

(No Model.)

H. KNIPHALS.
EXTENSION LADDER.

No. 502,403.

Patented Aug. 1, 1893.

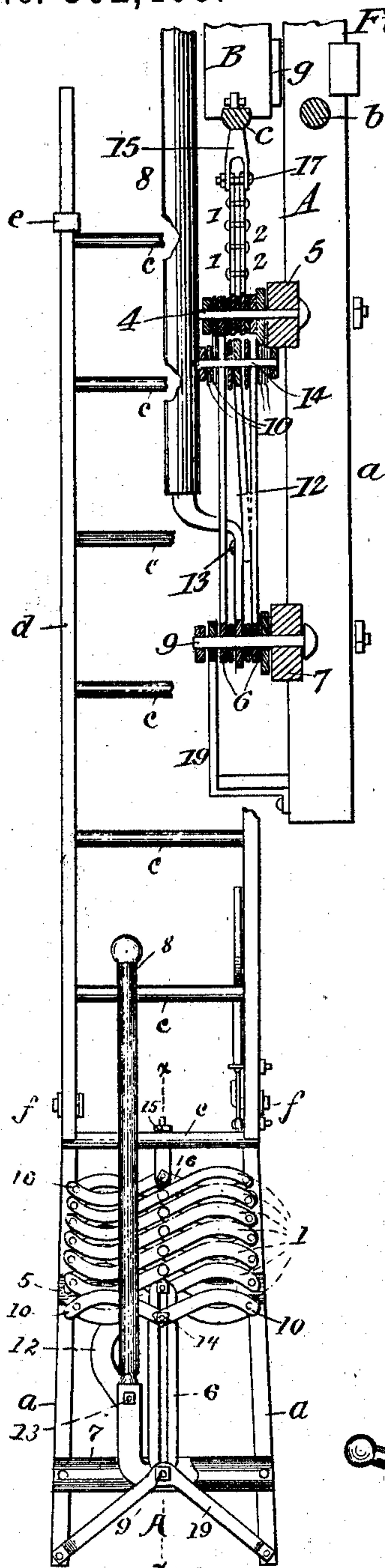


FIG. 1.

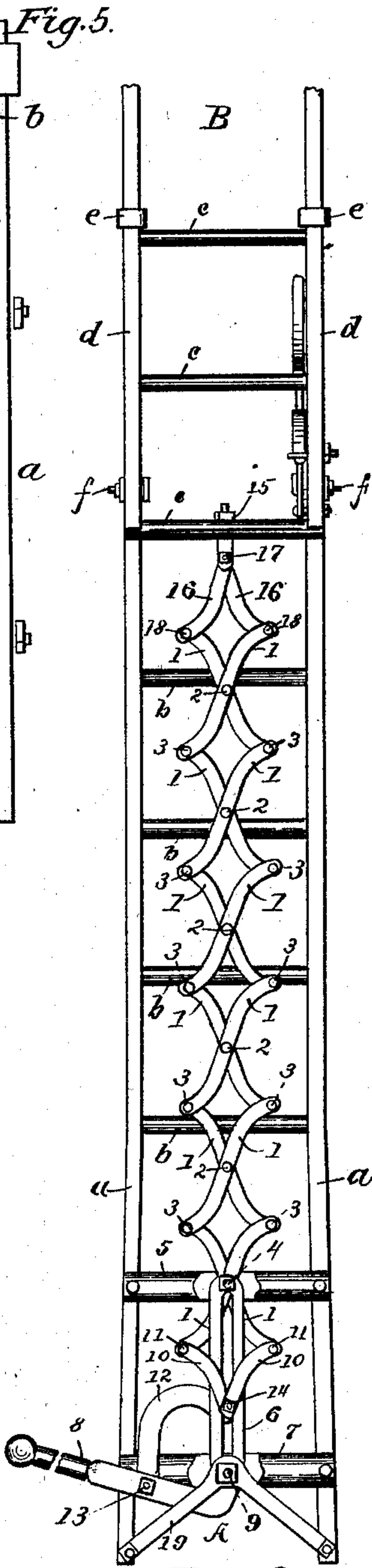


FIG. 2.

