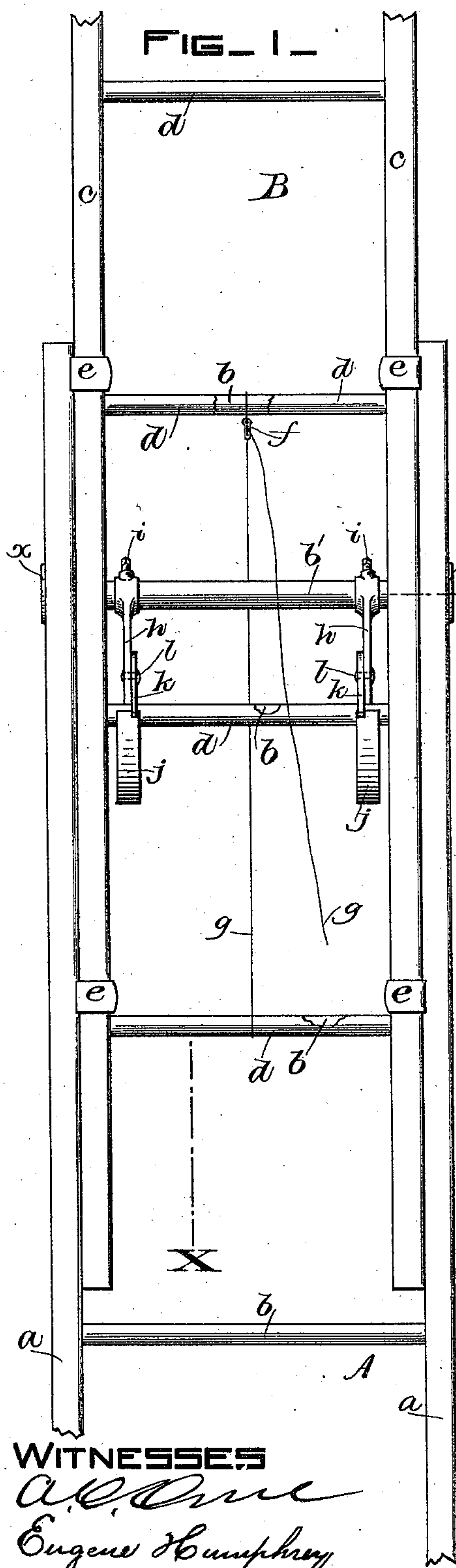


C. FRIZELL.
EXTENSION LADDER.

