

No. 664,385.

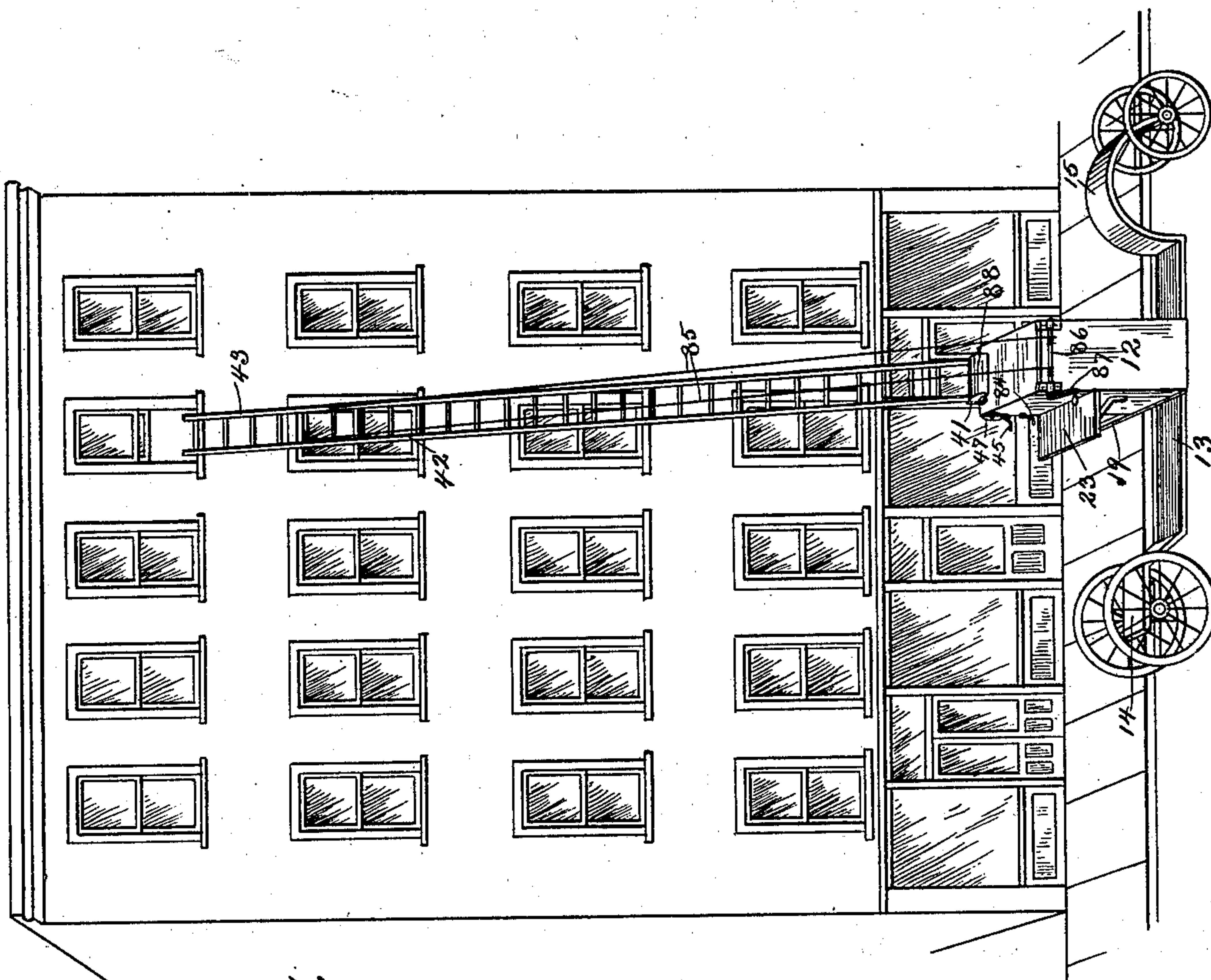
Patented Dec. 25, 1900.

C. COPLANTZ.
LADDER.

(Application filed Feb. 17, 1900.)

(No Model.)

3 Sheets—Sheet 1



Witnesses:
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Fig. 1.