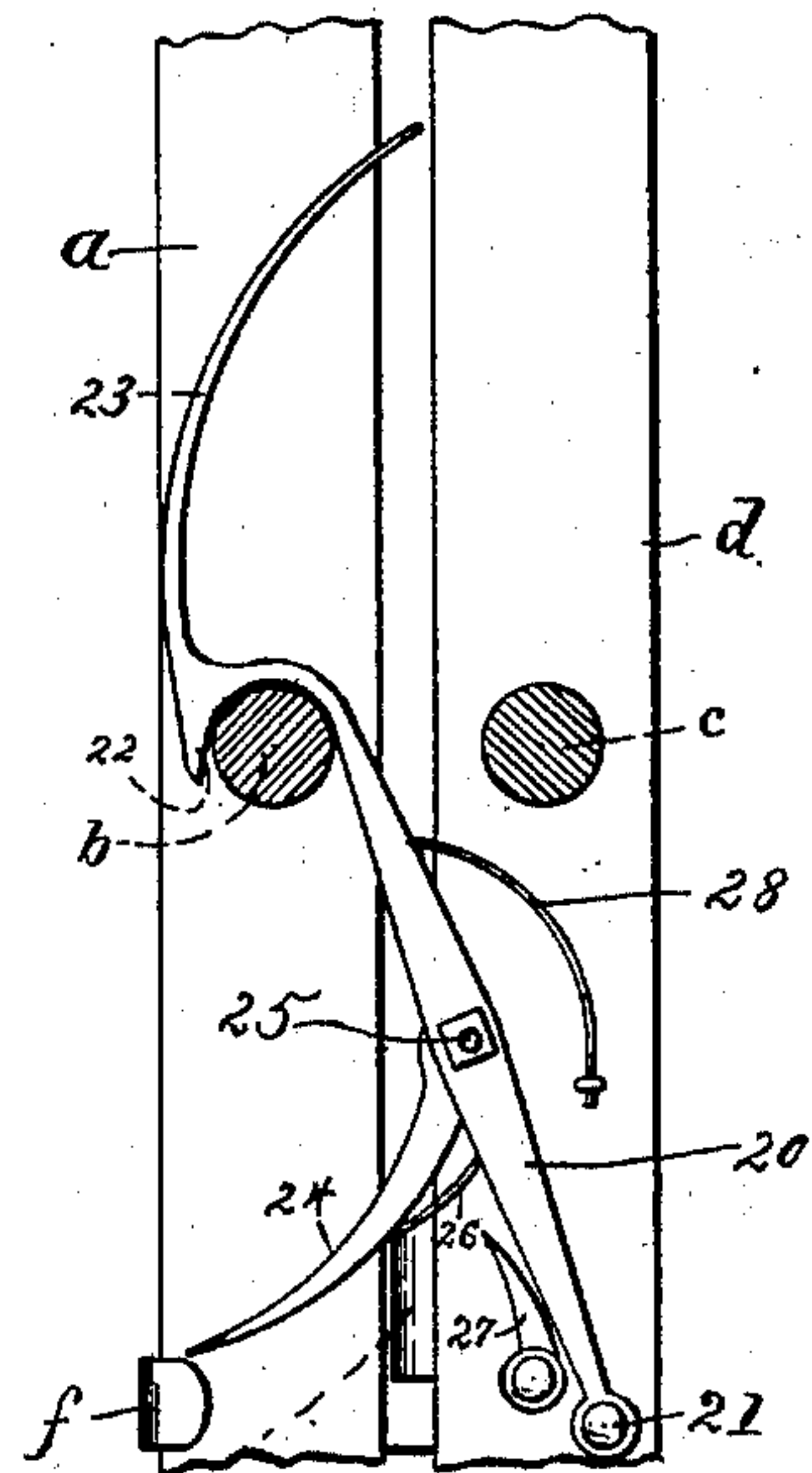


FIG. 3.