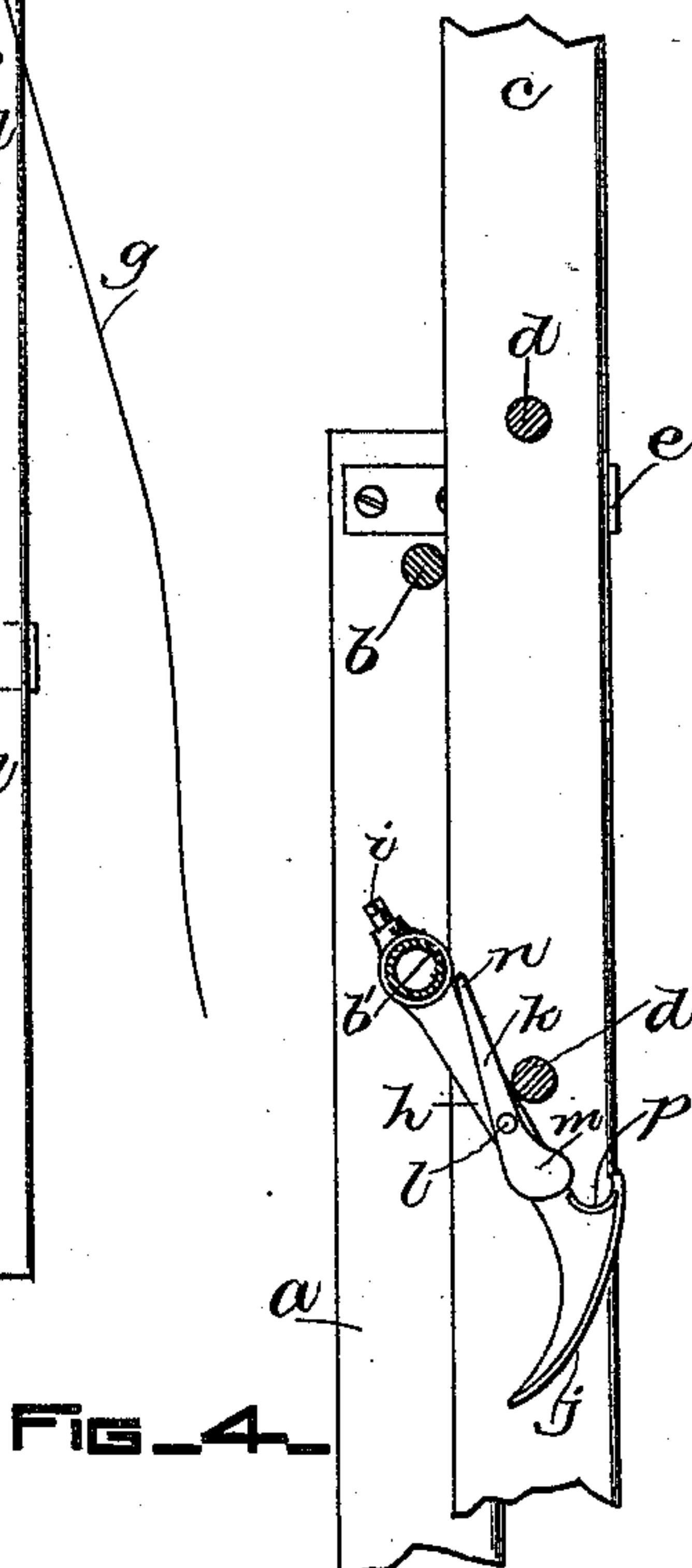
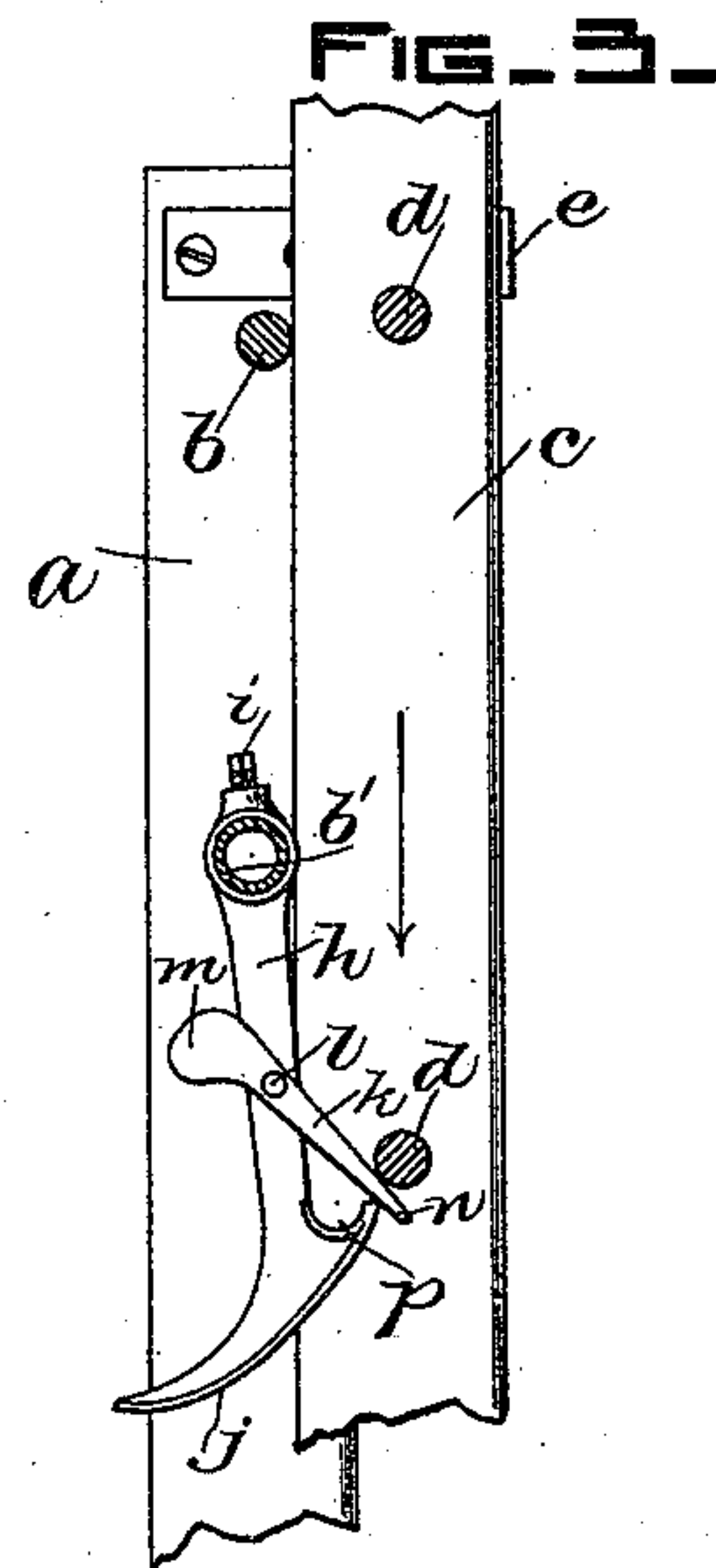
