(No Model.)

3 Sheets—Sheet 1.

D. H. CREWS.

EXTENSION LADDER.

No. 475,935. Patented May 31, 1892.

FIG_4_

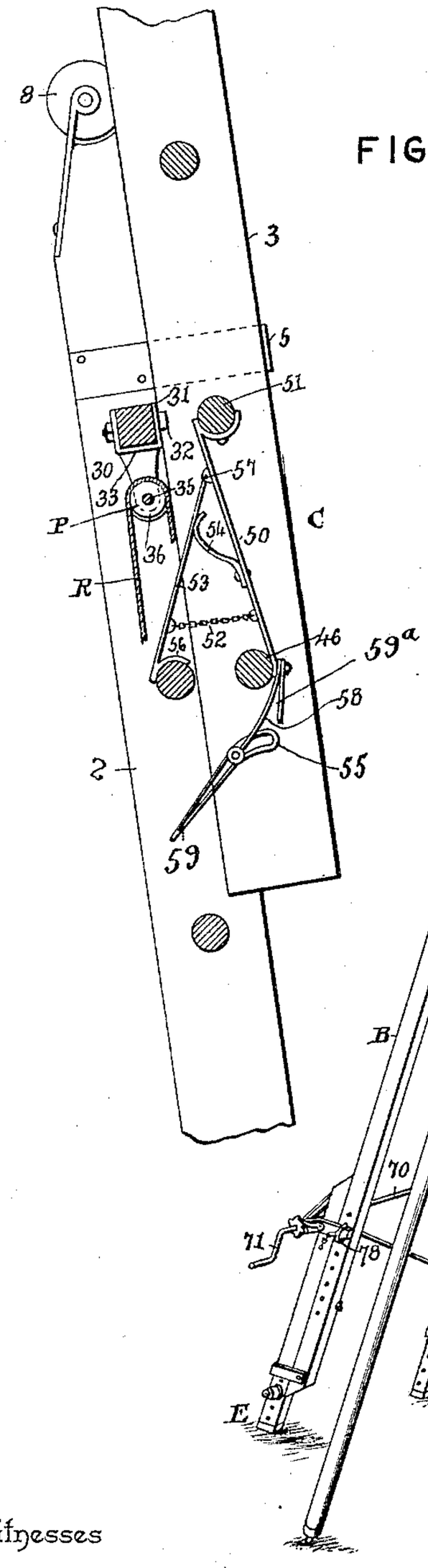


FIG_1_

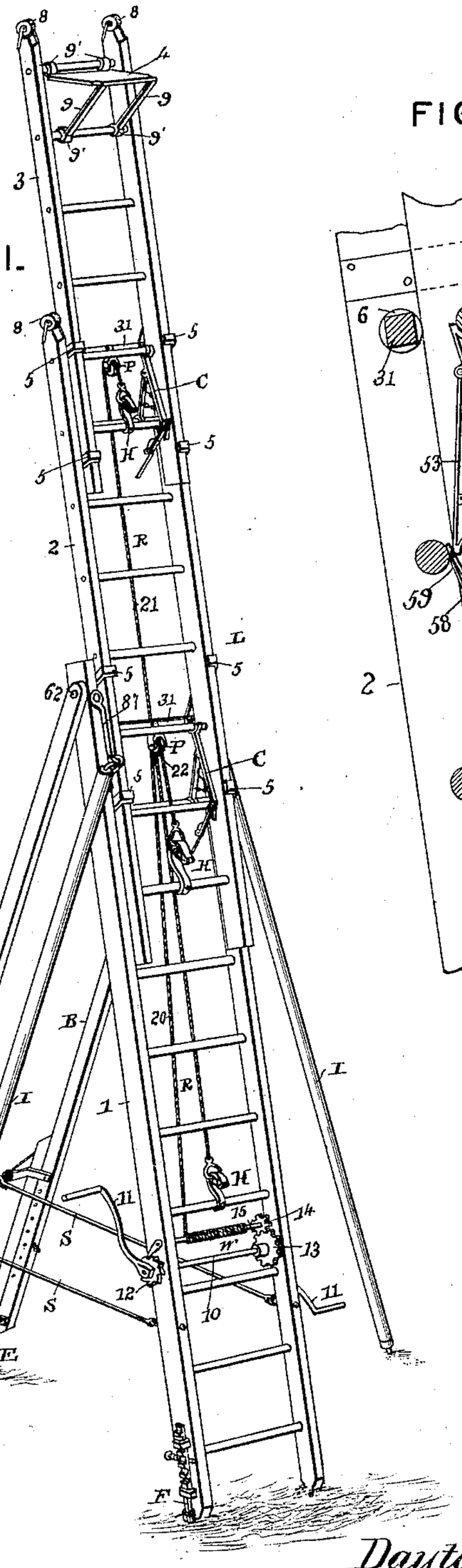
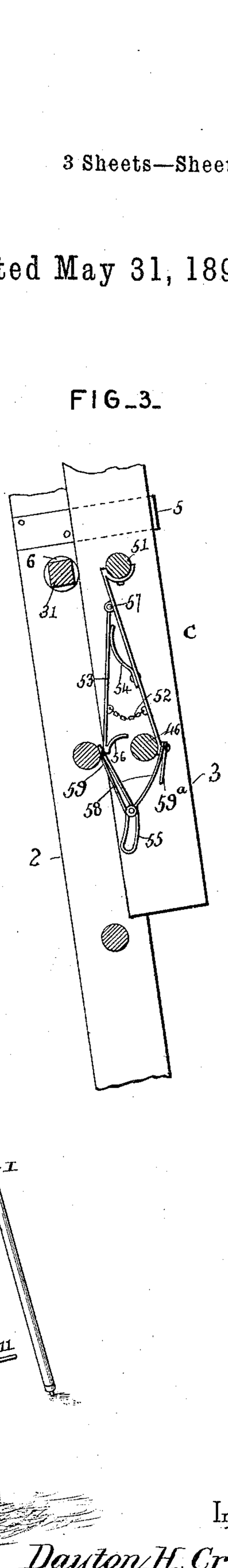


