder is, preferably, made rather wider at the bottom than at the top so as to increase its stability. The uppermost tread c' of the lower wall-ladder section is preferably made wider than the others from front to back to form a platform and may be slotted at each side to receive a strip of wood or metal to stiffen it. The projecting part of this wider tread is supported by suitable metal struts e. The treads c^2 of the upper section or extension-ladder, which serves as the legs or prop when the ladder is to be used as a pair of steps, may all be of the same length but, in this case, the treads are mounted so as to be parallel to the treads c in the lower section when the ladder is used as a wall-ladder. If desired, the terminal treads of each or only the lowermost wall-ladder section may be provided with metal brackets or braces screwed or bolted to the treads and the stringers to reinforce or stiffen the latter.

The hinge straps f, g are made of sheet metal, each hinge-strap having at one end a disc-like joint-part h, i centrally perforated to receive a pivot j, suitably consisting of a rivet, and the disc-like joint part of one hinge member of a pair is, preferably, offset so that the straps are in the same plane. A hole k is provided in each inner joint part h and two or more holes l are provided in each outer joint part i to serve as sockets for bolts or catches m, for locking the hinges in alter-

native positions, these bolts or catches consisting of short cylindrical pieces of metal of a diameter slightly less than that of the holes intended to receive them and having a slightly diminishing diameter at their outer ends. Each bolt or catch is carried by a flat or leaf spring *n*, set to cause the bolt on the free end of the spring to be pressed into the hole *k* of the joint part *h* and one or another of the holes *l*, *l* in the joint part *i*, these holes being positioned so that the ladder sections can be locked in position for use as a step-ladder, or as a wall-ladder, or in some other desired relative position.

In order to remove the bolts or catches *m* from engagement in their holes or sockets *l* in the outer joint parts, the free ends of the two springs are connected together by a short chain or cord *o* and, to prevent the springs from becoming strained or bent by application of force in a wrong direction, the chain is confined or guided more or less on each side within the triangular space enclosed by the strut *e*, the edge or back of a stringer and the platform *c'*.

The movable end of each spring *n* may be guided by a plate *p* secured to the underside of the platform *c'* and having a slot or fork at its outer end in which the spring can move, the inner end of the fork or slot limiting the distance to which the spring can be drawn inwardly by the chain *o*.

Furthermore, for the purpose of limiting the spreading of the ladder section when used as steps, a chain or chains *r* may be permanently connected at one end to one ladder section and detachably connected, for example, by a hook to the other ladder section.

When the ladder sections are extended for use as a wall-ladder, the movement of the ladder sections about the pivot *j* is limited by the ends of the sections abutting one against the other, as shown in Figure 4. If desired, the edges of the straps *f*, *g* may be made to coincide with the ends of the sections, as indicated by the broken lines *s*, so that these edges abut one against the other, the abutting edge of one strap being at an obtuse angle and that of the other strap at an acute angle to the longitudinal edges of the straps.

The tie bolts *d* are preferably set in grooves *t* in the treads. Thus, when used as a step ladder, these tie bolts do not cause any inconvenience in the use of the treads of the upper ladder section, and both sides of the treads are available for use, according to the position of the ladder.

We claim:

1. In a combination ladder, ladder sections, hinges connecting together the ladder sections and comprising disc-like parts pivoted flatly together, locking bolts movable transversely to the disc-like parts, leaf springs carrying the said bolts, and guide plates having slots therein in which the said springs are movable through a limited distance.

2. In a combination ladder, ladder sections, hinge parts connecting the said ladder sections, each of said hinge parts comprising a pair of members rotatively connected together and secured, respectively, to said ladder sections, one of said members having a transverse hole, a bolt longitudinally slidable in said hole, the other of said members having a plurality of transverse holes adapted, when said members are relatively rotated, to register with the transverse hole of the former member and receive said bolt, leaf springs carried at opposite sides of one of the ladder sections and engaging said bolts and tending to project said bolts into the holes of the second-named members, a flexible connection extending between the said leaf springs, and guide plates each limiting the movement of one of said leaf springs to prevent the withdrawal of the bolt associated with such spring from the hole of the first-named member.

CECIL FEATHERSTONE HAMMOND.
WILLIAM SHACKLETON.