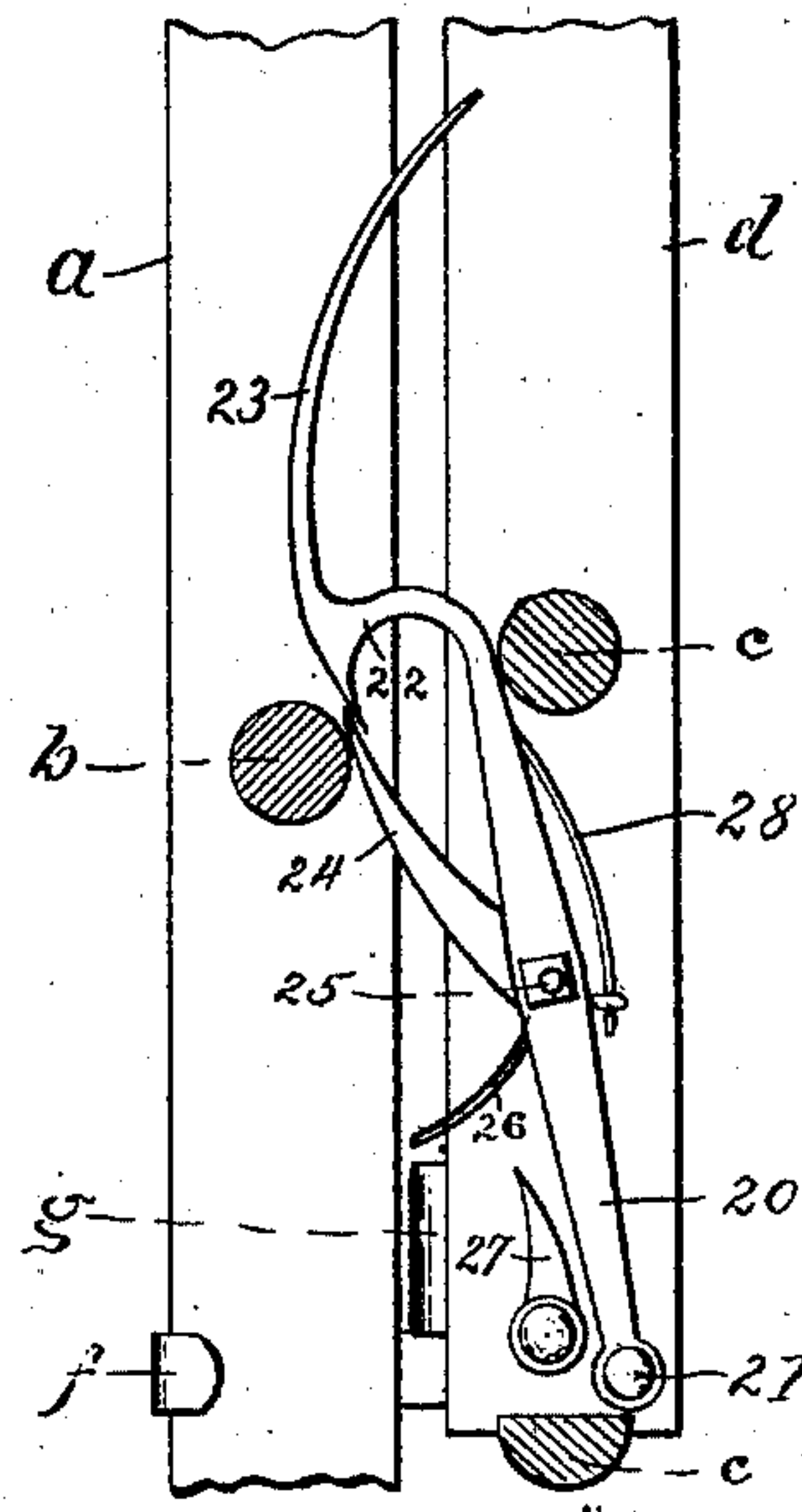


FIG. 4.

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EXTENSION-LADDER.

SPECIFICATION forming part of Letters Patent No. 502,403, dated August 1, 1893.

Application filed November 14, 1892. Serial No. 451,997. (No model.)

To all whom it may concern:

Be it known that I, HINRY KNIPHALS, a citizen of the United States, residing at Davenport, in the county of Scott and State of Iowa, have invented a new and useful Extension-Ladder, of which the following is a specification.

My invention relates to improvements in extension ladders in which levers acting conjointly upon one section of the ladder, force or move the same in a line parallel with the other section of the ladder which remains stationary, and the objects of my improvement are, first, to provide co-operating levers, of novel and inexpensive construction, which move the section of the ladder operated upon with great rapidity; second, to provide means for automatically locking the movable section of the ladder, to the stationary section, at any desired round or rung of the ladder; and, third, to provide means for automatically unlocking the movable section of said ladder from the stationary section whenever desired. I attain these objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a plan view of my extension ladder when its sections are in their normal position. Fig. 2 is a plan view of the same when said sections are in an operative position, the upper section B being partially broken away, and Figs. 3 and 4 are enlarged details which will hereinafter be explained. Fig. 5 is a sectional side view of my improved extension ladder, taken on line $x-x$ of Fig. 1, the upper portion thereof being broken away.