FIG_3_



Witnesses

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Inventor

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(No Model.) 3 Sheets—Sheet 2.

D. H. CREWS.

EXTENSION LADDER.

No. 475,935. Patented May 31, 1892.

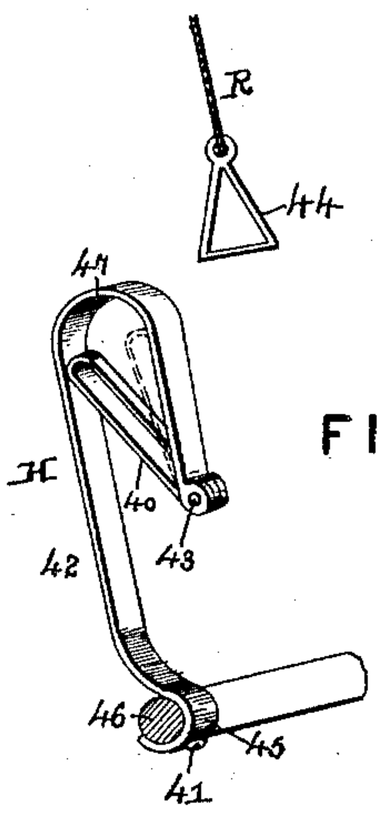

FIG. 5.

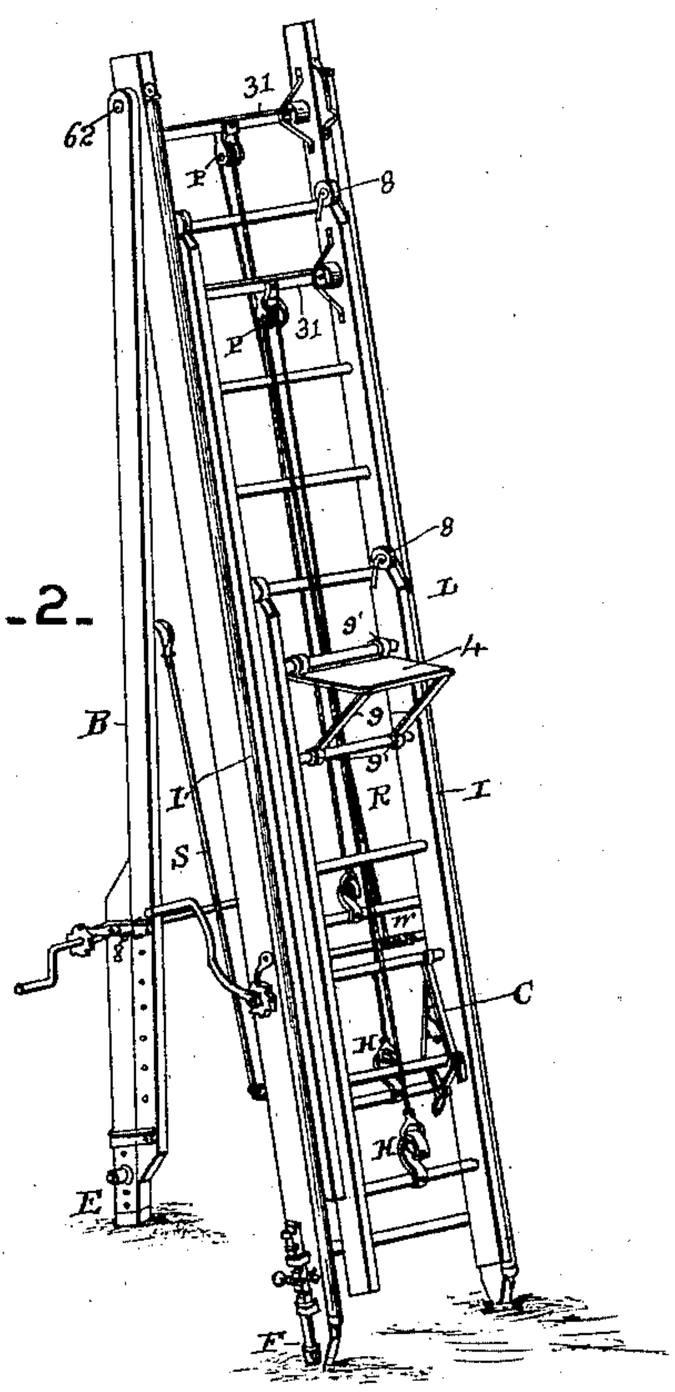

FIG. 2.

