(No Model.) 4 Sheets—Sheet 1.

W. ORNATOWSKI.

PORTABLE EXTENSION LADDER.

No. 567,814. Patented Sept. 15, 1896.

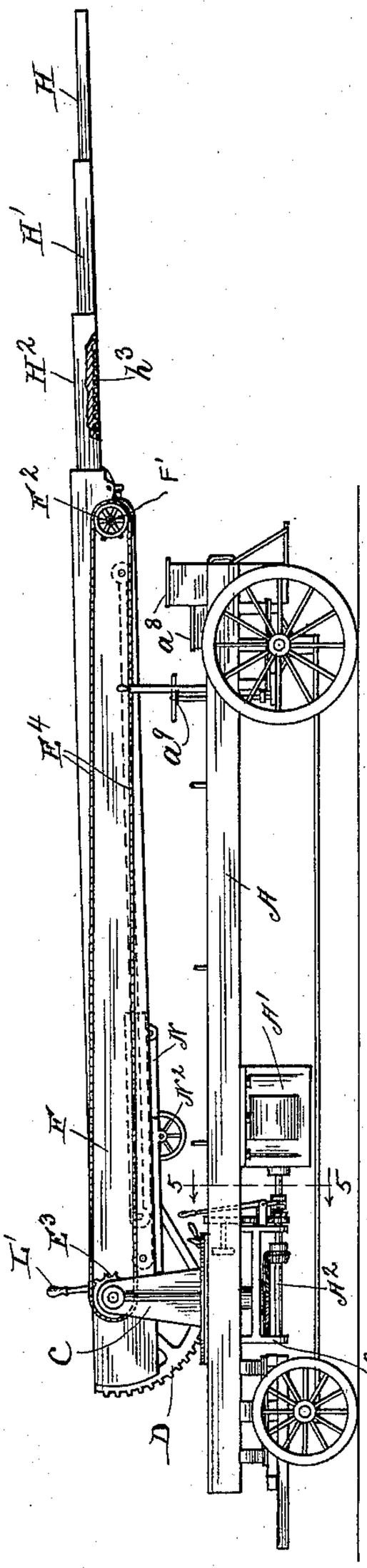

Fig. 1.

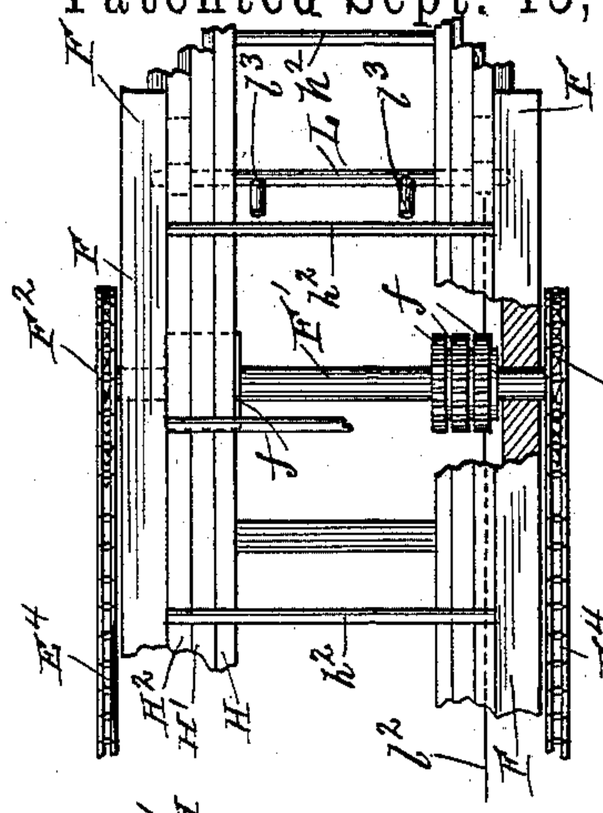

Fig. 3.

