

May 29, 1945.

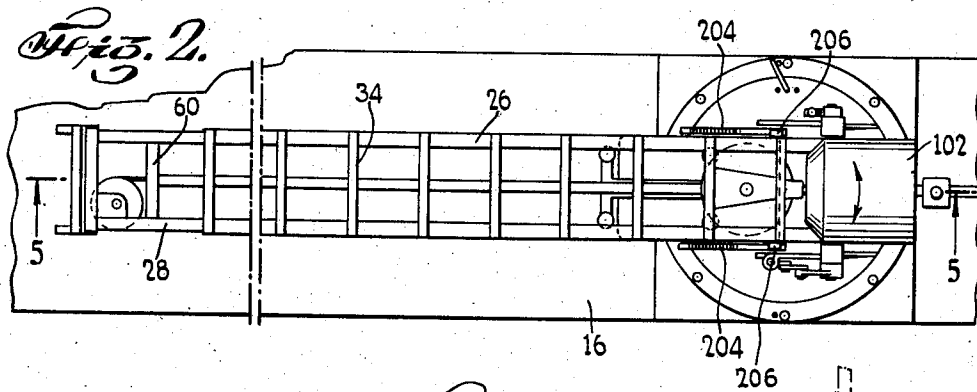
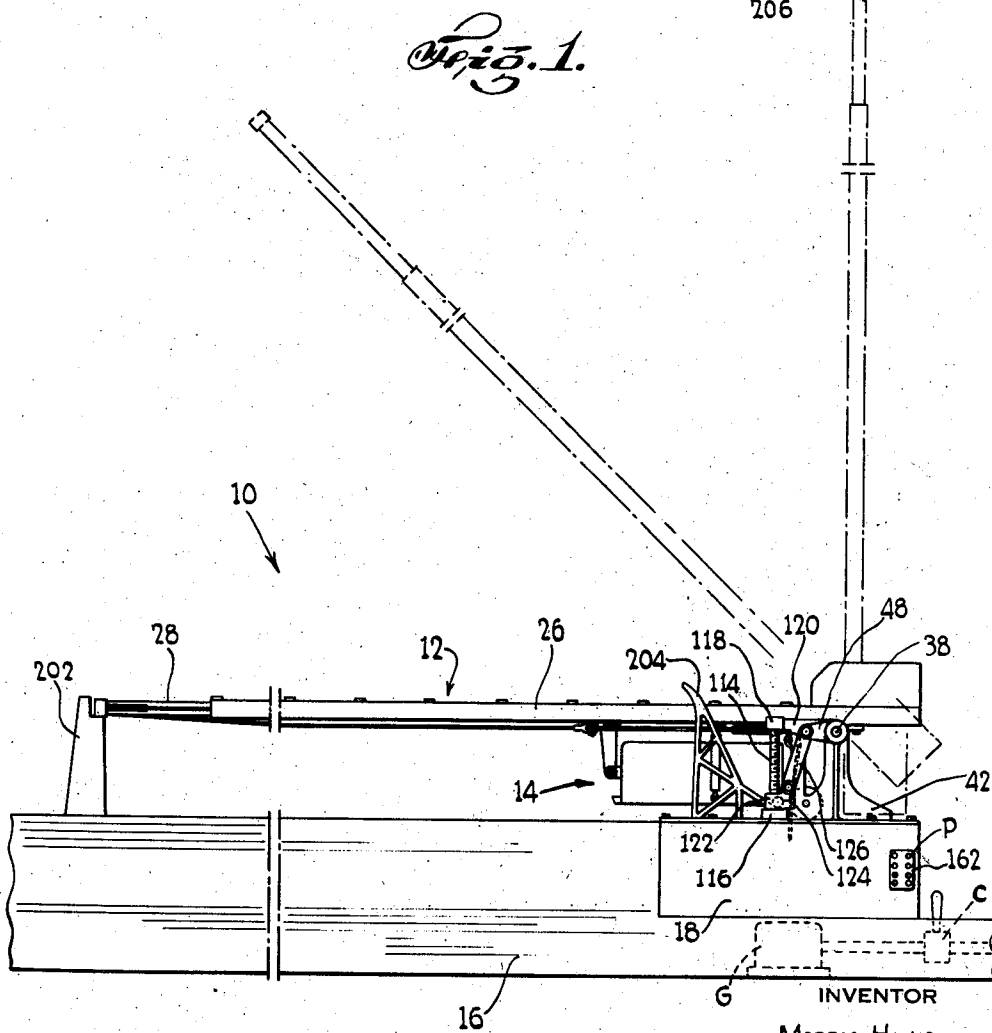
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2,376,875