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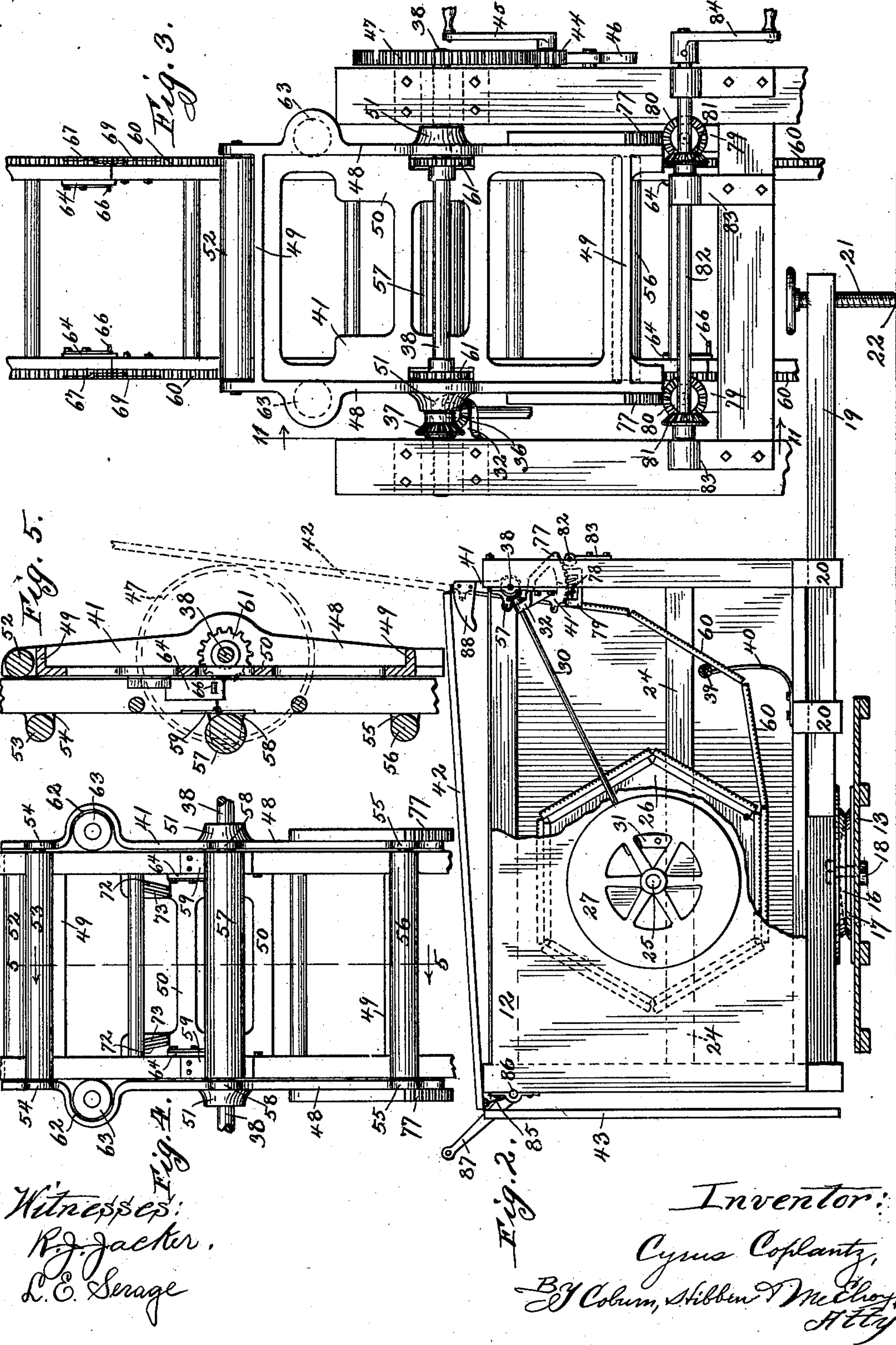
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