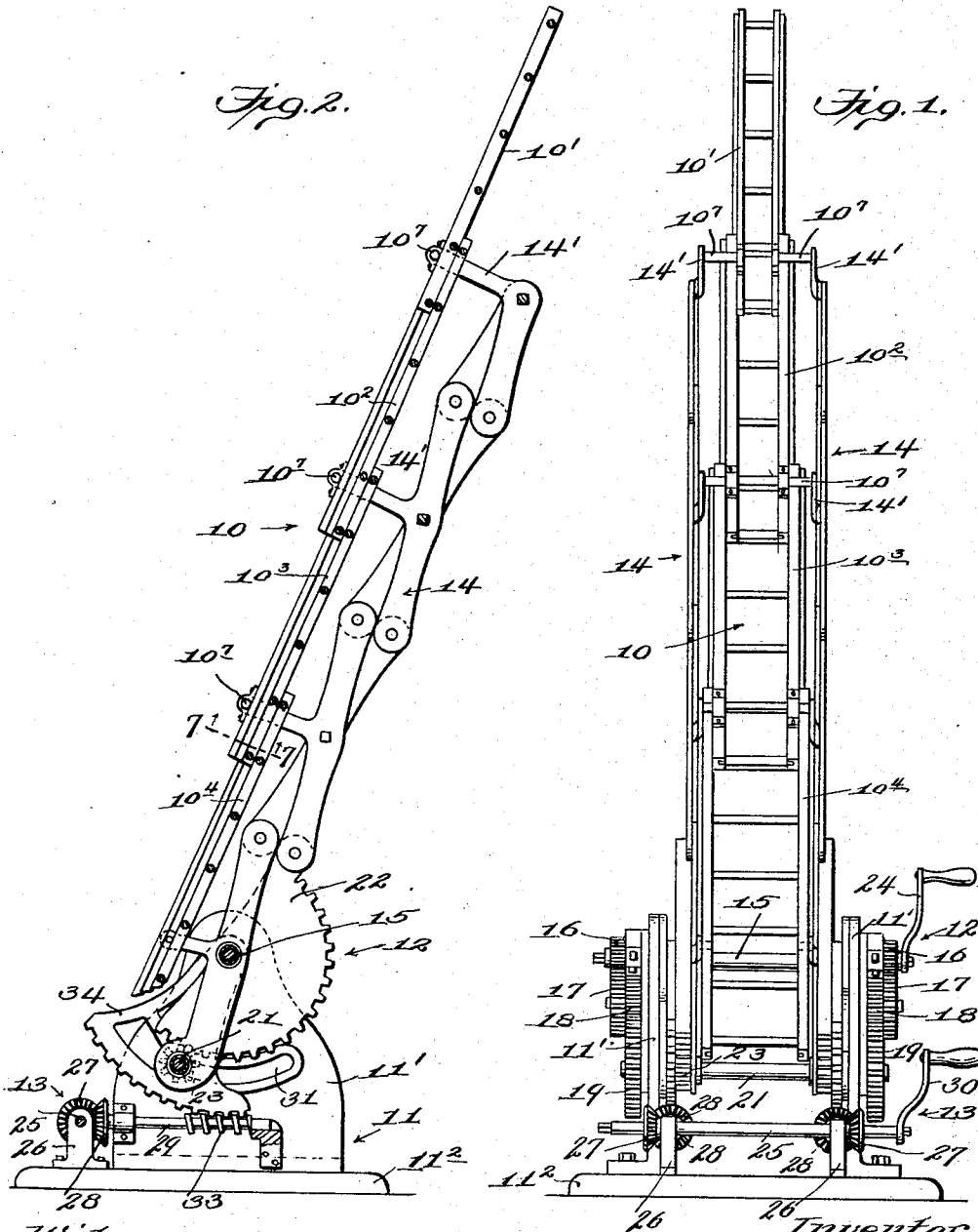


F. H. KALENITS.
EXTENSIBLE LADDER.
APPLICATION FILED OCT. 7, 1914.

1,186,404.

Patented June 6, 1916.
2 SHEETS—SHEET 1.