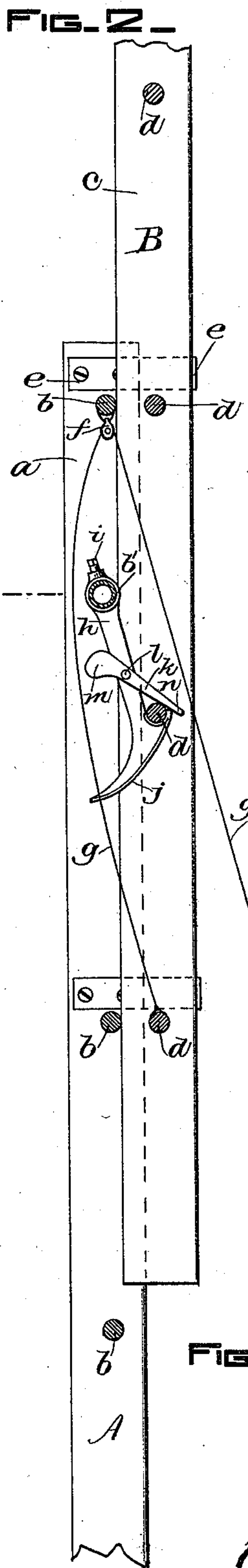
No. 408,610.