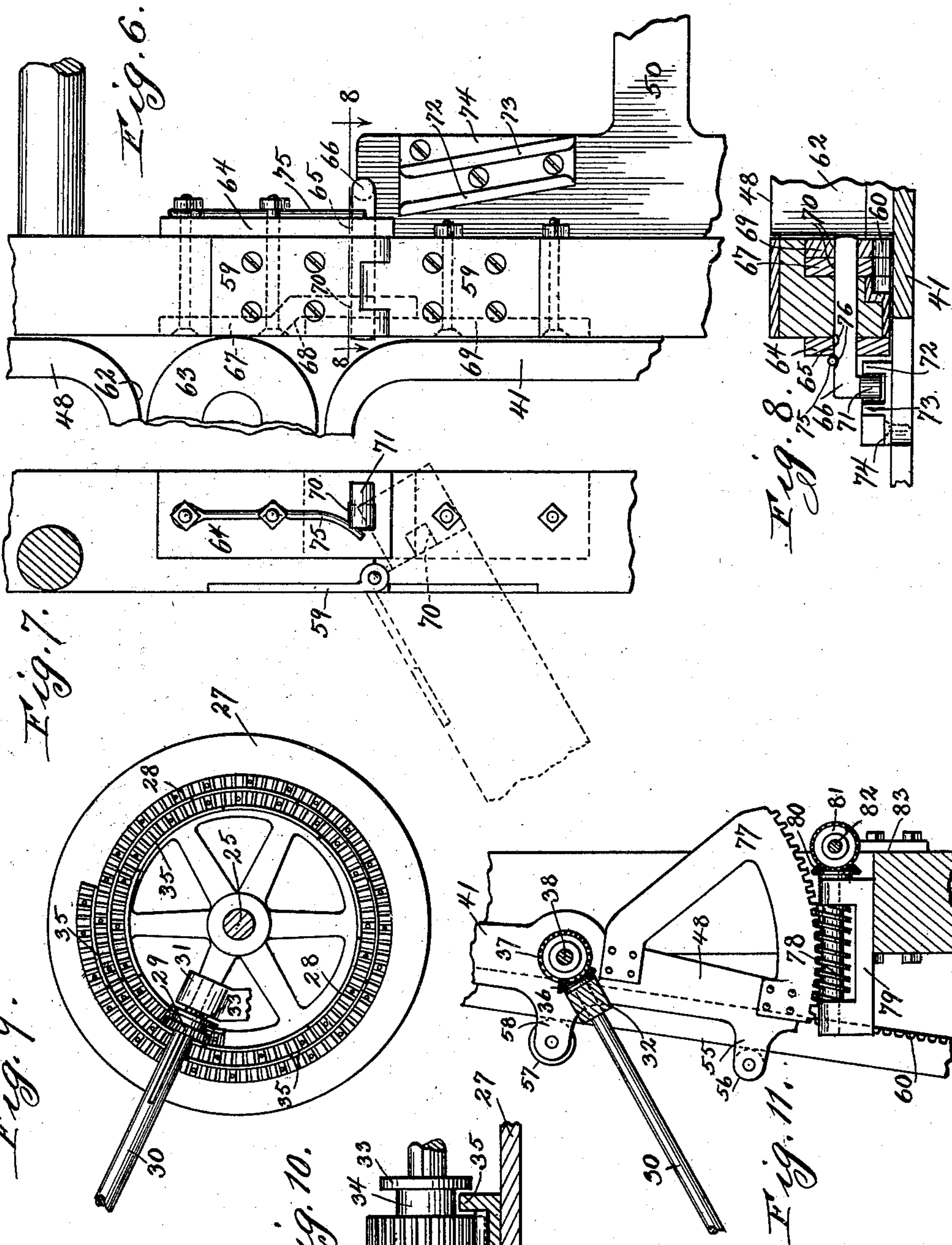
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3 Sheets—Sheet 3.