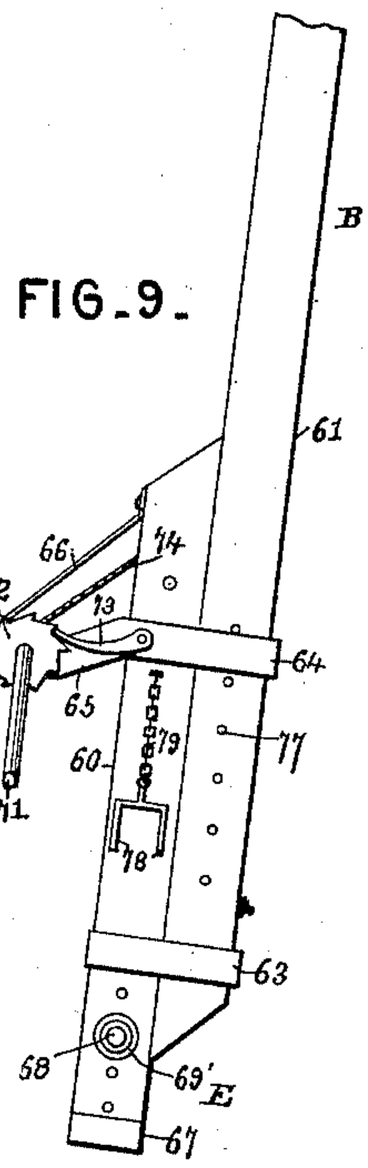

FIG. 9.

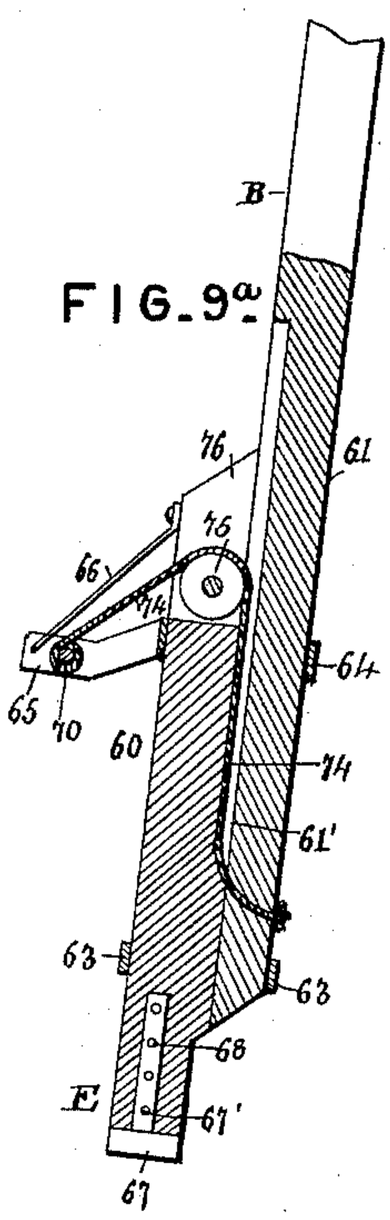

FIG. 9a.

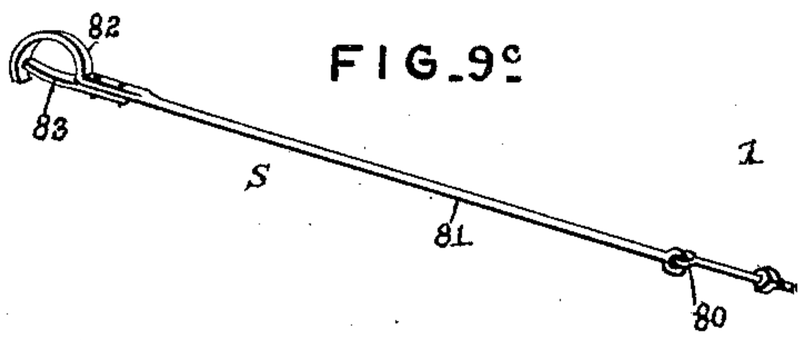

FIG. 9c.

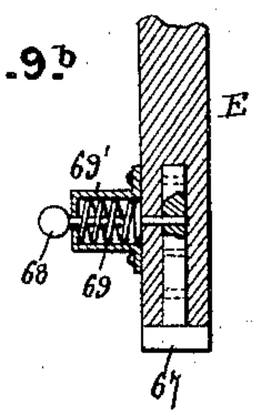

FIG. 9b.