EXTENSIBLE FIRE LADDER AND ELEVATOR

Filed April 8, 1943

5 Sheets-Sheet 1



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EXTENSIBLE FIRE LADDER AND ELEVATOR

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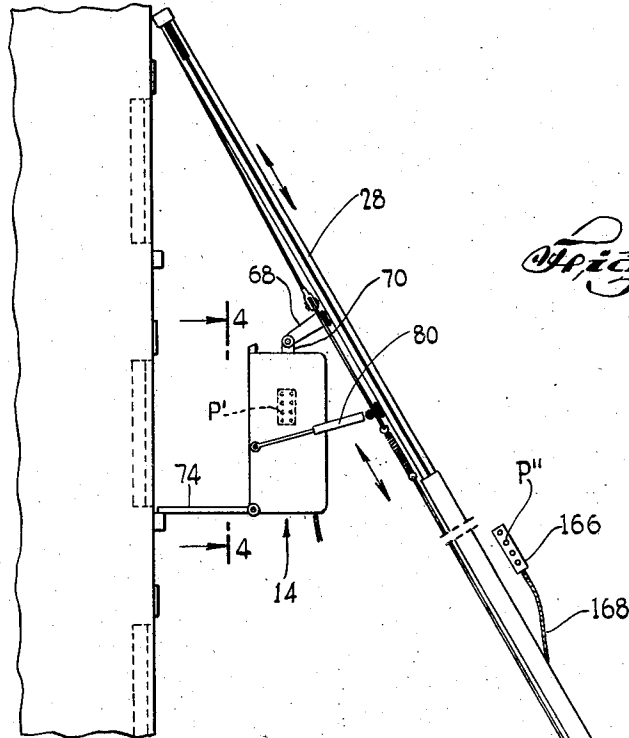


Fig. 3.

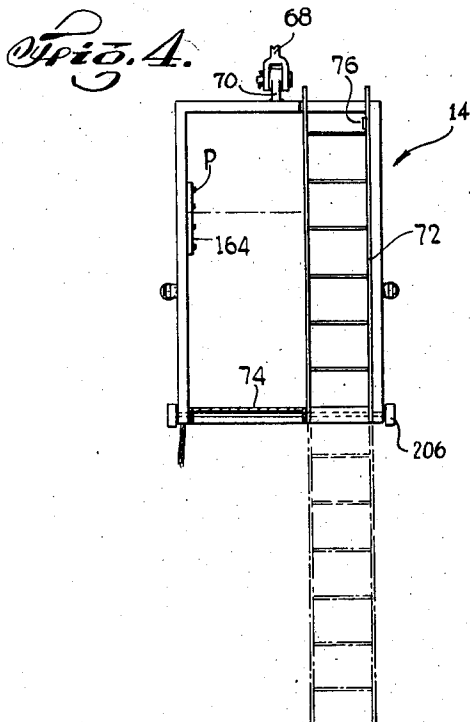
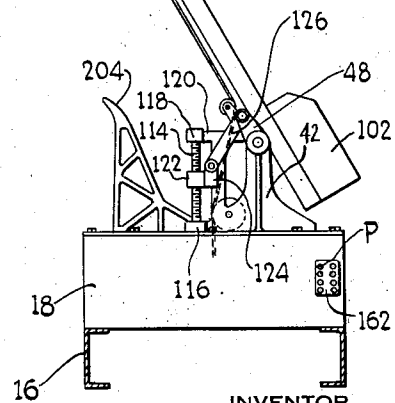


Fig. 4.