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Fig. 10.

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UNITED STATES PATENT OFFICE.

CYRUS COPLANTZ, OF JOLIET, ILLINOIS, ASSIGNOR TO LYDIA COPLANTZ
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LADDER.

SPECIFICATION forming part of Letters Patent No. 664,385, dated December 25, 1900.

Application filed February 17, 1900. Serial No. 5,555. (No model.)

To all whom it may concern:

Be it known that I, CYRUS COPLANTZ, a resident of Joliet, in the county of Will and State of Illinois, have invented certain new and useful Improvements in Ladders, of which the following is a specification.

My invention relates to certain new and useful improvements in that class of ladders in which the ladder is composed of several jointed sections which are wound upon a reel, so that it can be transported upon a truck while occupying a small space. When it is desired to use the ladder, the reel is turned and the ladder is automatically fed upward to any desired position, the joints being provided with locking mechanism which is automatically actuated to lock the several joints to form a rigid ladder as it is extended and automatically unlocked to permit their being wound upon the reel when it is taken down.

My invention relates to certain new and useful improvements in the construction of such ladders, as will be fully set out in the specification and in the annexed claims.

Referring to the accompanying sheets of drawings, in which the same numerals of reference are used to designate identical parts in all the views, Figure 1 is a perspective view of the ladder mounted upon a truck and extended adjacent to a building as it would appear in service. Fig. 2 is a side elevation of the casing containing the ladder and reel, with parts of one side thereof broken away to show the interior construction. Fig. 3 is a front elevation of a portion of said casing on an enlarged scale. Fig. 4 is a rear view of a portion of the same mechanism, the portion illustrated being the guide or chute which directs the ladder as it is being extended. Fig. 5 is a central section through the chute and a portion of the ladder on the line 5 5 of Fig. 4. Fig. 6 is a detail view, on an enlarged scale, showing the construction of the joints and their locking mechanism. Fig. 7 is an elevation of an inner side of the ladder, showing the joint construction. Fig. 8 is a section on the line 8 8 of Fig. 6. Fig. 9 is a side elevation of the gear mechanism by which the reel is rotated. Fig. 10 is an enlarged detail elevation of the same mechanism; and Fig. 11 is a side elevation of a por-

tion of the chute, showing the gearing for controlling its position and directing the angle at which the ladder shall be elevated.

Referring first to Fig. 1, it will be seen that for convenience of transportation I preferably mount the casing 12 containing my improved ladder upon a truck, which, as will be seen, consists of the wheels and a bed 13, which consists of the elongated central portion, which is set as low as can be safely done for transportation purposes and which has the elevated rear portion 14 resting upon the rear wheels, while it is provided with the curved front portion 15, beneath which the front wheels can turn, as may be necessary in guiding the truck. The casing 12, as shown in Figs. 1 and 2, is of a generally rectangular shape, slightly elongated, and has a concave bearing-plate 16, secured to the under side thereof near the center of gravity of the casing, which coöperates with the convex bearing-plate 17, secured upon the base of the truck 13. A bolt 18 connects these two bearings, so as to permit of the free rotation of the casing upon the truck, while preventing their separation. While the ladder is being transported, the casing 12 is lengthwise of the truck—that is, at right angles to the position shown in Figs. 1 and 2—but when it is desired to use the same the truck is driven up close to the curb and the casing 12 turned into the position shown in Fig. 1, where the beams 19, at either side, which are mounted in the brackets 20, secured to the under side of the base, can be pulled out to the extended position shown in Figs. 1 and 2, after which the elongated base for the ladder thus produced can be leveled and securely supported by adjusting the set-screws 21, arranged in the outer ends of the beams 19, the lower ends of the set-screws taking upon the sidewalk, as indicated at 22 in Fig. 2. A platform 23 is secured to the casing 12 at the side thereof from which the mechanism is operated, so as to furnish a convenient place for those who are operating the ladder to stand upon.