Witnesses

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(No Model.) 3 Sheets—Sheet 3.

D. H. CREWS.

EXTENSION LADDER.

No. 475,935. Patented May 31, 1892.

FIG. 6.

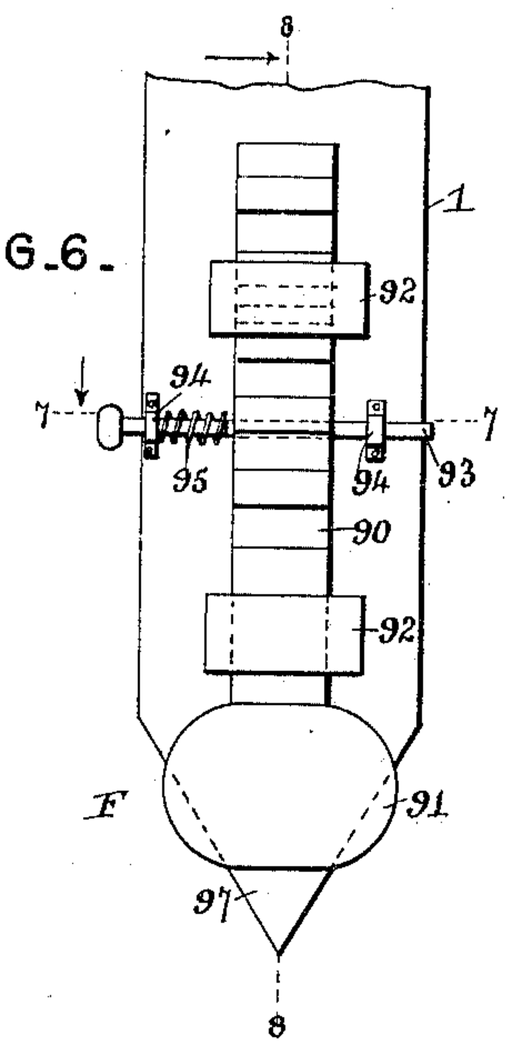


FIG. 7.

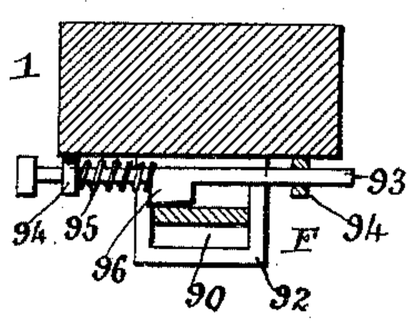


FIG. 8.

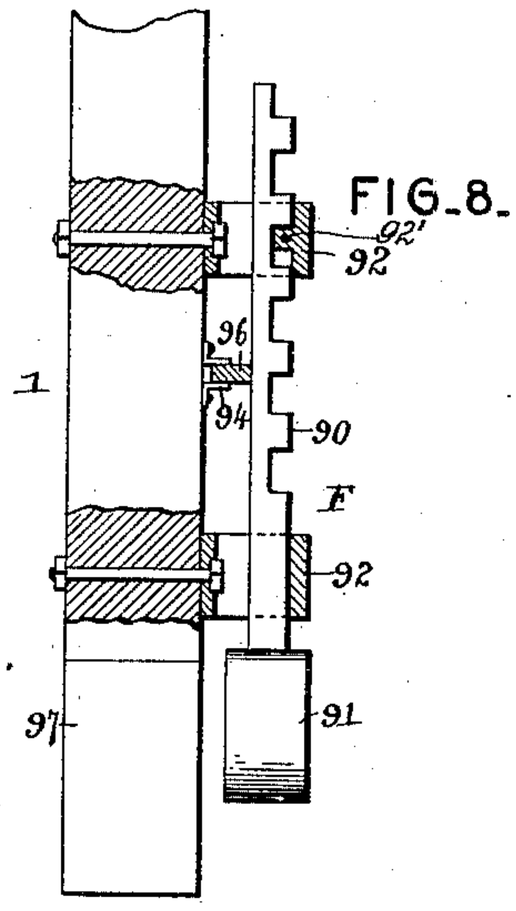


FIG. 12.

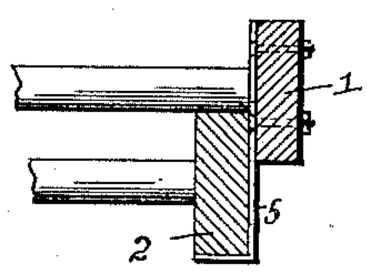


FIG. 10.