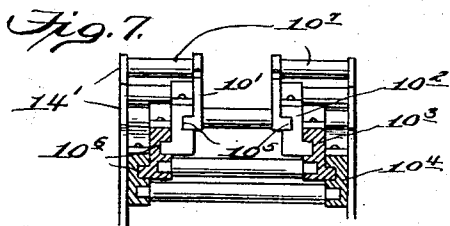
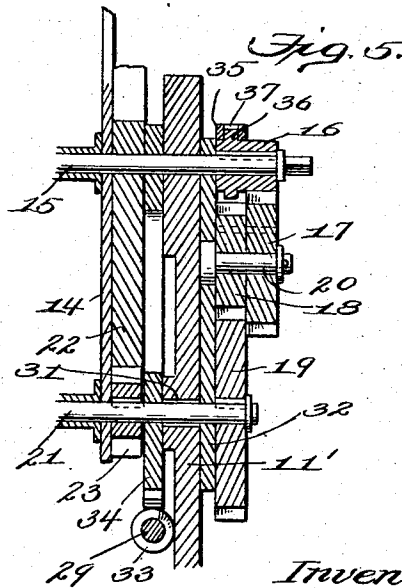
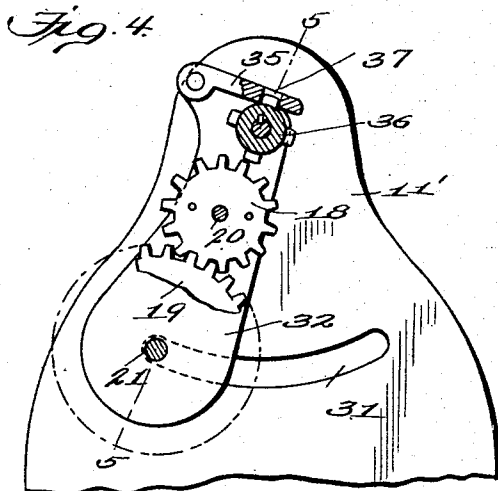
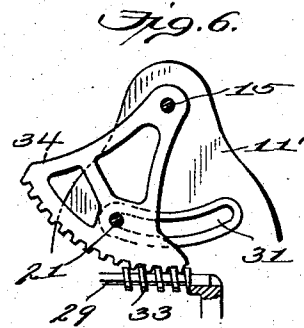
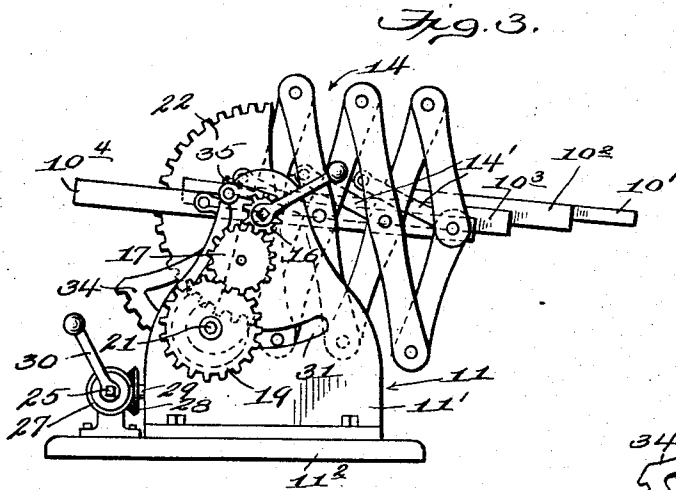
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2 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

FRANK H. KALENITS, OF YOUNGSTOWN, OHIO, ASSIGNOR OF FORTY-NINE ONE-HUNDREDTHS TO DUDLEY R. KENNEDY, OF YOUNGSTOWN, OHIO.

EXTENSIBLE LADDER.

1,186,404.

Specification of Letters Patent.

Patented June 6, 1916.

Application filed October 7, 1914. Serial No. 865,544.

To all whom it may concern:

Be it known that I, FRANK H. KALENITS, a citizen of the United States, residing at Youngstown, in the county of Mahoning and State of Ohio, have invented new and useful Improvements in Extensible Ladders, of which the following is a specification.

The present invention has reference to extensible ladders, and it proposes certain hereinafter-described improvements in or relating to the means or mechanism employed for raising and lowering the sections of which the ladder is composed, and, more especially, the means or mechanism utilized to swing the ladder bodily in either direction, so as to vary its inclination.