INVENTOR

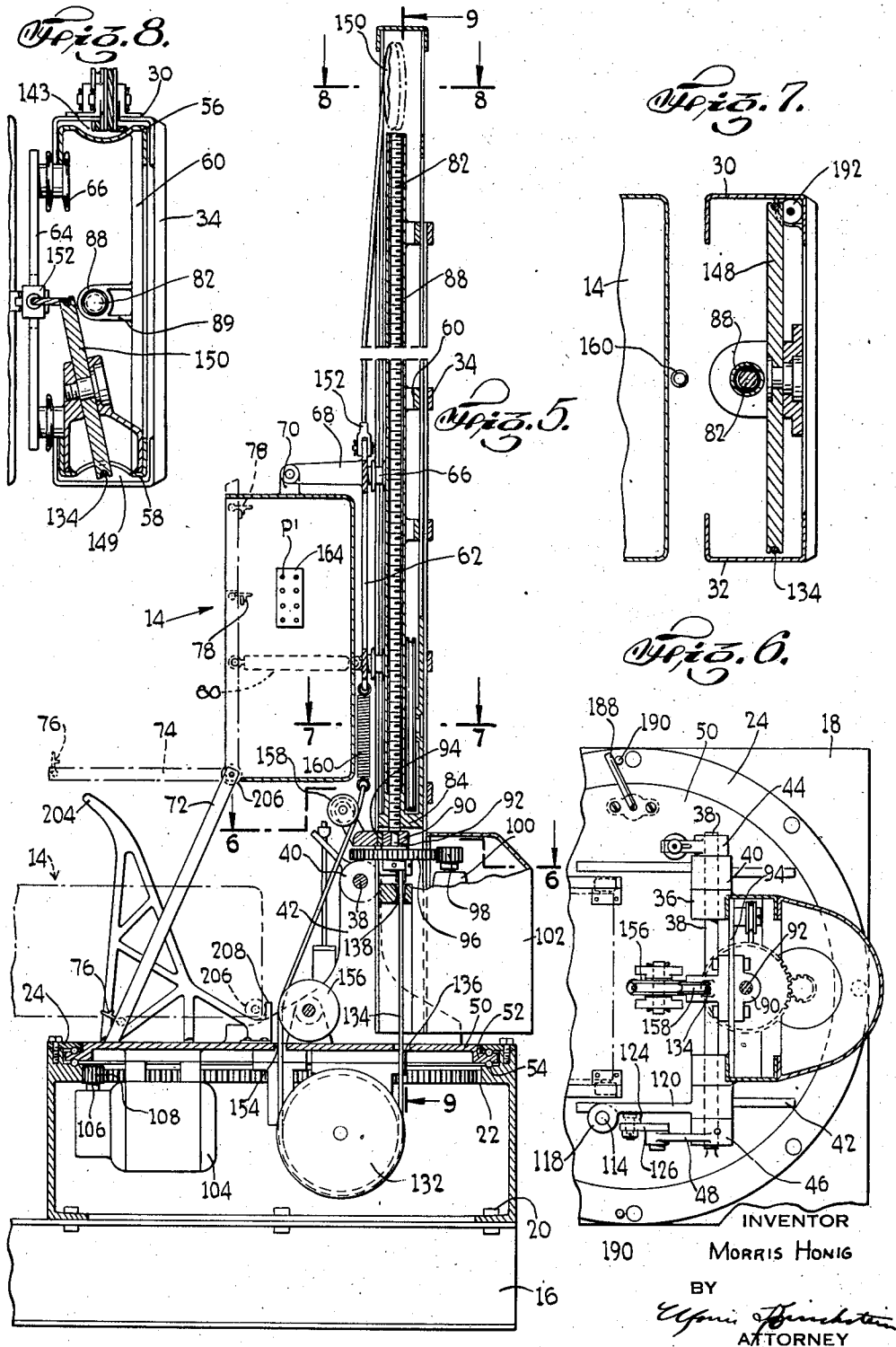
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EXTENSIBLE FIRE LADDER AND ELEVATOR

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Fig. 10.