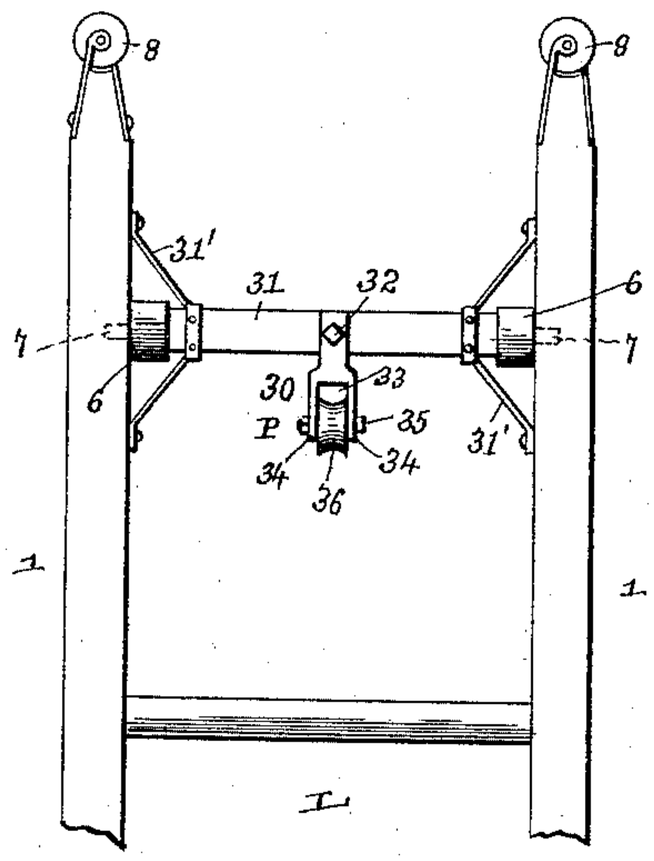
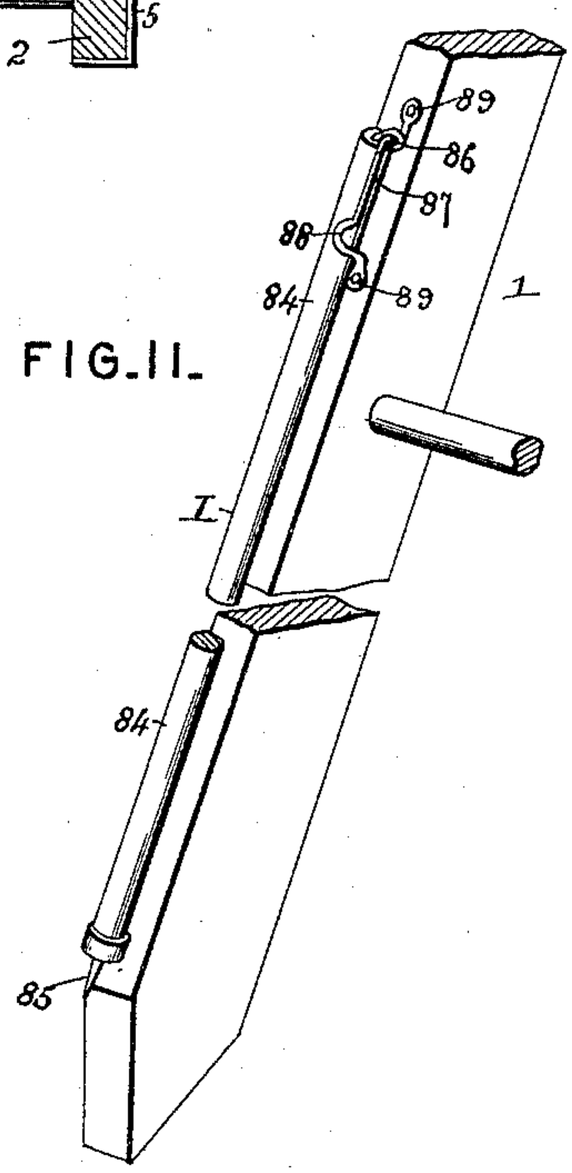


FIG. 11.



Witnesses

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UNITED STATES PATENT OFFICE.

DAYTON H. CREWS, OF LADONIA, TEXAS.

EXTENSION-LADDER.

SPECIFICATION forming part of Letters Patent No. 475,935, dated May 31, 1892.

Application filed December 29, 1891. Serial No. 416,413. (No model.)

To all whom it may concern:

Be it known that I, DAYTON H. CREWS, a citizen of the United States, residing at Ladonia, in the county of Fannin and State of Texas, have invented a new and useful Extension-Ladder, of which the following is a specification.

This invention relates to ladders, and more especially to that class thereof known as "extension-ladders;" and the object of the same is to produce certain improvements therein.

To this end the invention consists in the details of construction, substantially as hereinafter more fully described and claimed, and as illustrated on the three sheets of drawings, wherein—

Figure 1 is a perspective view of this ladder in its extended position. Fig. 2 is a similar view of the ladder with its sections telescoped and its braces in the act of being folded against the ladder. Fig. 3 is a central longitudinal section showing the catch in position when one section of the ladder is being raised. Fig. 4 is a similar section showing how the catch supports the section raised. Fig. 5 is an enlarged perspective detail of one of the hooks. Fig. 6 is a side elevation, on an enlarged scale, of the lower end of one side of the lower ladder-section. Fig. 7 is a cross-section on the line 7 7 of Fig. 6, and Fig. 8 is a vertical section on the line 8 8 thereof. Fig. 9 is a side elevation of the lower end of one of the braces. Fig. 9^a is a central vertical longitudinal section thereof. Fig. 9^b is a section through the extension device for the brace, taken at right angles to the section of Fig. 9^a. Fig. 9^c is a perspective detail of one of the struts. Fig. 10 is a front elevation of the upper end of one ladder-section. Fig. 11 is a perspective detail showing one of the inclined braces out of use. Fig. 12 is a cross-section of two ladder-sections, showing one of the guiding-straps.