An embodiment of the invention is illustrated in the accompanying drawing, whereof:—

Figures 1 and 2 are, respectively, a front elevation and a vertical section of the improved ladder in extended condition; Fig. 3 is a side elevation of the ladder in retracted condition; Fig. 4 is an enlarged detail view with parts in section and broken away, of the extending mechanism; Fig. 5 is a vertical section on line 5—5, Fig. 4; Fig. 6 is a detail view of the mechanism for swinging the ladder; and Fig. 7 is a transverse section on line 7—7 Fig. 2.

Referring to said drawing, 10 indicates, generally, the ladder proper, 11 the frame wherein the same is mounted, and 12 and 13 the two mechanisms for respectively extending and retracting the ladder sections and swinging or inclining the ladder. The ladder may consist of any desired number of sections, four being here shown, and these sections are connected together for endwise sliding movement relative to one another, as is customary. While such connection may be effected in any suitable manner, it is considered preferable to utilize the construction represented, in which instance the four sections 10¹, 10², 10³ and 10⁴ are of gradually increasing width, to permit them to be nested or interfitted, and are provided with cooperating guides.

Referring to Fig. 7, it will be observed that the mutually-adjacent sides of the ladder sections are provided, for the purpose just specified, with longitudinal projections and grooves 10⁵ and 10⁶, the top section 10¹ being equipped only with the projections,

and the bottom section 10⁴ only with the grooves, while the intermediate sections 10² and 10³ are furnished with both projections and grooves, as will be understood. The several sections are directly connected to lazy-tongs 14, for actuation thereby, which, in turn, are operatively connected to the elevating mechanism 12, hereinabove referred to, the sides of each section, adjacent the lower ends thereof, being furnished for this purpose with outwardly-projecting trunnions 10⁷, which project across the sides of the next lower section and are connected to upstanding arms 14¹ provided upon the adjacent members of the lazy-tongs.

The lower end of the bottom section 10⁴ projects between a pair of spaced, uprights 11¹, which are bolted or otherwise secured to a suitable bed or base 11², the parts 11¹ and 11² thus constituting the members of the afore-mentioned frame 11. The two pairs of levers which form the lowermost members of the lazy-tongs are also disposed between these uprights, and at the point where they cross each other, they are loosely supported upon a horizontal shaft 15 which forms one element of the elevating mechanism 12 and is itself journaled in said uprights.

The mechanism just mentioned consists, by preference, of a train of gears 16, 17—18, and 19, the uppermost gear 16 being keyed to one end of shaft 15, the compound intermediate gear 17—18 mounted loosely on a stub shaft 20, and the lowermost gear 19 keyed to a horizontal shaft 21 which is likewise disposed cross-wise of the uprights 11¹ and to which the lower ends of one of the two pairs of levers specified are loosely connected, as will be understood from Fig. 5. The other pair of levers are formed with gear segments 22 which mesh with and are driven by a pair of gears 23 keyed to shaft 21, so that when shaft 15 is rotated, (by means of a crank 24 thereon, or in any other desired manner), such rotation will be transmitted to shaft 21, through the gear train, with the result that the gear segments and the lazy-tongs are actuated, the intermediate gear having its outer member 17 in mesh with gear 16 and its inner member 18 in mesh with gear 19. The gear train may be duplicated upon the other side of the supporting frame 11, and has, in fact, been so shown in Fig. 1, but it is to be observed that

such arrangement is not compulsory, since a single train only may be employed if conditions warrant.

The mechanism 13 for adjusting the inclination of the ladder preferably consists, as shown, of a horizontal shaft 25 which is journaled in brackets 26 secured to bed 11² and is provided with a pair of bevel gears 27 that mesh with similar gears 28 fixed upon the ends of a pair of horizontal shafts 29 arranged against and suitably connected to the inner faces of the standards 11', the drive shaft 25 being provided with an operating crank 30, or the like. As the shaft 15 of the elevating mechanism is designed to act as the fulcrum about which the ladder swings during its adjustment, provision for an arcuate movement of the lower shaft 21 must, therefore, be made, the adjustment in question being effected by forcing the latter to travel laterally in an arcuate path. Accordingly, the standards 11' are formed with arcuate slots 31, (Fig. 4), through which project the ends of shaft 21, the terminals of the said shaft being supported in bearing openings formed in the lower portions of a pair of rocking plates 32 that are arranged against the outer faces of the standards and are loosely suspended from the upper shaft 15, these rockers carrying the stub shafts 20.