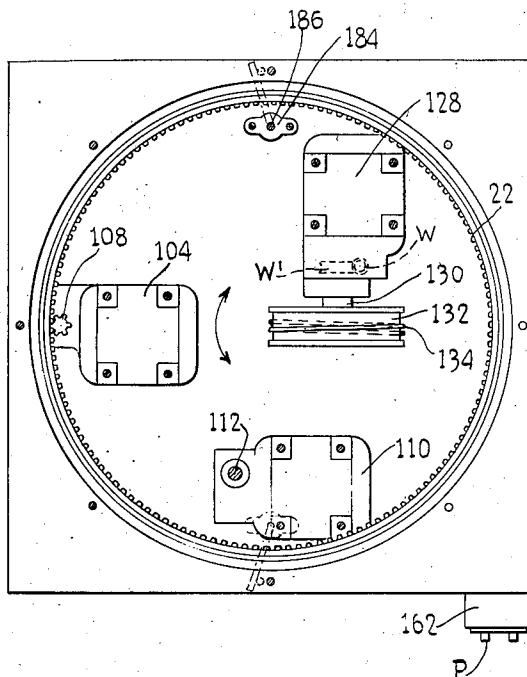


Fig. 11.

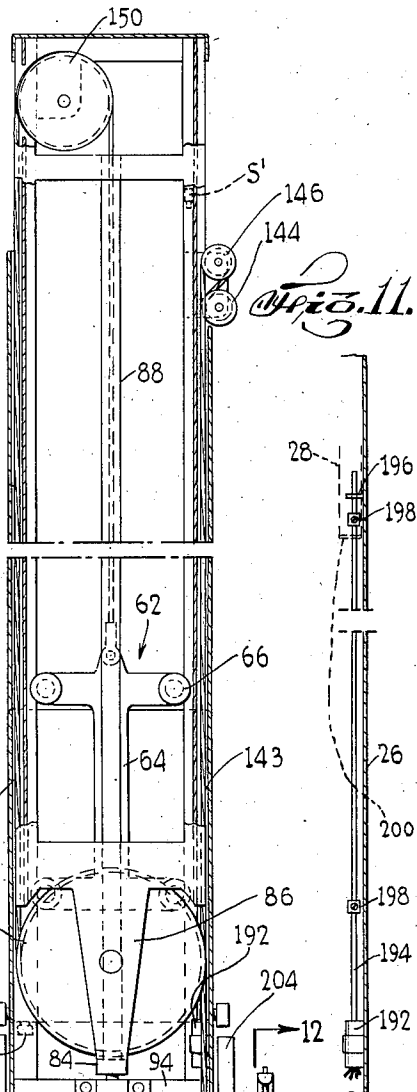


Fig. 9.

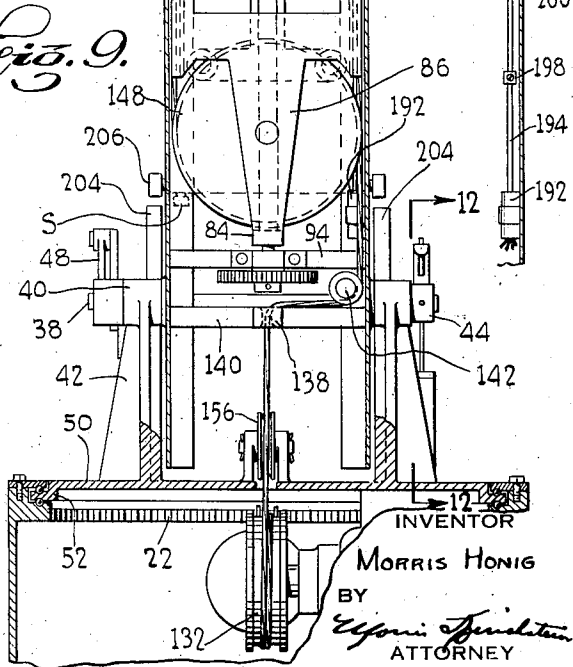
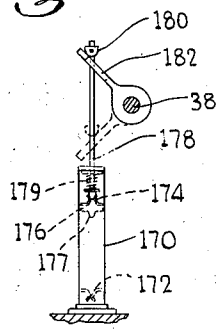


Fig. 12.