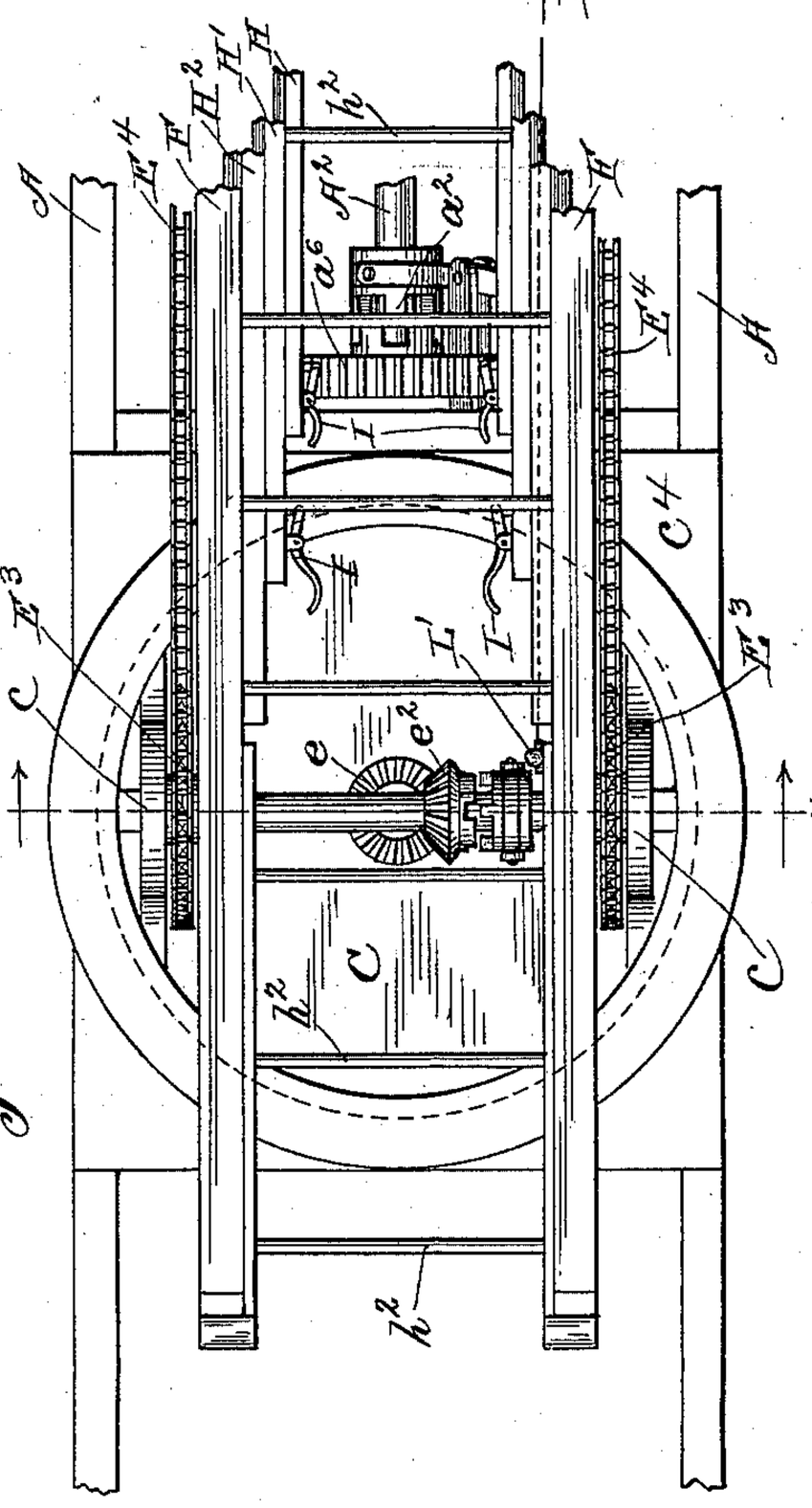

Fig. 2.

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Inventor:
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By Chas. C. Tillman Atty.

(No Model.) 4 Sheets—Sheet 2.

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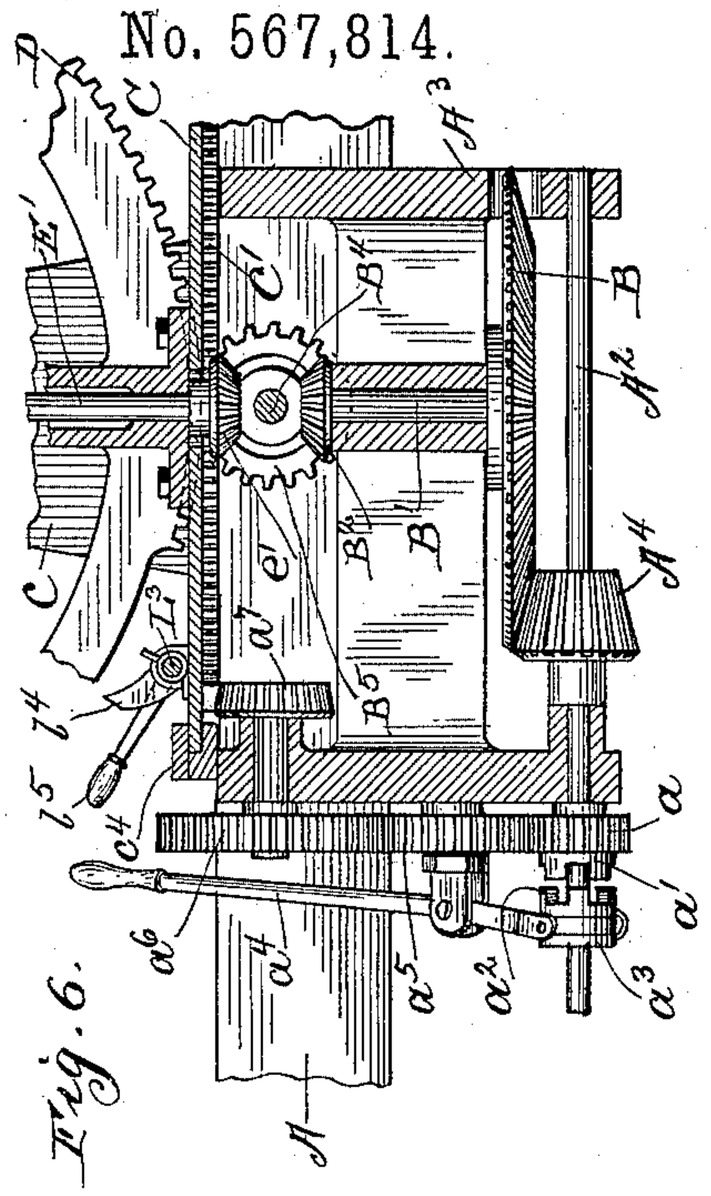

Fig. 6.

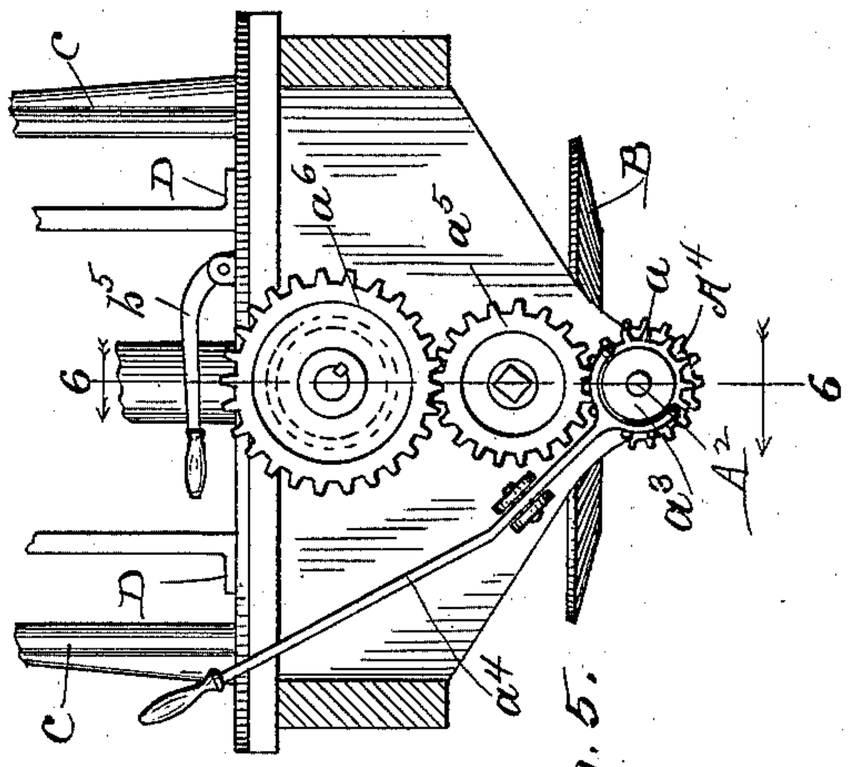

Fig. 5.