Similar letters and numerals of reference refer to similar parts throughout the several views.

A represents the stationary section of the ladder, consisting of the side pieces $a-a$ and rounds or rungs b , and B represents the movable section of the ladder also consisting of the side pieces $d-d$ and rounds or rungs c . The upper ends of the side pieces $a-a$ of the ladder A, are each provided with L shaped extension pieces $e-e$ each of which partially surrounds a side piece d of the ladder B. The lower ends of the side pieces $d-d$ of the latter are each provided also with L shaped extension pieces $f-f$ each of which partially surrounds a side piece a of the ladder A. The

inner edge of each side piece d , that is the edge which abuts an edge of the side piece a , is provided at its lower end with a thin block g , and the upper end of each side piece a , is likewise upon its abutting edge provided with a similar thin block, the latter not being shown in the drawings, but in Figs. 3 and 4 one of these thin blocks g , is shown attached to one of the side pieces d , and as these blocks are all similar and similarly attached to the side pieces a and d , near the upper end of the former and near the lower end of the latter, it is not deemed necessary to further illustrate them by drawings.

It will be seen that by means of the L shaped extension pieces $e-e$ and $f-f$, together with the thin blocks g , the two sections A and B of the ladder are held together parallel to each other, the blocks g only being in contact with the edges of the side pieces $a-a$ and $d-d$ as shown in Figs. 3 and 4, and it will also be seen that the two sections may be drawn apart or extended, so as to form a ladder of nearly twice the length of one of the sections.

I do not broadly claim these mechanical devices, that is the extension pieces $e-e$ and $f-f$, together with the blocks g , applied as I have described to two sections of a ladder, because I am aware they are well known and in use for the purpose stated.

I use the S shaped flat bars 1, which are secured together at their centers through eye holes in such bars, by a double headed pin 2, so that said bars may turn upon such pin. The bars thus secured together, I will designate as a pair, and I use such number of pairs as may be desirable, the extremities of each bar being provided with an eye hole, and the respective pairs being secured together by means of the double headed pins 3, so said bars may turn on said pins as is fully illustrated in Fig. 2. The lower pair of bars I secure together at the center by means of a threaded bolt and nut 4, which bolt passes through the round 5 of the section A of the ladder, which is the stationary section. This round 5 is the second one from the bottom of the stationary section A, and is raised from the face of the side pieces $a-a$ as shown in Fig. 5, of the drawings in order that the pair of bars which are secured to said round 5 by means of the bolt

and nut 4, as well as other movable parts connected therewith, will not come in contact with the stationary section of said ladder, when said parts are being manipulated.

5 I use two vertically slotted plates 6, both being of the same size and form of construction, the upper end of the outer plate being provided with an eye hole through which the
10 outer end of the bolt 4 passes, securing such outer plate 6 against the lower pair of plates 1—1, and the inner plate 6 being also provided with an eye hole, is interposed between the round 5, and the lower pair of plates 1—1, said bolt 4 passing through said eye hole, and
15 thus secures said inner plate 6 to the round 5. The inner slotted plate 6, being directly behind the outer slotted plate 6, is therefore not shown in the drawings, and as it is precisely like the outer plate and occupies a similar position, it is not deemed necessary to separately illustrate it. Very nearly at the lower
20 end of the side pieces *a*—*a* is secured another round 7, and of similar construction and arrangement as round 5. The L shaped hand lever 8 is provided at its lower end with an eye hole, as are also the two slotted plates 6, and the inner end of such lever is interposed between the slotted plates 6, and the threaded bolt 9 is passed through said eye holes
25 and through the round 7 and secured by means of its threaded nut. The curved flat bars 10, are provided with eye holes at their extremities. I use four of said flat bars 10, interposing an end of each bar 1, of the lower
30 pair between the upper ends of two of said flat bars 10, and secure them together by the headed pins 11, so said bars may turn upon said pins. The curved bar 12 is secured at one end by a pin 13 to the hand lever 8 so it
35 may turn upon such pin, and its opposite end is provided with an eye hole, and such end is interposed between the slotted bars 6, and the outer bars 10 rest against the outer surface of the outer slotted bar 6, while the lower
40 ends of the inner bars 10 rest against the inner surface of the inner slotted plate 6, and the threaded bolt 14 is passed through the eye holes of said bars and slots in said plates 6 and the same secured together by means of
45 a nut on said bolt. The inner curved flat bars 10 are of the same form of construction and size and occupy a similar position as the outer curved flat bars 10, which are shown in the drawings, but as said inner bars are directly behind the outer ones, they are therefore not shown in the drawings and it is deemed unnecessary to separately illustrate said inner bars. The lower rung or round *c*
50 of section B of said ladder, being the movable section, is provided with an eye plate 15 and to the end of which are secured two curved flat bars 16 by means of a suitable bolt or pin 17 passing through the eye holes in the ends of such bars and eye plate. These curved
55 flat bars are the same in form and size as curved flat bars 10, and their opposite ends are connected respectively with an end of bar