Patented Aug. 6, 1889.



WITNESSES

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Eugene Humphrey



INVENTOR

Charles Frizell
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(No Model.)

2 Sheets—Sheet 2.

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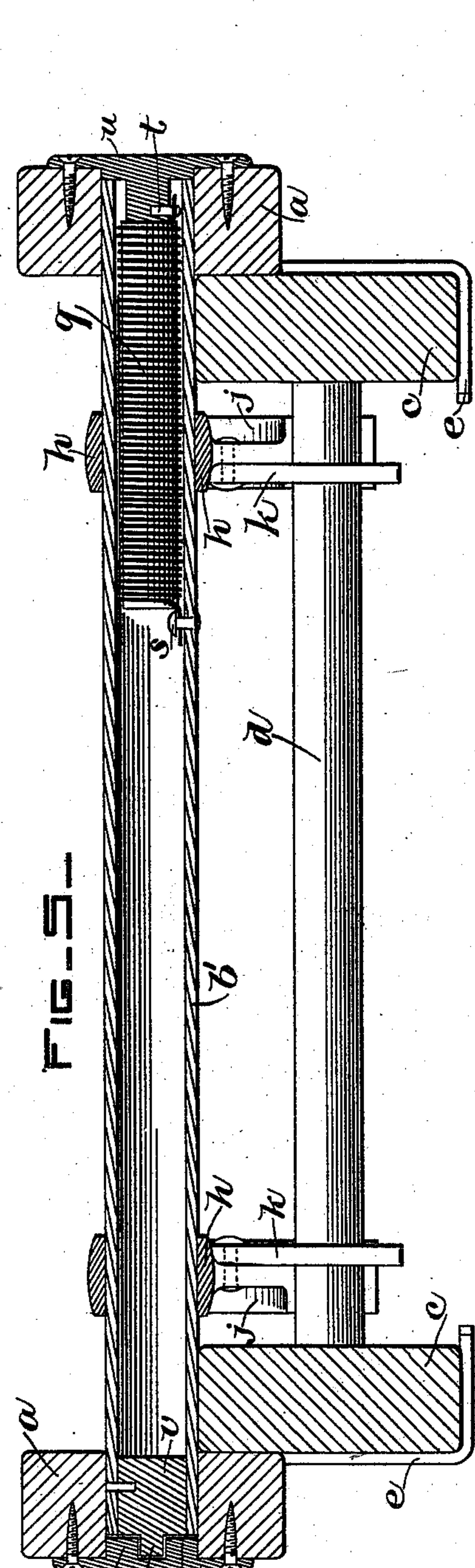