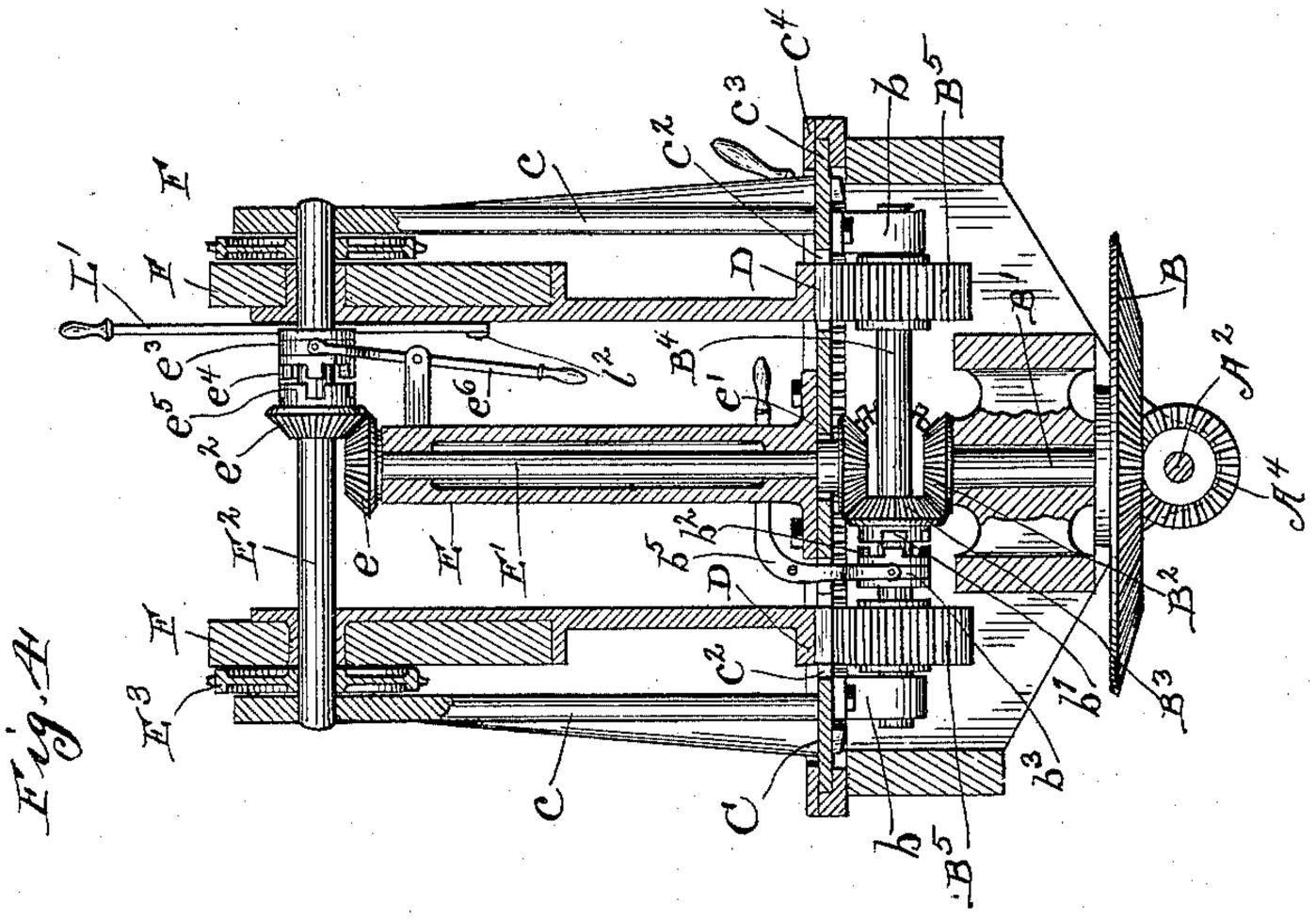

Fig. 4.

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(No Model.) 4 Sheets—Sheet 3.

W. ORNATOWSKI.

PORTABLE EXTENSION LADDER.

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Fig. 12.

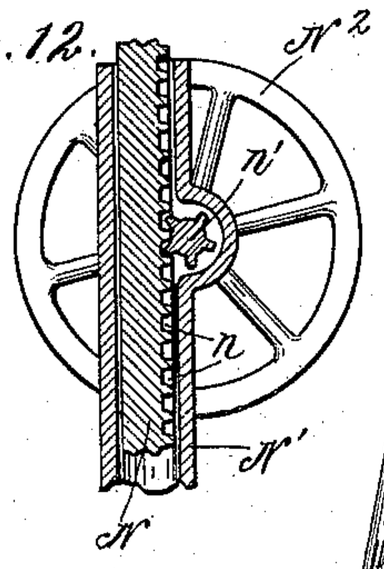


Fig. 8.

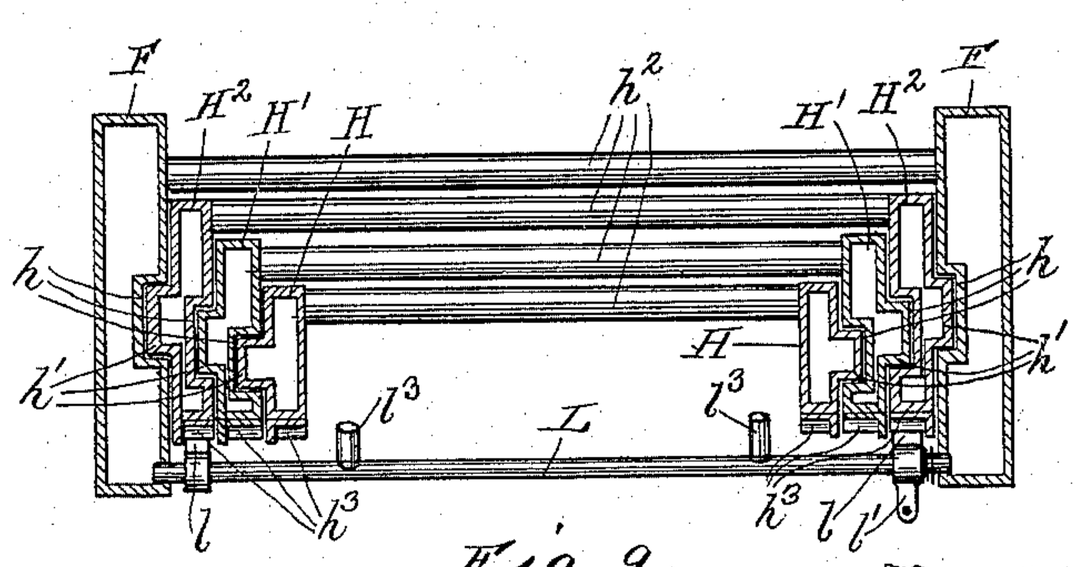


Fig. 9.