1, of the upper pair of bars by means of the headed pins 18, so said bars may turn upon said pins. 70

If desired the lower ends of side pieces *a*, of section A, may be provided with an inverted V shaped brace 19 secured to said side pieces and said round 7. If the ladder be upright it will be seen from the description 75 given that then if the hand lever 8, is moved laterally or substantially to a horizontal position, the curved bar 12 will move downward with the bolt 14, in the slots of bars 6, and thus move the curved bars 10 similarly, which 80 bars, cause the lower pair of bars 1, to swing upon their pivot, and in turn each pair of bars 1 are caused to similarly swing upon their respective pivots, including the bars 16, which movement causes section B of the ladder, to move or slide upon the side pieces *a* of section A of the ladder. This position is shown in Fig. 2. If the hand lever 8 be moved to a vertical position, the movement of the parts are reversed, and the S shaped bars 1, 90 are brought substantially in a horizontal position, causing section B of the ladder to slide or move upon section A of the ladder, in an opposite direction to the movement previously explained. This position is shown in Fig. 95 1. It will be observed that by this arrangement of parts the movement of section B of the ladder is very rapid. I do not broadly claim bars 1, pivoted together as I have described, as I am aware bars have been so pivoted before. 100

To the inner side of one of the side pieces *d* near its lower end, I secure a hook of any suitable form of construction adapted to catch upon a round of the stationary section A of 105 the ladder, so that when the section B is extended, the hook will catch over a round of said stationary section, thereby holding said movable section in the desired position, and preventing the same from returning to its normal position until further manipulated. 110

Figs. 3 and 4 of the drawings represent a hook which may be used in operating my improved extension ladder, in which the hook 20 at its lower end, is secured by a pin 21, 115 upon which it can turn, to the inner side and near the lower end of a side piece *d*, of section B of the ladder. The catch part of said hook is curved sufficiently at 22 to fit over and partially surround a rung or round *b* of 120 section A of the ladder and from such catch part of said hook is extended a curved bar 23. The curved latch 24 is attached at one end to said hook 20 by means of a pin 25 upon which it may turn, and the curved spring 26 125 is also secured at one end rigidly to said hook 20, and the free end of such spring bears against the under side of said latch 24. The spring 27 is rigidly secured at one end to the inner side of side piece *d*, so its free end bears 130 against the inner side of hook 20 near its lower end, and the curved spring 28 is also rigidly secured at one end to the inner side of the side piece *d*, so the free end of said

spring bears against the outer side of said hook 20 near its upper end.

From the description given, persons skilled in the art will readily understand the construction and mode of operation of my device, and it will be understood that modifications and changes may be made therein without departing from the scope of my invention.

What I claim as new, and desire to secure by Letters Patent, is—

1. In an extension ladder composed of sections, the combination of the pairs of bars 1 attached to the respective sections, the slot-

ted bars 6, the hand lever, the bar 12 and curved bars 10 for the purposes stated and substantially as described.

2. In an extension ladder composed of sections, the combination of the pairs of bars 1 attached to the respective sections, the slot- ted bars 6, the hand lever, the bar 12, the curved bars 10, and a hook for the purposes stated and substantially as described.

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