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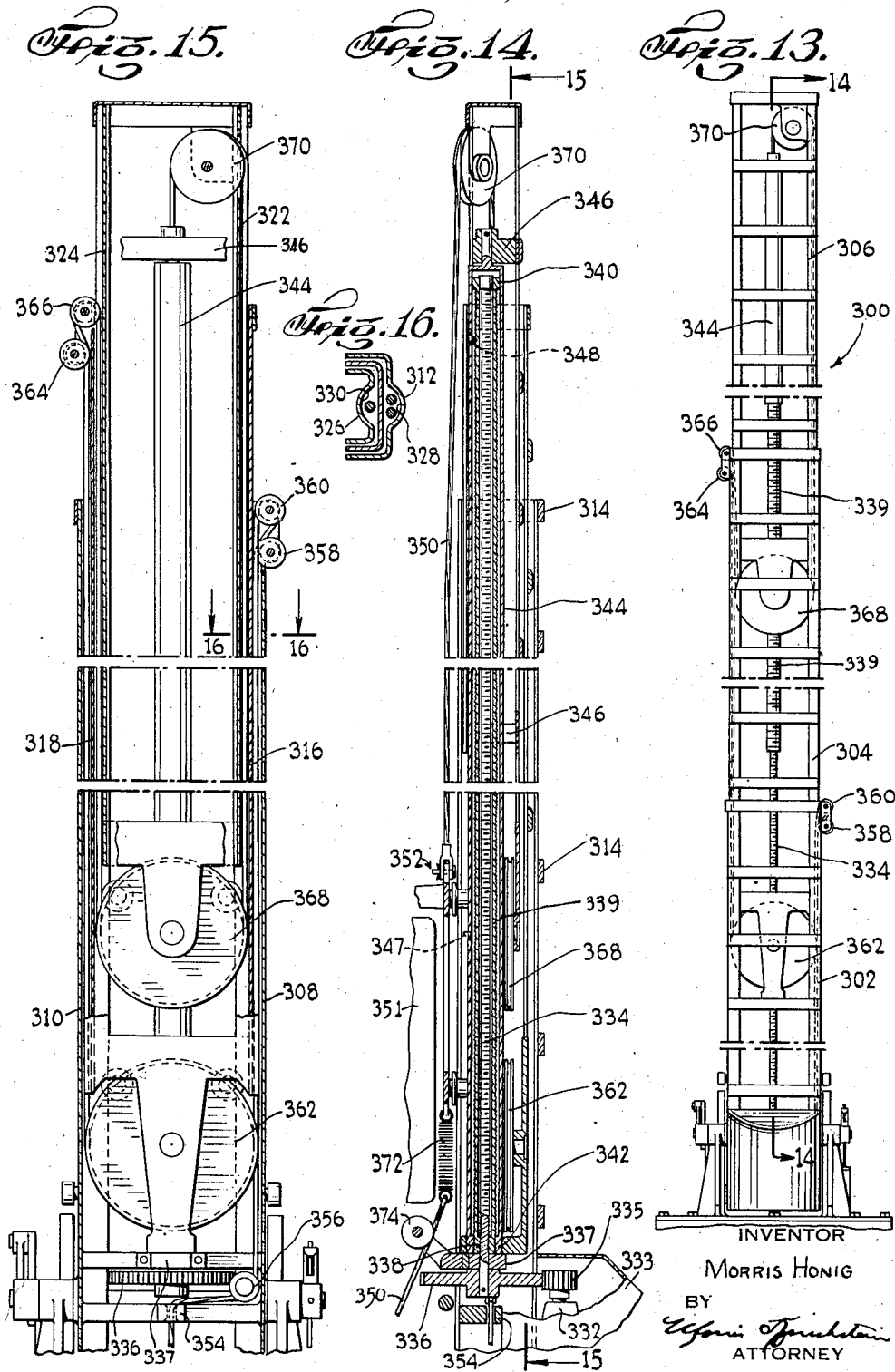
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2,376,875