Referring to the said drawings, the letter L designates the ladder-sections; R, the raising-rope; W, the windlass; C, the supporting-catch; P, the friction pulleys or rollers; H, the hooks; B, the braces; E, the extension devices for said braces; S, the struts; I, the inclined braces, and F the extension-feet for the lower ladder-section, these parts being preferably of the following construction:

The ladder L is made in a number of sections, in the present instance three, designated by the numerals 1, 2, and 3, (although there may be more, if desired,) the second section sliding upon the rungs and just inside the side bars of the first, and so on to the top of the ladder, and they are guided under angular metallic straps 5, as seen in Fig. 12, the straps permitting the side bars of an upper section to slide over the rungs of the section below and preventing the displacement of the sections. The uppermost rung 31 of each section is preferably of iron, Fig. 10, having a square body and reduced rounded ends 7, which are secured in the side bars of the ladder and form bearings for friction-rollers or wheels 6, which guide the ladder-section above in its vertical movements, strap-braces 31′ preferably connecting this rung near its ends with the side bars, in order to brace the ladder. At the upper ends of the ladder-sections there are preferably arranged guide-wheels 8, which travel against the face of a dead-wall, if the ladder is leaned against the same and extended. 4 is a small platform mounted on angular brackets 9, which have hooks 9′, adapted to engage two contiguous rungs on any section, so as to hold the platform approximately level, whereby a bucket of water or other article may be supported thereon.

The means for extending this ladder consists of a windlass W, journaled in bearings at the rear of the lowermost section 1, and this windlass comprises a main shaft 10, having crank-handles 11 and a ratchet-wheel 12, large gears 13 on this shaft meshing with smaller gears 14 on a second shaft 15 in the bearings 16, above mentioned. Thus when one or both of the cranks 11 are turned the shaft 15 is rapidly revolved and this winds the rope R, which is used for raising the several sections of the ladder. The rope itself is in several sections, the lowermost section 20 being connected to the shaft 15 of the windlass, passing thence upwardly over a friction-pulley P, connected to the upper rung 31 of the lower section 1 and leading thence down to a hook H, which is connected with one of the lower rungs of the second ladder-section 2. The second rope-section 21 is connected in a similar manner to the lower rung

of the first ladder-section, passes over another pulley P on the upper rung 31 of the second ladder-section, and is connected by a hook H to one of the lower rungs of the third ladder-section. Thus when the windlass is operated the second ladder-section is raised over the first, and this raises the center of the second rope-section; but as the lower end of this rope-section is secured to a stationary rung it cannot move, and hence the other end rises with twice the speed of the center, which therefore raises the third ladder-section.

Each of the hooks H, just mentioned, is preferably of the construction shown in Fig. 5—that is to say, the body 42 of the hook is straight, having its upper end turned over, as at 47, into a large hook and its lower end 45 curved around under the rung 46, to which it may be bolted, as at 41. To the extremity of the large hook 47 is pivoted, as at 43, a tongue 40, which stands within this hook, and 44 is an eye of any suitable pattern secured to the rope R and of proper size to pass over the pivot 43. As the eye rises the tongue moves to the dotted position, and after the eye has passed the tip of the tongue the latter falls back to its full-line position and prevents the displacement of the eye.

In Fig. 4 is shown one of the friction-pulleys P in section, and Fig. 10 shows it in elevation. The same comprises a strap-hook 30, extending over the rung 31, to which it may be connected by a bolt 32, and the lower end of this hook is divided, as at 33, its extremity being formed into eyes 34. Through these eyes extends a transverse bolt or pin 35, and on the pin is journaled a grooved sheave or pulley proper 36, as shown.

The catch C, which I preferably use, is best seen in Figs. 3 and 4. This catch comprises a body 50, secured at its lower end to the lower rung 46 of any ladder-section but the lower one, and at its upper end at 51 to the rung next above. A second member 53 is pivoted at 57 to the body, from which it is borne by a spring 54, a chain 52 limiting its rearward movement to just such point that a face 56 at its lower end will come over one of the rungs of the ladder-section next below, as seen in Fig. 4. The upper section being raised this catch slides over the rungs of the lower section, and when the upper section is brought back a little the lower end 56 of the member 53 rests on one of the rungs, whereby the upper ladder-section is supported. When it is desired to lower the extension-section, the member 53 of the catch is carried past the rungs of the lower stationary section by an automatically-operating pivoted lever 55, which is pivoted at the lower end of a depending hanger 58 and which is arranged so that it will assume normally a position shown in Fig. 4, with its end 59 in alignment with the rungs of the lower stationary section, whereby when the extension-section is lowered the pivoted lever 55 will be raised and will engage the member 53 and will carry the latter inward clear of the rungs. In raising an extension-section the pivoted lever 55 will swing to a vertical position when it strikes the rungs and will pass the same, and to prevent it entirely rotating by contact with the rungs a stop 59ª is provided. Preparatory to lowering an extension-section it is slightly elevated to bring the pivoted lever 55 above the rung on which the member 53 has been supported.