Mounted in suitable bearings in the side of the casing 12, which are preferably supported by the cross-pieces 24, is the shaft 25, which inside of the casing supports the reel 26,

which is in the form of some regular polygon, preferably in the hexagonal form shown, and which is designed to support the different sections of the ladder, as clearly shown in Fig. 2, the first six sections being of a length to rest accurately upon the facets of the reel, while the next six sections are just of sufficient length to rest squarely upon the preceding six sections. While I have shown but two complete sets surrounding the reel, it will be understood that more sections might be employed, if found desirable. Rigidly secured upon the outer end of this shaft 25 and outside of the casing 12 is the rack-disk 27, the inner face of which has secured thereon the spiral rack 28, with which coöperates the gear-pinion 29, which is splined to slide freely upon the shaft 30, which has one end mounted in the bearing-bracket 31, secured to the framework adjacent to the shaft 25, while its other end is supported in the bearing-bracket 32, secured to the upper corner of the framework, as shown in Fig. 2. A collar 33, formed on the sleeve 34, secured to the pinion 29, forms a channel which coöperates with a flange 35, secured to the edge of the rack 28, so that as the disk 27 is rotated by reason of the rotations imparted to the shaft 30 the pinion 29 will be kept in engagement with the proper sections of the rack 28. The shaft 30 has secured at its upper end the beveled gear-pinion 36, meshing with the beveled gear 37, secured upon the shaft 38, the rotation of which by mechanism subsequently to be described feeds out the ladder into its extended position. Referring to Fig. 9, when the parts are in this position the ladder is extended, and as the shaft 30 is rotated to wind up the ladder during the first revolution of the disk 27 the pinion 29 will be in mesh with the inner spire of the rack 28, and as the inner sections of the ladder, the length of which controls the number of revolutions imparted to the pinion 29, and consequently the rate of rotation of the reel 26, are being drawn in, the short lengths of the six sections will be sufficient to give one complete rotation to the disk 27 and the reel 26. As the next six sections are fed in by the means hereinafter described, they being somewhat longer and the pinion 29 being held in mesh with the longer outer spire of the rack 28, sufficient movement is thereby given to the shaft 25 to give the reel just another complete rotation, and thus the movement of the reel is compelled to keep an average pace with the movements of the sections of the ladder, despite the change in their lengths. The last section of the ladder will be pivotally secured to the reel 26, and the adjacent sections in its closed position are wound around the reel, as shown in Fig. 2, the seventh and eighth sections being suspended in the casing, as shown in Fig. 2, and held in the position shown by a cross-piece which preferably takes the form of the roller 39, which is supported by the spring-arms 40 and coöperates with the eighth sec-

tion in the closed position, as clearly shown in Fig. 2. In this closed position the ninth section, which is somewhat longer than the seventh and eighth sections, which in turn may be longer than the preceding sections, is supported by the chute or guide, which I will designate as a whole by the reference character 41. The extreme outer end of the ladder is formed by the two sections 42 and 43, the section 42 being jointed to the ninth section, or the one supported by the chute 41, and normally resting upon the top of the casing 12, while the outermost section 43 is in turn jointed to the section 42 and normally hangs down at the end of the casing 12, as clearly shown in Fig. 2. When the ladder is to be used, the section 43 is brought up in line with the section 42 and the joint made solid by the mechanism employed in connection with the other sections, which will be explained in detail hereinafter, or by any other desired mechanism, it not being essential that these joints shall be locked automatically. The sections 42 and 43 are now swung up to the dotted-line position shown in Fig. 2, when the joint between the sections 42 and the ninth section is locked the same as the joint between sections 42 and 43, after which the ladder is in condition to be extended by the mechanism to be now described.

Journaled upon a stub-shaft in the framework directly below the shaft 38 is a gear-pinion 44, which is provided with a crank arm and handle 45 for turning the same, and which has a pivoted dog 46 coöperating with the teeth thereof to prevent any possible backward movement. This gear-pinion 44 meshes with the gear-wheel 47, rigidly secured upon the outer end of the shaft 38 and opposite to the end upon which the pinion 37 is secured. Pivotally mounted upon this shaft 38 and partly supported thereby is the chute 41, which consists of a metallic framework, preferably of a substantially rectangular shape and having the sides 48 connected by the end pieces 49 and having a central web 50, which is largely cut away by apertures, as clearly shown in Fig. 3. Substantially centrally located in the sides 48 are the bosses 51, in which are formed the bearings by which the shaft 38 supports the chute. Journaled in bearings at the upper end and outer side of the chute 41 is the roller 52, and oppositely disposed thereto is the roller 53, which is journaled in the lugs 54, projecting inwardly from the upper ends of the sides 48. At the lower end of the chute 41 is a similar pair of brackets 55, which contain bearing for the antifriction-roller 56. Another and larger antifriction-roller 57 is centrally located upon the chute 41, in line with the rollers 53 and 56, and is supported by bearings formed in the lugs 58. By consideration of Fig. 5 it will be apparent that these rollers 52, 53, 56, and 57 coöperate with the sides of the sections of the ladder to guide said sec-