FIG. 5—

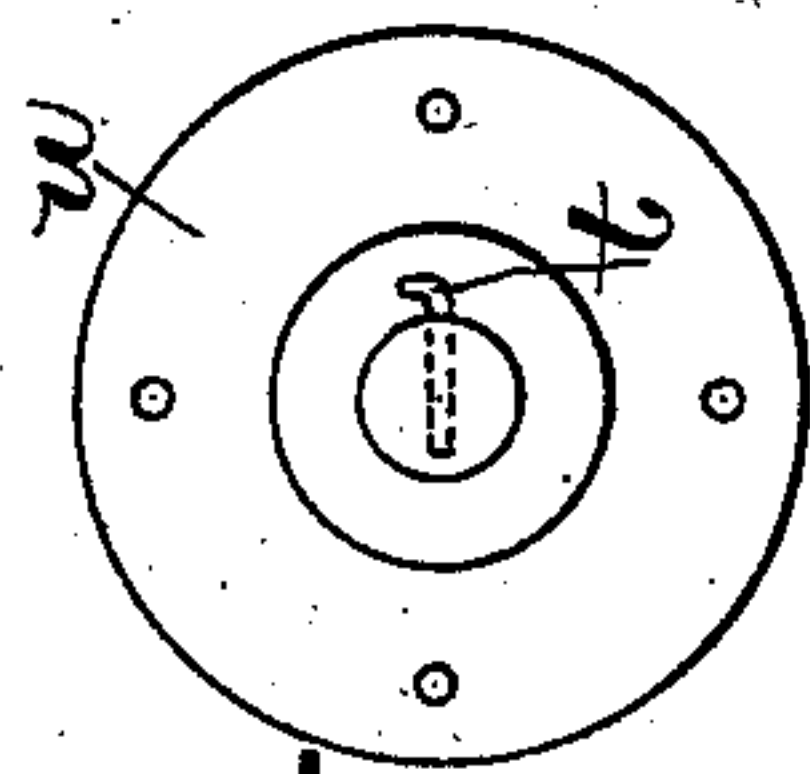


FIG. 2—

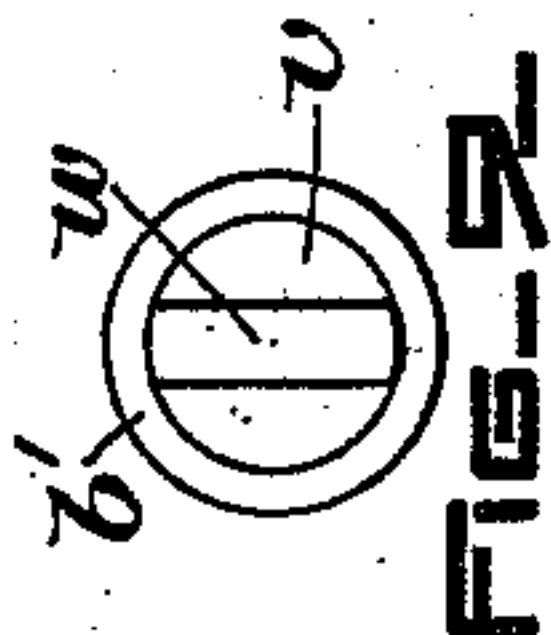


FIG. 3—

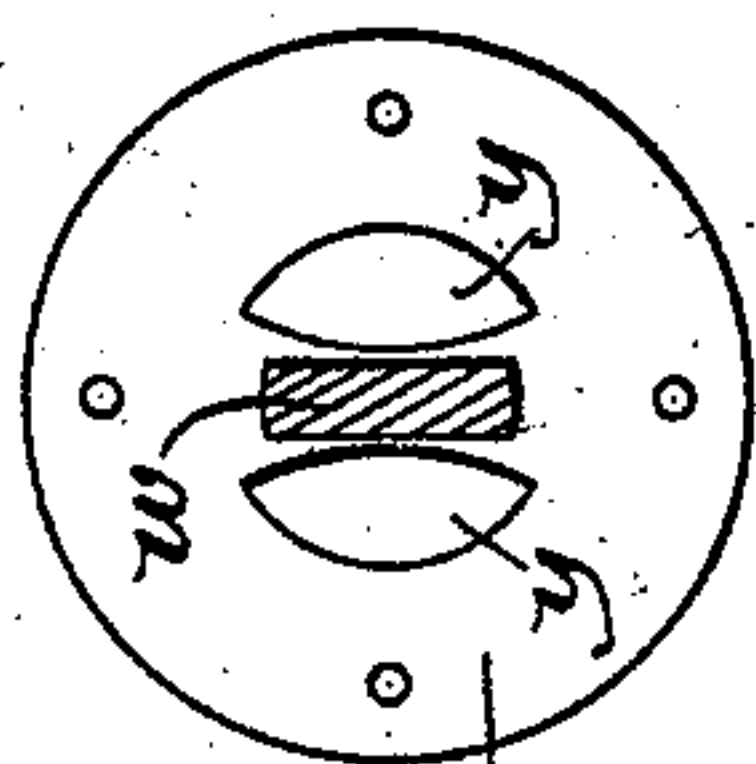


FIG. 4—

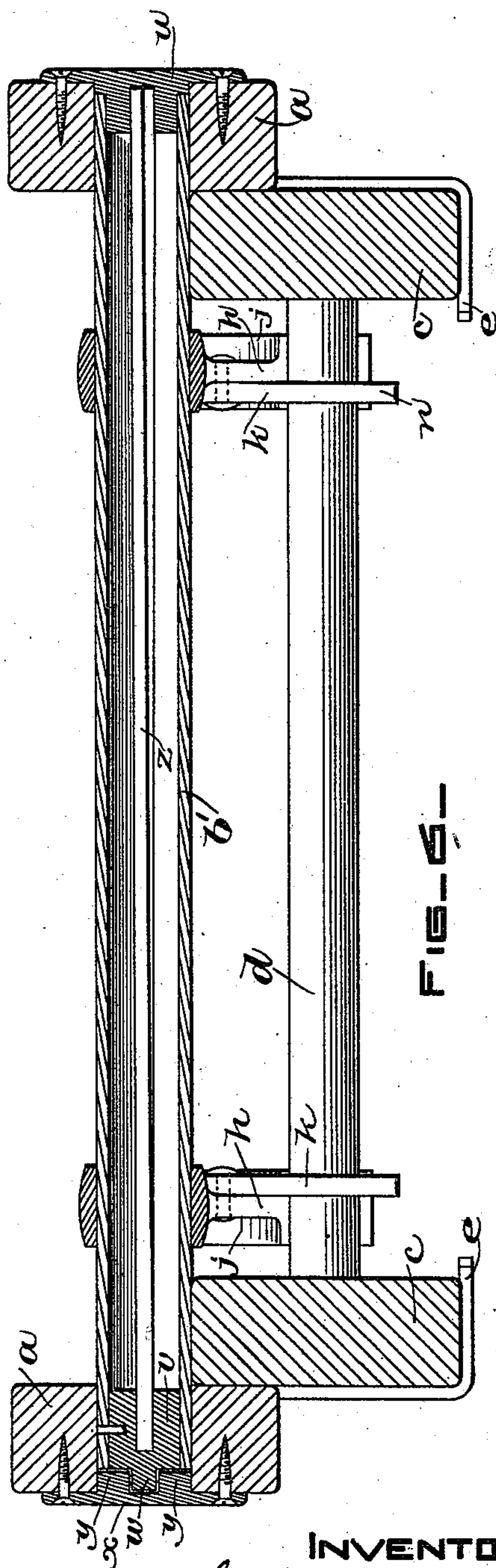


FIG. 6—

WITNESSES

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UNITED STATES PATENT OFFICE.

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EXTENSION-LADDER.

SPECIFICATION forming part of Letters Patent No. 408,610, dated August 6, 1889.

Application filed May 9, 1889. Serial No. 310,099. (No model.)

To all whom it may concern:

Be it known that I, CHARLES FRIZELL, of Boston, in the county of Suffolk and State of Massachusetts, have invented a new and useful Improvement in Extension-Ladders, which will, in connection with the accompanying drawings, be hereinafter fully described, and specifically defined in the appended claims.

In said drawings, Figure 1 is a front elevation showing a ladder having my improvements thereto applied, the lower portion of the lower section and the upper portion of the upper section of the ladder being broken away. Fig. 2 is a sectional elevation, the section being taken on line X, Fig. 1, and the view as from the left thereof. Fig. 3 is a detached sectional elevation corresponding to Fig. 2, but showing the relation of parts when the upper section is being lowered and when a rung is passing the supporting-hooks. Fig. 4 is a view similar to Fig. 3, but showing the relation of parts when the upper section has been raised and when a rung is being lowered into the seat in the supporting-hooks. Fig. 5 is a sectional plan view, the section being taken on line Z, Fig. 1, and the view from above that line. Fig. 6 is a view like Fig. 5, but showing a modification thereof. Fig. 7 is an inside view of the clutch that controls the extent of rotation of the hook-supporting rung. Fig. 8 is an inside view of the cap by which the torsion of the spring that actuates the hooks is adjusted. Fig. 9 is an end elevation of the hook-supporting rung viewed as from the left in Figs. 5 and 6.

This invention relates to that class of ladders known as "extension-ladders," which consist of a lower section provided with metal clamps in which the upper section slides and is supported, said lower section being also provided with hooks, which, when engaged with a rung of the upper section, serve to sustain the same and the load that may be thereon; and my invention consists in certain improvements in the devices which actuate the hooks, as will be hereinafter described.