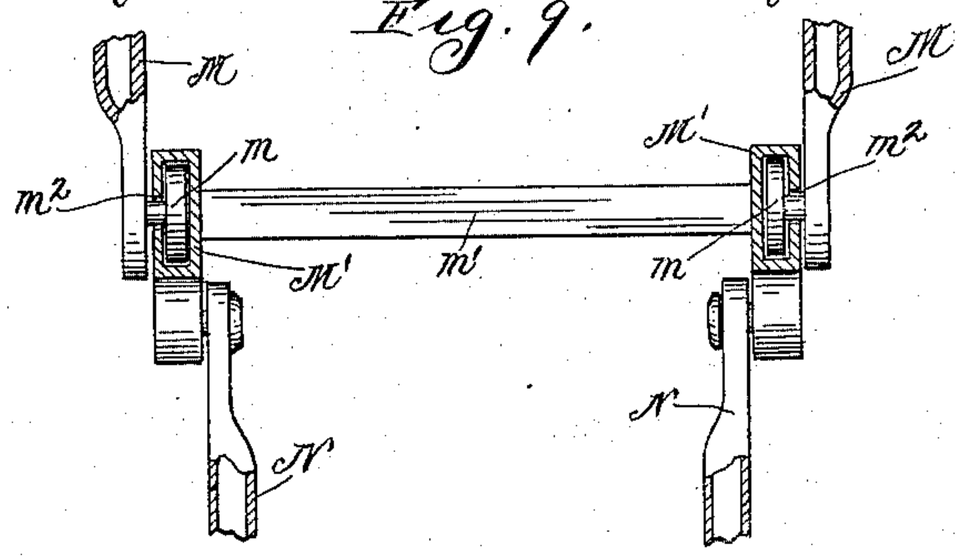


Fig. 7.

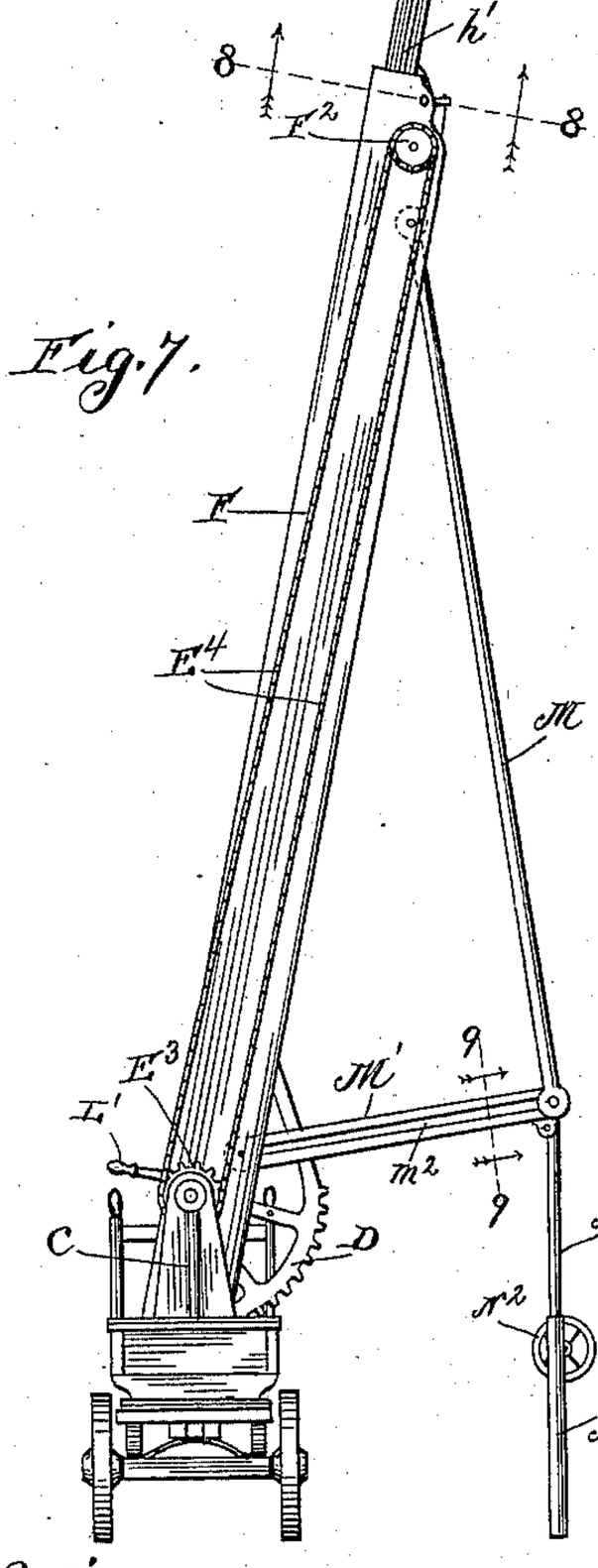


Fig. 10.