tions and bring the sections in perfect alignment as they pass through this chute. The sections of the ladder are connected by the hinges 59, secured in the ends of the inner sides, as best shown in Figs. 6 and 7. On the other or outer sides of these sections are secured the rack-bars 60, which occupy a portion of the width of the sides of the ladder, and which cooperate with the teeth of the gear-pinions 61, which are rigidly secured upon the shaft 38, so that as the handle 45 is turned the shaft 38 will be slowly rotated and the sections of the ladder fed up through the chute 41. Journaled in the semicircular recesses 62, formed upon the sides of the chute 41, are the antifriction-rollers 63, which cooperate with the outer edges of the sides of the ladder to prevent any lateral displacement thereof.

It will be apparent that it is necessary to provide some locking mechanism for locking the joints of the sections of the ladder as they are extended and unlocking them as they are wound up, and this locking mechanism should be automatic. For this purpose I provide the mechanism illustrated in detail in Figs. 6 to 8, where it will be seen that I secure or bolt upon the inner side of the lower end of each section a metallic plate 64, which has near its lower end an aperture 65, through which the locking-bolt 66 passes. On the opposite side of the ladder I secure the metallic plate 67, the upper end of which is preferably inserted in the side of the ladder so that its outer edge will be flush with said side, while its inner end is offset, as shown in dotted lines at 68 in Fig. 6, so that its lower end will come inside of the upper end of a metallic plate 69, which is securely bolted on the outer side of the upper end of each of the sections and is preferably set therein, as shown, so that its outer surface will be flush with the outer surface of the ladder. The plates 67 and 69 have apertures therein, as shown in dotted lines at 70 in Fig. 7, directly opposite the aperture 65, and through which the inner end of the bolt 66 is adapted to pass when the sections are to be locked together. The apertures 65 and 70 in the plates 64, 67, and 69 are of the same polygonal shape, preferably rectangular, to correspond with the cross-section of the bolt 66, which is thereby prevented from turning therein. This bolt 66 is formed of a substantially L shape, and the L portion is provided with a bearing portion 71, which is adapted to cooperate with the cam-flanges 72 and 73, formed upon a plate 74, which is securely bolted upon the web 50 of the chute 41 in position so that as the ladder is fed outward the bearing portions 71 of the bolts 66 will cooperate with the flange 73 and be cammed inward, so that the end of the bolt will pass through the apertures in the plates 67 and 69, and thus securely lock the joints of the sections together. When the ladder is wound

up, the bearing portions 71 will cooperate with the flange 72 and the bolt will be drawn out of engagement, so that the sections can swing relative to each other, as is necessary to wind them upon the reel. To prevent accidental displacement of the bolt except when operated upon by the cam, I provide the spring 75, secured upon the plate 64 and adapted to cooperate with the notches 76, properly located upon the bolt 66, so as to hold it yieldingly in either its inner or outer position. While I have shown and described in detail the cam and locking-bolt upon but one side of the ladder, it will be understood that, as shown in Fig. 4, the cams and bolts are furnished upon both sides of the ladder, being modified only so much as may be necessary to adapt them to the different sides.