The shafts 29 are each provided, in addition to the gear 28, with a worm 33 that meshes with a second gear segment 34, loosely suspended from shaft 15, as depicted in Fig. 6. The lower portions of these segments are likewise formed with openings for the passage of the ends of shaft 21 there-through, in consequence whereof said segments, during their swinging movement in one direction or the other, will carry said shaft with them, thereby rocking the lazy-tongs in the same direction and varying the inclination of the ladder correspondingly. This adjustment of the ladder may take place either prior or subsequent to its extension, as will be apparent. Means is finally provided for locking the ladder in position after having been adjusted, such means being here shown as embodying a pair of pawls 35 which coact with toothed enlargements or extensions 36 of the gears 16. These pawls are pivoted to the upper corners of the two rockers 32 and are formed, each, with an opening 37, (Fig. 4), for reception of the teeth 36, the operation being apparent from the figure indicated.

The operation of the entire structure is believed to be obvious from the foregoing and, therefore, to require only a brief description. Accordingly, it is sufficient to state that rotation of the main shaft 15 of the elevating or extending mechanism is transmitted, through the gear trains or train to the shaft 21, and thence, through the gears 23 and segments 22 to the lazy-tongs,

with the result that the latter are actuated and, in turn, effect the movement of the ladder sections, the locking pawls 35 being actuated after the adjustment has been completed. In like manner, rotation of the shaft 25 of the inclination-adjusting mechanism, which may take place either before or after the elevating operation just described is transmitted, through the gearing, to the segments 34, the latter being rocked thereby and carrying with them the shaft 21, which operation serves to produce the required variation in the inclination of the ladder. The employment of the worms 33 in connection with this mechanism renders the use of additional locking devices unnecessary, since the worms themselves will act to preclude accidental displacement. Also, the bearings wherein the worm-shafts 29 are mounted are of such a nature as to provide for the slight endwise play of said shafts necessary during adjustment.

I claim:—

1. In an extensible ladder, the combination, with a plurality of relatively-movable ladder sections; of a lazy tong mechanism for extending and retracting said sections including a pair of superposed shafts, on the upper of which the lowermost pair of levers of the lazy-tongs are fulcrumed at their point of intersection, the lower end of one lever being connected to the lower shaft, a gear segment provided on the other lever, a gear fixed to said lower shaft in mesh with said gear segment, means for bodily shifting said shaft, lazy tongs and gear segment to adjust the inclination of said ladder, a gear train connecting said shafts, and means for positively driving said upper shaft, whereby the sections of said ladder are extended and retracted.

2. In an extensible ladder, the combination, with a plurality of relatively-movable ladder sections; of mechanism for extending and retracting said sections embodying a lazy tong construction a pair of superposed shafts, on the upper of which the lowermost pair of levers of the lazy-tongs are fulcrumed at their point of intersection, the lower end of one lever being connected to the lower shaft, a gear segment provided on the other lever, a gear fixed to said lower shaft in mesh with said gear segment, means for bodily shifting said shaft, lazy tongs and gear segment to adjust the inclination of said ladder, a link connecting said shafts, a gear train mounted on said links and connecting said shafts, and means for positively driving said upper shaft for effecting the extension and retraction of said ladder sections.

3. The combination with a ladder comprising collapsible sections and a support therefor provided with an arcuate slot, of mechanism for adjusting the inclination of

the ladder comprising a pair of superposed shafts rotatably mounted in said support and connected with said ladder, the upper shaft constituting a fulcrum about which
5 the ladder rocks and the lower shaft being adapted to travel in said slot, a depending rocking gear segment pivoted to said support and having the lower shaft rigidly connected thereto for bodily lateral move-
10 ment therewith, a shaft provided with a worm in mesh with said gear segment, means for rotating the last-mentioned shaft where-
by said adjustment is effected, and means for rotating said lower shaft from the upper shaft and shiftable with the lower shaft for
15 extending and retracting said ladder.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

FRANK H. KALENITS.

Witnesses:

DUDLEY R. KENNEDY,
W. G. KUHLMAN.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."