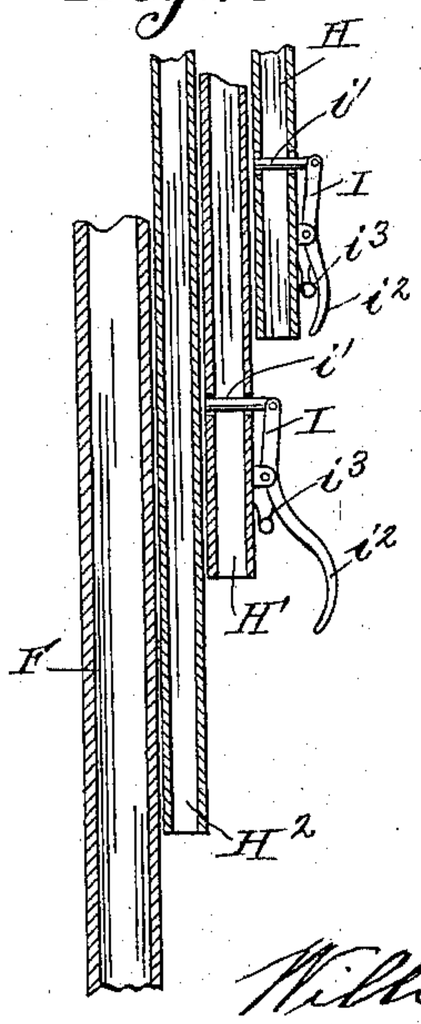
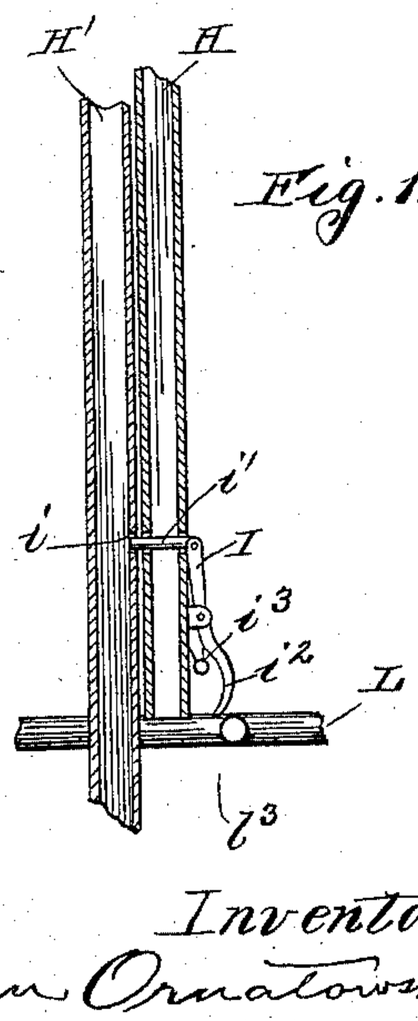


Fig. 11.



Witnesses:
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W. ORNATOWSKI.

PORTABLE EXTENSION LADDER.

No. 567,814. Patented Sept. 15, 1896.

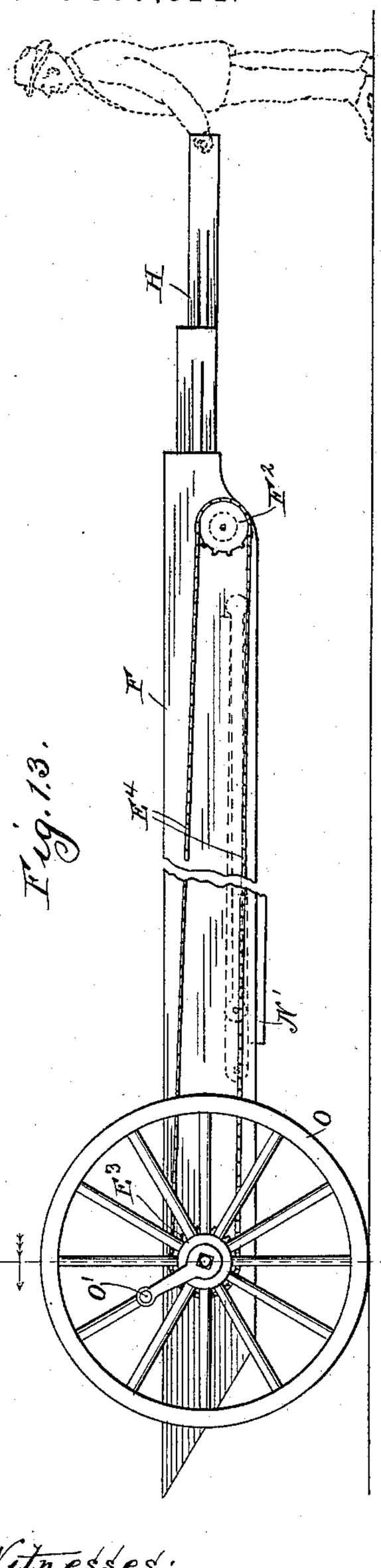

Fig. 13.

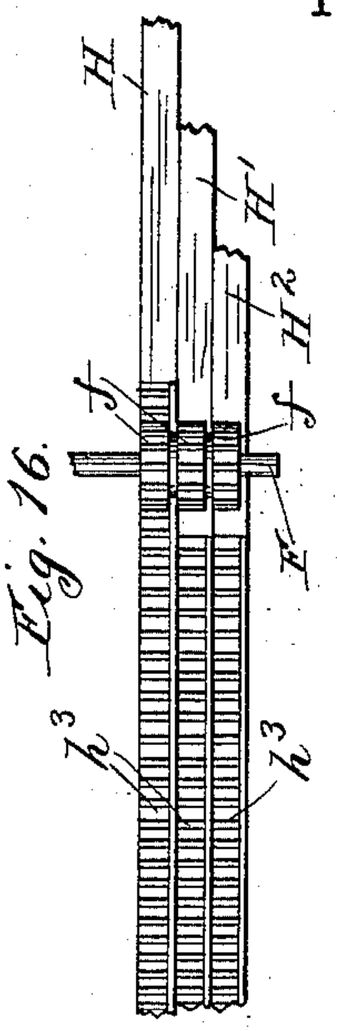

Fig. 16.