To adjust the chute 41 to different angles, and thus vary the angle at which the ladder shall stand, I secure upon the lower outer sides 48 of the chute 41 the gear-segments 77, which are provided with teeth adapted to mesh with the worm 78, journaled in the bracket 79, secured to the casing and having on its outer end the bevel gear-pinion 80, adapted to cooperate with the corresponding bevel gear-pinion 81, secured upon the shaft 82, journaled in the bearings 83, secured upon the framework of the casing and provided with the crank arm and handle 84, by which the shaft 82 can be rotated to slowly vary the angle at which the ladder stands. In operation the ladder will be run up in a substantially perpendicular position, inclining slightly outward and supported by guy-ropes 85, secured near the upper end thereof and wound upon the windlass-shaft 86, mounted in bearings on the rear end of the casing and provided with the handle 87 for operating the same. After the ladder has been extended opposite the window which it is desired to reach the handle 84 is turned, so as to incline the ladder toward the window, the handle 87 being at the same time turned sufficiently to loosen the guy-ropes 85 sufficiently to permit this movement. After the work required has been done in that location the ladder is once more raised to substantially perpendicular position, after which the handle 45 is turned backward and the ladder wound up by a reverse operation that will be readily understood. I preferably secure to the upper end of the chute 41 a casing 88, (shown in Figs. 1 and 2,) which serves to cover and protect some of the mechanism connected with the chute when it is not in operation.

While I have described my invention as applied to ladders of the class described, it will be understood that some of the improvements might be applied to other kinds of ladders.

While I have shown my invention as embodied in the form which I at present consider best adapted to carry out its purposes, it will be understood that it is capable of modifications and that I do not desire to be

limited in the interpretation of the following claims, except as may be necessitated by the state of the art.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In a ladder, the combination with the reel, having the connected jointed sections wound thereon and each section being provided with teeth thereon forming a rack-bar; of gear-pinions meshing with said teeth, and means for rotating said pinions to positively raise and lower the sections; and positive gearing connecting said pinions and said reel, said gearing being so arranged that the rate of movement of the reel will be automatically varied as necessary, while the sections are being extended or retracted.

2. In a ladder, the combination with the reel, having the connected jointed sections wound thereon and each section being provided with teeth thereon forming a rack-bar; of gear-pinions meshing with said teeth, and means for rotating said pinions to positively raise and lower the sections; and positive gearing connecting said pinions and said reel, said gearing being so arranged that the rate of movement of the reel will be automatically varied as necessary, while the sections are being extended or retracted, said positive gearing including a gear-pinion rotated at a uniform rate during the passage of the ladder, and the spiral rack moving with the reel with which said pinion meshes.

3. In a ladder, the combination with the reel, and the jointed sections wound thereon, of mechanism cooperating directly with said sections to extend them, and connections between said mechanism and the reel whereby the rate of movement of the reel may be varied while the sections are being operated upon, said connections comprising a gear-pinion provided with a collar forming a circumferential groove and rotated at a uniform rate during the passage of the ladder, and a spiral rack moving with the reel with which said pinion meshes and provided with a flange cooperating with the groove of the pinion, substantially as and for the purpose described.

4. In a ladder, the combination with the reel, and jointed sections wound thereon, of mechanism cooperating directly with said sections to extend them, and connections between said mechanism and the reel for rotating the reel as the ladder is extended, said connections comprising a shaft rotated at a uniform rate as the ladder is extended, a pinion splined upon said shaft to rotate therewith but longitudinally movable thereon, a spiral rack moving with the reel with which said pinion meshes, and means for holding said pinion in mesh with the rack.

5. In a ladder, the combination with the reel, and jointed sections wound thereon, of mechanism cooperating directly with said sections to extend them, and connections between said mechanism and the reel for rotat-

ing the reel as the ladder is extended, said connections comprising a shaft rotated at a uniform rate as the ladder is extended, a pinion splined upon said shaft to rotate therewith but longitudinally movable thereon, a spiral rack moving with the reel with which said pinion meshes, and means for holding said pinion in mesh with the rack, said means comprising a circumferential groove connected to the pinion and cooperating with a flange on the edge of said rack.

6. In a ladder, the combination with the reel, and the jointed sections wound thereon having a rack formed on each section, of a shaft having a pinion thereon meshing with said rack, connections between said shaft and the reel for rotating the reel whereby its movement will be varied in accordance with the length of the sections being operated upon, and means for rotating said shaft.