In Fig. 9 is shown to best advantage one of the braces B, which I preferably employ for supporting this ladder when it is to be used at a point where the upper end of the upper section will not rest against a support. Each of these braces consists of a main or stationary section 60, whose lower end rests on the ground, and an upper or sliding section 61, adapted to be moved over the lower section by the extension devices E, this upper section being pivoted at 62 to the lower ladder-section 1 near its upper end. The lower end of the upper section has a strap 63, which embraces and slides on the body of the lower section, and the upper end of the lower section has a similar strap 64, loosely engaging the body of the upper section. It will be seen by Fig. 1 that each section is in duplicate and the rear ends of the two straps 64 are extended, as at 65, and connected by braces 66 with the upper end of the members of the lower section. At the lower end of the extension device is a plug 67, let into the same and having holes 67′ through its body, and 68 is a pin moving through a spring 69 in a small keeper 69′ and removably engaging one of such holes. By this means the plug can be drawn out the proper extent at the lower end of either member of the lower section to cause the brace to properly rest on inclined or uneven ground, as will be clear. The extension devices E for this brace are preferably of the following construction: 70 is a shaft journaled in the rear ends 65 of the two straps 64 and having a crank-handle 71. 72 is a ratchet on this shaft engaged by a pawl 73, and 74 is a rope or chain leading from the shaft 70 over a wheel 75, mounted within the slotted upper end 76 of the lower section 60, led down the groove 61′ of the section 61 (I should have said that the adjacent faces of the sections of the brace preferably have tongue and groove) and connected at its other end to the lower end of the upper section. 77 is a vertical series of holes formed in the upper section 61, and 78 is a stout staple supported by a chain 79 from the section 60 and adapted to be passed astride the upper strap 64 and into a pair of the holes when the two sections have been properly adjusted, by which means the brace is locked against a possible retrograde movement in case the pawl 73 should slip or the rope or chain 74 should break.

When the ladder is set up and the braces run out to hold it raised, struts S are used to hold the braces the proper distance from the ladder, and each strut preferably comprises an eyebolt 80, taking through the side bar of

the lower ladder-section 1, a long rod 81, linked into the eye of said bolt, a hook 82 at the other end of the rod adapted to take over the shaft 70, and a spring-tongue 83 within the hook to prevent the accidental disengagement of the latter from the shaft. In Fig. 2 is seen the manner in which these struts fold up against the back of the lower ladder-section when the complete ladder is to be folded, as for transportation.

I designates an inclined brace, of which there are preferably two, and these are useful for supporting the ladder against lateral displacement when it does not rest against a wall. Each brace I has a stout pole 84 for its body, with a spike 85 in its lower end, adapted to embed the earth, and a laterally-projecting eye 86 at its upper end. 87 is a bracket secured to the outside of the side bar of the lower ladder-section 1, which bracket has an enlargement 88 near its lower end and has its two extremities 89 fastened to the said side bar. When not in use each inclined brace is moved so that its eye 86 travels to the upper end of the body 87 of the bracket; but when in use, Fig. 11, the eye is slipped down into the enlargement 88, at which time the body of the brace is longer than the side bar of the ladder below said enlargement, and hence the brace must stand oblique. Its spike 85 is embedded in the earth and the ladder is held against all lateral displacement.

In order that the lower section of the ladder may be adjusted to accommodate it to inequalities in the ground, I provide the adjustable feet F. (Best seen in Figs. 6, 7, and 8.) Each foot comprises a toothed body 90, with an enlarged lower end 91, the body sliding vertically through eyes 92 in the side bar of the ladder.

93 is a catch sliding under staples 94, laterally of the body 90, and 95 is a spring normally drawing an enlargement 96 of this catch into place in rear of the body, so as to prevent a vertical movement of the body by engaging the teeth with a lug 92′ in one of the eyes. The lower ends or extremities 97 of the side bars of the ladder are sharpened, as seen in Fig. 6, and usually embed the earth for at least a short distance or until the enlarged lower end 91 strikes the earth; but when it is desired to make either side bar longer the catch 93 is moved through the staples 94 until its enlargement 96 disengages the teeth of the body. The latter is then set vertically through the eyes 92, as may be necessary, and the catch is returned to its position.

With the above construction of parts the ladder in its extended condition, Fig. 1, may be used for any desired purpose, and the braces B and inclined braces I may be omitted entirely if the ladder is to be used against a house or other similar support. The sections of the ladder may be extended by the windlass W, and the catches C will hold them positively raised, and these catches can be thrown out of operative position by their hooks 55 when it is desired to again lower the ladder. When the braces B are used, they may be extended by their extension devices E, or in lieu of such devices I might have other means for extending them—such, for instance, as shown in my patent, No. 462,240, granted November 3, 1891.