Referring again to said drawings, A represents the lower section of the ladder, formed with the usual side bars *a* and rungs *b*, the upper section being shown at B and having the usual side bars *c* and rungs *d*, said section B

being of a width to fit within bars *a* and to bear upon rungs *b*, as shown, a pulley-block *f* being shown as secured to the upper rung *d* and having a rope *g* rove through it, one end of said rope being secured to the lower rung *d* and serving as a well-known means of raising and lowering section B, which is held by clamps *e* in contact with section A. I form the rung *b*, which is the second from the top of section A, of gas-pipe, and I arrange thereon the supporting-hooks *h*, which may be locked in position by their set-screws *i* in a well-known manner, said hooks at their lower ends being formed with a cam-like face *j* and having a seat *p* to retain rungs *d* when supporting the upper section B, as in Figs. 1 and 2. A clearer *k* is pivoted to hooks *h*, as at *l*, said clearer having a longer arm *n* and a shorter arm *m*, the prolongation of the axis of the longer arm passing to one side of the center of the shorter arm, in order that when the long arm is thrown back past the center, as in Fig. 4, the weight of the short arm, which is less than that of the longer arm, will serve to tilt the long arm forward after it is released by the rising of the rung or by lowering it into seat *p*. To throw hooks *h* forward a proper distance to automatically engage rungs *d*, I arrange in rung *b* a coiled spring *q*, the inner end of which is anchored to the rung at *s*, while the outer end is anchored at *t* to the cap *u*, that is secured to bar *a* by screws, as shown. In the opposite end of the hollow rung I secure the plug *v*, having the stud *w*, Figs. 5, 6, 7, and 9, said stud being arranged between the clutch-like studs *y*, formed on the inner face of plate *x*, secured to bar *a*, Figs. 1, 5, and 6. It will be seen that said studs *y* are upon their exterior faces the arc of a circle, so as to fit the hole in bar *a* that receives the rung, while their inner faces are rounded away just enough to allow the rung to rotate sufficiently for hooks *h* to swing into and out of the path of the rungs *d* in the top section B. To arrange these parts in operative relations, hooks *h* are placed loosely on rung *b*. The spring is anchored to the rung and to cap *u*, which latter is secured to bar *a*. Then by rotating the rung in the right direction the proper strain on the spring is effected, when the hooks are locked by their set-screws, and the cam-plate *x* is secured to bar *a*, so as to

check the forward movement of hooks *h* at the proper point when they are not engaged by rungs *d*.

It will be obvious that when section B is moving upward its rungs *d* will engage cams *j* of the hooks, and so move the hooks back out of the path of the rungs, and that when section B is descending the clearers *k* perform the same office, and hence section B can be raised or lowered without the operators having any regard to the hooks, and when it is desired to seat a rung of B in *p* it is only necessary to move the rung slightly above cam *j*, as in Fig. 4, and then lower it into the seat, the spring *q* always holding the hooks against the rungs as they pass the hooks.

Instead of helical spring *q* a torsion-spring *z* may be substituted therefor, as shown in Fig. 6, said spring being square, round, or oblong in cross-section, as preferred.

I do not confine myself to the hooks shown and described, as the means shown for sup-

porting and automatically moving the hooks into the path of the rungs of the upper section may be employed with various kinds of hooks other than those shown and described.

I claim as my invention—

1. In an extension-ladder, the combination of a hollow rung, a pair of hooks secured on said rung, a spring arranged in the rung to actuate the same and the hooks thereon, and a clutch interlocked with the rung, all combined and arranged to operate substantially as specified.

2. The combination, in an extension-ladder, of a hollow rung *b*, hooks *h*, secured on said rung, spring *q*, arranged in the rung to actuate it, and cam-plate *x*, interlocked with the rung to control the rotation thereof, all substantially as specified.

CHARLES FRIZELL.

Witnesses:

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EUGENE HUMPHREY.