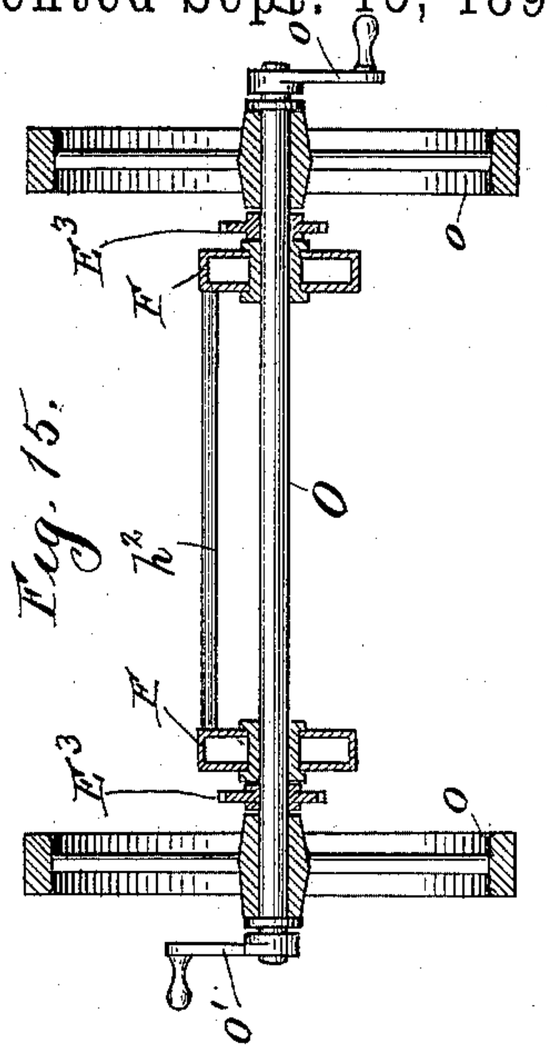

Fig. 15.

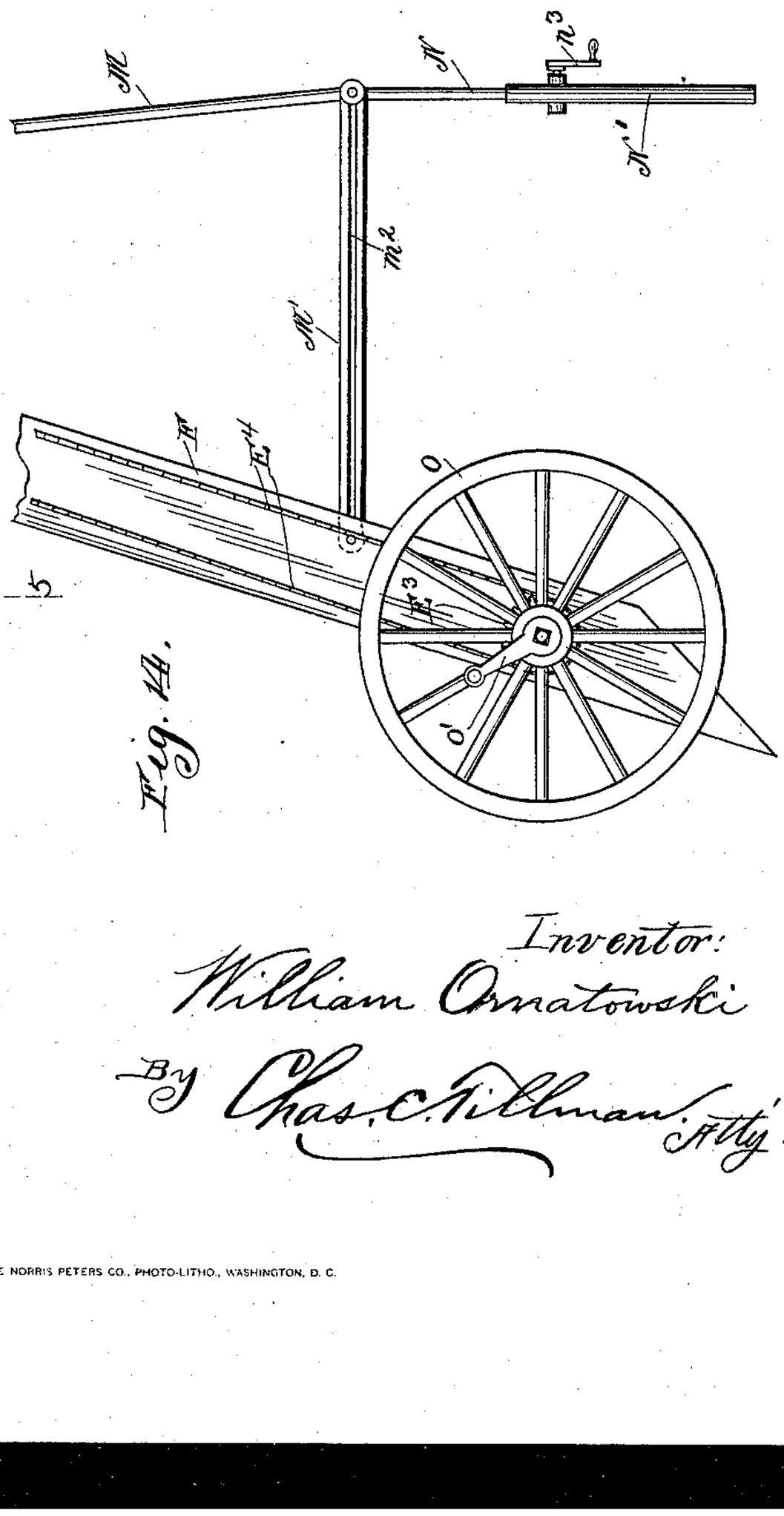

Fig. 14.

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Inventor:
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UNITED STATES PATENT OFFICE.

WILLIAM ORNATOWSKI, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-HALF TO STANISLAUS BERENS, OF DOWNER'S GROVE, ILLINOIS.

PORTABLE EXTENSION-LADDER.

SPECIFICATION forming part of Letters Patent No. 567,814, dated September 15, 1896.

Application filed June 26, 1896. Serial No. 596,992. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM ORNATOWSKI, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Portable Extension-Ladders, of which the following is a specification.

This invention relates to improvements in a portable extension-ladder which is more especially adapted to be used by firemen; and it consists in certain peculiarities of the construction, novel arrangement, and operation of the various parts thereof, as will be hereinafter more fully set forth and specifically claimed.

The objects of my invention are, first, to provide a ladder which can be readily transported from place to place and extended to any suitable length in a quick and easy manner; second, to furnish means for adjustably supporting the ladder in a safe and efficient manner at any desired angle, and, third, to retract the extended sections into a compact and convenient form.

Other objects and advantages of the invention will be disclosed in the following description.