Parts of this device may be used without the whole, and considerable change in and elaboration of details may be made without departing from the spirit of my invention.

What is claimed as new is—

1. A ladder having aligned eyes in its side bars near their lower ends, a foot sliding vertically through said eyes and having an enlarged lower end, the body of the foot being toothed, and a spring-actuated catch sliding horizontally through staples and having an enlargement normally causing the teeth on said foot to engage with one of the eyes, as and for the purpose set forth.

2. A ladder having on each side bar a bracket with an enlargement near its lower end, in combination with an inclined brace having a spike in its lower end and a laterally-projecting eye in its upper end loosely engaging said bracket, the brace being longer than the portion of the side bar below said enlargement, as and for the purpose set forth.

3. The combination, with a ladder made in several sections sliding over each other and means for extending and telescoping said sections, of a brace in two members pivoted to the lower ladder-section near its upper end, each member comprising two sections sliding over each other and having straps loosely embracing the other sections, the upper section having a vertical series of holes, means for extending said sections, and a staple adapted to pass over the strap on the lower section and take into two of the holes of said series, as and for the purpose set forth.

4. The combination, with a ladder made in several sections sliding over each other and means for extending and telescoping said sections, of friction-wheels journaled on the upper rung of each ladder-section but the uppermost, the side bars of the sections next above moving over said wheels, strap-braces 31′, connecting the rungs supporting the friction-wheels with the side bars of the ladder, and angular metallic straps on the side bars of one section loosely embracing the side bars of the other, substantially as described.

5. The combination, with a ladder, a brace made in two sections, the upper one of which is pivoted to said ladder, and guides causing the sections to slide on each other, of a crank-shaft journaled in an extension of the guide on the lower section, a pawl and ratchet on this shaft, a wheel journaled in the slotted upper end of this section, and a rope leading from the shaft over the wheel and connected with the lower end of the upper section, substantially as described.

6. The combination, with a ladder, a brace made in two sections, the upper one of which

is pivoted to said ladder and has a longitudinal series of holes, and a guide on the lower section, through which the upper section slides, of a crank-shaft journaled in an extension of said guide, a wheel journaled in a slot in the upper end of the lower section, a rope leading from the shaft over the wheel and connected with the lower end of the upper section, and a staple adapted to stand over said guide and removably engage two of the holes in said series, as and for the purpose set forth.

7. In a ladder, the combination, with the ladder proper and means for lengthening either of its side bars at its lower ends, of a pair of braces pivoted to the upper end of the ladder, a plug seated in the lower end of each brace and having a series of holes through its body, and a spring-actuated pin moving through a keeper on the brace and adapted to engage one of said holes, as and for the purpose set forth.

8. The combination, with a ladder, a brace pivoted to the upper end thereof and made in two members, and a rod connecting said members, of an eyebolt through the side bar of the ladder, a rod linked into the eye at one end and having a hook at its other end adapted to embrace said rod, and a spring-tongue normally closing said hook, as and for the purpose set forth.

9. In an extensible ladder, the combination, with a lower section having a pulley secured to its upper rung, a windlass, and a rope leading from the windlass over the pulley to an eye, of a second section sliding on the first and a hook comprising a bent lower end secured to the lower rung of this section, a large hooked body, and a tongue pivoted to the extremity of the body and normally closing it, said eye being of a size to pass over the pivot and tongue, substantially as described.

10. In an extension-ladder, the combination, with a lower ladder-section and an upper ladder-section sliding thereover, of a catch comprising a body secured to two rungs of the upper section, a member pivoted at its upper end to the body and having a curved face at its lower end, a spring bearing the member to the rear, and a chain limiting its movement so as to bring said face over a rung of the lower section, substantially as described.

11. In an extension-ladder, the combination, with a lower ladder-section and an upper ladder-section sliding thereover, of a catch comprising a body secured to two rungs of the upper section, a member pivoted at its upper end to the body and having a curved face at its lower end, a spring bearing the member to the rear, a chain limiting its movement so as to bring said face over a rung of the lower section, and a pivotally-mounted lever arranged to be engaged by the rungs of the lower section and adapted to engage the pivoted member of the catch, as and for the purpose set forth.

12. In an extension-ladder, the combination, with a lower section, a metallic rung at the upper end thereof having reduced ends seated in the side bars, strap-braces connecting said bars with the body of this rung, a pulley carried by the rung, wheels journaled on said reduced ends, and an upper ladder-section whose side bars slide over said wheels, of a windlass on the lower section, a rope leading therefrom over the lower pulley and connected with a lower rung of the upper section, and guide-wheels journaled in the upper ends of the side bars of the ladder-section, all substantially as and for the purpose set forth.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

DAYTON H. CREWS.

Witnesses:
M. G. COTTRELL,
W. R. CROCKETT.