7. In a ladder, the combination with the reel, and the jointed sections wound thereon having a rack formed upon each section, of a pinion on a shaft meshing with said rack, and connections between said shaft and the reel for rotating said reel whereby its movement will be varied in accordance with the length of the sections being operated upon, said connections comprising a gear-pinion rotated at a uniform rate by the rotation of said shaft, and a spiral rack moving with the reel, and with which said pinion meshes.

8. In a ladder, the combination with the jointed sections, of means for feeding out said sections to extend the ladder, locking mechanism for said sections comprising overlapping portions upon the adjacent sections, bolts adapted to pass transversely through said overlapping portions, and means for automatically shifting said bolts to lock the sections as they are extended and to unlock them as they are retracted, said means comprising cam-flanges cooperating with the ends of said bolts.

9. In a ladder, the combination with the jointed sections, of means for feeding out said sections to extend the ladder, locking mechanism for said sections comprising overlapping portions on each section, bolts adapted to pass transversely through said overlapping portions, means for automatically shifting said bolts to lock the sections as they are extended and to unlock them as they are retracted, and means for yieldingly holding said bolts in either position.

10. In a ladder, the combination with the jointed sections, of means for feeding out said sections to extend the ladder, locking mechanism for said sections comprising overlapping portions on each section, bolts adapted to pass transversely through said overlapping portions, means for automatically shifting said bolts to lock the sections as they are extended and to unlock them as they are retracted, and means for yieldingly holding said bolts in either position, comprising a pair of

notches in each bolt and a spring cooperating with the notches.

11. In a ladder, the combination with the jointed sections, of means for feeding out said sections to extend the ladder, locking mechanism for said sections comprising overlapping portions on each section, bolts adapted to pass transversely through said overlapping portions, cam-flanges cooperating with the ends of said bolts to automatically shift them to lock the sections as they are extended and to unlock them as they are retracted, and means for yieldingly holding said bolts in either position.

12. In a ladder, the combination with the jointed sections, of means for feeding out said sections to extend the ladder, locking mechanism for said sections comprising overlapping portions on each section, bolts adapted to pass transversely through said overlapping portions, cam-flanges cooperating with the ends of said bolts to automatically shift them to lock the sections as they are extended and to unlock them as they are retracted, and means for yieldingly holding said bolts in either position, said means comprising a pair of notches in each bolt and a spring cooperating therewith.

13. In a ladder, the combination with the jointed sections, of means for feeding out said sections to extend the ladder, a chute through which said sections pass as they are extended, locking mechanism for said sections comprising overlapping portions on each section, L-shaped bolts adapted to pass transversely through said overlapping portions, and cam-flanges upon said chute cooperating with the L portions of said bolts for automatically shifting them to lock the sections as they are extended and to unlock them as they are retracted.

14. In a device of the class described, the combination of the reel, with the sections wound thereon, a guide-chute through which said sections pass as they are extended, and means for taking up the sag of the sections between the reel and the chute consisting of

a spring-pressed cross-piece cooperating with said sections.

15. In a device of the class described, the combination of the reel, with the sections wound thereon, the guide-chute through which said sections pass as they are extended, and means for taking up the sag of the sections between the reel and the chute consisting of the springs 40 carrying the roller 39 journaled thereon and cooperating with said sections.

16. In a device of the class described, the combination of the reel, a casing in which said reel is located, the ladder-sections wound upon said reel, and a chute at one end of said casing through which the sections are fed, the inner sections being of a length to be wound on the reel, and an outer section of a length substantially equal to that of the casing, substantially as and for the purpose described.

17. In a device of the class described, the combination of the reel, a casing in which said reel is located, with the ladder-sections wound on said reel, and a chute at one end through which said sections are fed, the inner sections being of a length suitable to be wound on the reel, the outermost section being of a length substantially equal to the height of said casing, and the next adjacent section being of a length substantially equal to the length of the casing, substantially as and for the purpose described.

18. In a device of the class described, the combination of the reel, a casing in which said reel is located, with the ladder-sections wound on said reel, and a chute at one end through which said sections are fed, the inner sections being of a length adapted to be wound upon the reel, the adjacent sections being somewhat longer, and two outer sections of a length substantially equal to the length and height of the casing.

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