In order to enable others skilled in the art to which my invention pertains to make and use the same, I will now proceed to describe it, referring to the accompanying drawings, in which—

Figure 1 is a view in side elevation of the ladder mounted on a truck or wheel-carriage, showing it with the parts in position ready for transportation and use. Fig. 2 is a plan view of the front part of the frame and ladders, showing a part of the mechanism for operating the same. Fig. 3 is a similar view, partly in section, of the rear portion of the ladders. Fig. 4 is a cross-sectional view taken on line 4 4 of Fig. 2. Fig. 5 is a similar view taken on line 5 5 of Fig. 1. Fig. 6 is a sectional view, partly in elevation, taken on line 6 6 of Fig. 5. Fig. 7 is a view in side elevation, showing the ladder raised and adjustably supported and ready to be extended. Fig. 8 is a cross-sectional view taken on line 8 8 of Fig. 7. Fig. 9 is a fragmental sectional view taken on line 9 9 of Fig. 7, showing a portion of the adjustable support. Fig. 10 is a detail longitudinal sectional view of a portion of the sections of the ladder, showing them disengaged. Fig. 11 is a similar view of a portion of two sections of the ladder, showing them engaged or secured together. Fig. 12 is a vertical sectional view of a portion of the adjustable support. Fig. 13 is a view in elevation of a modification in the construction of the ladder. Fig. 14 is a like view of a portion of said modification, showing it raised and adjustably supported. Fig. 15 is a sectional view taken on line 15 15 of Fig. 13. Fig. 16 is a bottom plan view of portions of sections of the ladder, showing the progressive rack-bars thereon and illustrating one set of the gears to mesh therewith.

Similar letters refer to like parts throughout the different views of the drawings.

A represents the main or supporting frame on which the ladder is mounted, and while it may be of any preferred construction, yet it is shown in the present instance mounted on wheels and provided with a gas, electric, or other motor A′, to be used for extending and otherwise operating the ladder. As shown in Fig. 1 of the drawings, the motor A′ is located at the rear of the front wheels of the carriage, which carriage may be drawn by horses, and operates a driving-shaft A^2, which has its bearings in the support A^3, secured on the main frame. The frame is furnished with compartments a^8 for the reception of tools and other articles, and with a steering-wheel a^9 to guide the carriage. On the driving-shaft A^2, and between its bearings, is mounted a beveled gear A^4, which meshes with a similar gear B on the vertical shaft B′, which is also journaled in the bracket A^3 and has at its upper end a beveled gear B^2, which meshes with the gear B^3 on the horizontal and transverse shaft B^4, journaled in suitable bearings *b* on the rotary disk or turn-table C, on which is secured standards *c* for the support of the sections of the ladder, as will be presently explained.

To the rear of the bracket A^3 and on the driving-shaft A^2 is mounted a cogged gear *a*, which is provided on its rear surface with re-

cesses a', adapted to receive the projections a^2 on the clutch a^3, which is also mounted on the driving-shaft and is operated by means of a lever a^4, fulcrumed on a suitable support above the driving-shaft. The cogged gear a meshes with an idler or idle gear a^5, journaled on the hanger or bracket A^3, which idler meshes with a cogged gear a^6, journaled in the said hanger, on the other end of whose axle or journal is mounted a gear a^7, which meshes with the annular rack-bar c' upon the lower surface of the disk C or turn-table. On the shaft B^4 and near each of its ends are mounted cogged gears B^5, which mesh with the segmental rack-bars D through openings c^2 in the rotary disk. The gear B^3 on the shaft B^4 is provided on its surface adjacent to the gear B^5 with recesses b' to engage projections b^2 on the clutch b^3, which is mounted on the shaft B^4 and is operated by means of a lever b^5, suitably fulcrumed above the said shaft, the said clutch, as well as the clutch a^3 on the driving-shaft, being employed for putting the mechanism in or out of gear, when desired.

Secured to the center of the rotary disk C is a standard E, through which passes a shaft E′, having the beveled gears e and e' on its upper and lower ends, respectively, the latter to mesh with the gear B^3 on the shaft B^4 and the former or gear e to mesh with the gear e^2 on the horizontal shaft E^2, which is journaled in the upper portion of the supports c on the rotary disk.

Near each of the ends of the shaft E^2, and mounted thereon, are sprocket-wheels E^3, which engage the sprocket-chains E^4. Between the gear e^2 and one of said sprocket-wheels is located a clutch e^3, whose projections e^4 engage the recesses e^5 on the gear e^2, the said clutch being operated by means of a lever e^6, fulcrumed on the standard E. The rotary disk C is held in a horizontal position by means of a circular groove c^3 at its periphery in the plate c^4 on the top of the main or supporting frame. The segmental rack-bars D are fixed on the shaft E^2, as are also the parallel side pieces F, which extend to about the rear portion of the carriage. In the rear ends of the side pieces F is transversely journaled a shaft F′, on the outer ends of which are located sprocket-wheels F^2 for engagement with the sprocket-chains E^4.

Near each and between the side pieces F and on the shaft F′ are mounted a number of cogged gears f, that is to say, two of said gears for each section of the ladder. The side pieces F, as well as the sections H, H′, and H^2 of the ladder, are preferably formed of metal and tubular or hollow, and have in their adjacent surfaces recesses h to receive corresponding projections h' of the adjacent section of the ladder, thus affording a telescopic connection for said sections. The side rails F, as well as the sections of the ladder, are provided with transverse rungs h^2 or rounds. The lower surface of each rail of each section of the ladder is provided with a longitudinal rack-bar h^3 to mesh with its corresponding cogged gear f on the shaft F′, which, as before stated, is journaled in the rear end of the parallel side pieces. As shown in Fig. 16 of the drawings, the rails of the section H are provided with a longer rack-bar than the rails of the sections H′ and H^2, so that the rack-bar on the rails of the section H will engage the inner gears on the shaft F′ and extend said section almost its entire length, in which operation it will slide within the grooves or recesses h of its adjacent section until the spring-catches located thereon engage openings i in the sides of the rails of the section H′, when said section will be drawn upward until its rack-bars engage the gears therefor on the shaft F′, when it, the section H′, and the section H will be further advanced until the spring-catches on the section H′ engage openings i in the section H^2, when the last-named section will be extended or drawn upward until its rack-bars mesh with the gears therefor. Each of the spring-catches is composed of a lever I, fulcrumed on the inner surface of the rails of the sections of the ladder, and has at one of its ends a pin i', extending through the rail to engage the opening i in the adjacent rail. The lower end of the lever is provided with a curved portion i^2, between which portion and the side of the rail is located a spring i^3, which normally holds the curved portion at a distance from the side of the rail and has a tendency to press the pin on the other end of the lever against the adjacent rail, in order that it may be forced into the opening thereof when in alinement with said opening.

Secured transversely near the rear ends of the side pieces F is a rod L, which is provided near each of its ends with a pawl l to engage the rack-bars h^3 on the rails of one of the sections of the ladder to hold them in an extended position. This rod is also provided at one of its ends with a projection l', to which is secured a wire l^2, the other end of which wire is secured to a lever L′, fulcrumed on one of the side rails and used for releasing the pawls l from the rack-bars when it is desired to allow the latter to be retracted. When so released, the motion of the driving-shaft may be reversed, which will cause the sections to be drawn downward or retracted, in which operation the curved portions i^2 of the spring-catches will contact with the pins or lugs l^3 on the rod L, which are turned to the proper position and force the curved portions toward the rails, thus liberating the pins i' from the sockets or openings in the adjacent rails, and allow the next section of the ladder to be retracted until its spring-catches strike the lugs l^3, when the same operation, as above described, will take place.

Horizontally on the upper surface of the rotating disk C is located a rod L^3, which is provided near its ends with pawls l^4 to engage

the segmental rack-bars D. The rod L^3 is provided with a handle l^5 to operate the same, as is clearly shown in Fig. 6 of the drawings. Pivotally secured to each of the side rails F, near its rear end, is a rod M, both of which are provided at their lower portions with rollers m, which operate in the grooves m^2 of the tubular pieces M′, which are united at their outer ends by means of a cross-piece m', and are pivotally secured at their other ends to the front portion of the side pieces. Pivotally secured to the pieces M′ near their outer ends are rods N, having on their surfaces teeth or rack-bars n to engage gears n', journaled in the tubular pieces N′, which fit over the lower portion of the rods N, as shown in Fig. 12. The gears n' are operated by means of a wheel N^2, fixed on their shaft or journal, which extends from one of the rods N′ to the other and has its bearings therein.

In Figs. 13 to 15, inclusive, is illustrated a modification in the construction of the ladder, which modification is designed to be used and operated by hand instead of by motive power. In the construction now under consideration the side pieces F are mounted on the axle O, which has its bearings in wheels o, forming a truck for carrying the ladder. On each end of the shaft O is a crank-handle o' for turning said shaft, and near each wheel is located a sprocket-wheel E^3, over which wheels pass sprocket-chains E^4, which engage other sprocket-wheels F^2 at the rear end of the side pieces, and extend and retract through the medium of the chains the sections of the ladder in the same manner as described in the other construction. In this construction it will be observed that the supporting-rods M, M′, N, and N′ are also employed, but instead of using the wheel shown in Fig. 12 to raise and lower the rods N in the tubes N′ a crank-handle n^3, having a pinion or gear journaled in the rod N′, is employed.

From the foregoing and by reference to the drawings it will be seen and readily understood that by applying power to the driving-shaft A^2 by means of the motor A′ and placing the mechanism in gear by means of the clutch a^3 the disk carrying the ladder may be rotated to any desired position through the medium of the gears a, a^5, a^6, and a^7, the latter of which mesh with the annular rack-bar c' on the disk. By disconnecting the clutch a^3 from the gear a and placing the clutch b^3 on the shaft B^4 in engagement with the gear B^3 the gears B^5, engaging the segmental rack-bars D, will lift the rear end of the ladder, and the sprocket-wheels on the shaft E^2, through their chains and gearing, will cause the sections of the ladder to be extended. When the ladder shall have been raised to a suitable angle, the rods or bars M may be drawn out at their lower portions in the grooves m^2 of the pieces M′ and the pivoted rods N and tubes N′ placed on the ground and adjusted so as to properly support the ladder. When it is desired to retract the sections of the ladder, it is only necessary to reverse the movement of the driving-shaft, when the sprocket wheels and chains, through the medium of the gears f on the shaft F′ and the rack-bars on the sections of the ladder, will draw them downward, the lugs l^3 on rod L, acting on the spring-catches, causing the sections to be automatically liberated. As soon as the sections have been retracted to the desired position the adjustable support formed by the pieces M, M′, N, and N′ may be folded to the side pieces, as shown in Fig. 1 of the drawings.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination with a supporting-frame, of two parallel side pieces pivotally secured thereon, a shaft at the front and a shaft at the rear ends of said pieces, wheels on each shaft, a belt connecting said wheels, a series of cogged gears on the shaft at the rear ends of the side pieces, means to turn the other shaft, a series of ladders telescopically connected together located between the side pieces, a rack-bar secured on each of the sections of the ladder adapted to engage the gears on the rear shaft, substantially as described.

2. The combination with a supporting-frame, of two parallel side pieces pivotally secured thereon, a shaft at the front and a shaft at the rear ends of said pieces, sprocket-wheels on each shaft, a sprocket-chain belt connecting said wheels, a series of cogged gears on the shaft at the rear ends of the side pieces, means to turn the other shaft, a series of ladders telescopically connected together located between the side pieces, and having openings in their rails, spring-catches on each of the ladders adapted to engage the opening in the adjacent rail, a rack-bar on each ladder to engage the gears on the rear shaft, and a cross-bar having lugs on its upper surface to impinge the spring-catches, substantially as described.

3. The combination with a series of ladders telescopically connected together, provided with openings in their rails, of means to raise and extend them, a spring-actuated lever fulcrumed on one of the rails of each ladder and having one of its ends curved outward, a pin on the other end of said lever adapted to engage the rail of the adjacent ladder, and a bar secured crosswise of the ladders, and having lugs or projections to contact with the levers, substantially as described.

4. The combination with a supporting-frame, of a rotary disk mounted thereon, two parallel side pieces pivotally secured on the disk, a shaft at the front and a shaft at the rear ends of said pieces, wheels on each shaft, a series of cogged gears on the shaft at the rear ends of the side pieces, a series of ladders telescopically connected together located be-

tween the side pieces, a rack-bar secured on each of the ladders, and adapted to engage the gears on the rear shaft, the rods M, pivotally secured to the rear portion of the side pieces, the grooved bars M′, pivotally secured to the front portion of the side pieces, and movably connected to the rods M, the rods N, pivoted to the outer portion of the bars M′, the tubes N′, vertically adjustably secured on the rods N, and means to rotate the disk to raise and lower the side pieces and extend the ladders, substantially as described.

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