EXTENSIBLE FIRE LADDER AND ELEVATOR

Filed April 8, 1943

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UNITED STATES PATENT OFFICE

2,376,875

EXTENSIBLE FIRE LADDER AND ELEVATOR

Morris Honig, Bronx, N. Y.

Application April 8, 1943, Serial No. 482,262

19 Claims. (Cl. 227-8)

This invention relates to extensible fire ladders having elevators associated therewith for facilitating the removal of persons from the upper stories of buildings.

One of the objects of the invention is to provide a device of the character described which is wholly operable by remote control either from the structure upon which the ladder is mounted, the elevator which travels up and down the ladder, or any momentarily desirable point of vantage.

Another object of the invention is to provide a device of the character described having highly improved, simplified, compact and positive means for actuating the ladder and elevator car without cluttering up the ladder.

A further object of the invention is to provide a device of the character described in which the various means for actuating the elevator and ladder are so arranged that they may be simultaneously operated without interfering with each other's action.

Still another object of the invention is to provide a device of the character described in which a compensating system enables the elevator to remain in a fixed vertical position while the ladder is either extending or retracting.

Yet another object of the invention is to provide a device of the character described in which jamming of the means for actuating the ladder and elevator is effectively prevented.

An additional object of the invention is to incorporate all the foregoing advantages in a ladder of the character described comprising more than two relatively movable ladder sections.

Another object of the invention is to provide a device of the character described which comprises relatively few and simple parts, is highly rugged in construction, easy to operate, and efficient for the purposes set forth.

Other objects of my invention will in part be obvious and in part hereinafter pointed out.

The invention accordingly consists in the features of construction, combinations of elements, and arrangements of parts which will be exemplified in the construction hereinafter described, and of which the scope of application will be indicated in the claims.

In the accompanying drawings, in which are shown various possible embodiments of this invention,

Fig. 1 is a fragmentary side view of an extensible fire ladder and elevator embodying my invention, there being shown in full lines the retracted, flat position of the ladder and elevator, and in

dotted lines various raised and extended positions of the ladder;

Fig. 2 is a top plan view of the apparatus shown in Fig. 1;

Fig. 3 is a fragmentary side view of the ladder in raised and extended position, leaning against the side of a building, and with the elevator positioned to receive persons emerging from a building window;

Fig. 4 is a sectional view taken substantially along the line 4-4 of Fig. 3;

Fig. 5 is an enlarged sectional view taken substantially along the line 5-5 of Fig. 2;

Fig. 6 is a sectional view taken substantially along the line 6-6 of Fig. 5;

Fig. 7 is an enlarged sectional view taken substantially along the line 7-7 of Fig. 5 and showing the lower compensating sheave on the extensible ladder section;

Fig. 8 is an enlarged sectional view taken substantially along the line 8-8 of Fig. 5 and showing the upper compensating sheaves on the fixed and extensible ladder sections;

Fig. 9 is a sectional view taken substantially along the line 9-9 of Fig. 5 and showing the compensating system which enables the elevator to remain in a fixed vertical position as the ladder is extended;

Fig. 10 is a top plan view in partial section of the ladder base with the turntable removed;

Fig. 11 is a fragmentary detail view of the limit switch for preventing over extension or over retraction of a ladder;

Fig. 12 is a detail view of the limit switch for preventing over raising or over lowering of the ladder;

Fig. 13 is a front view of a raised and fully extended ladder embodying a modified form of my invention;

Fig. 14 is an enlarged sectional view there-through taken substantially along the line 14-14 of Fig. 13 with the ladder fully retracted;

Fig. 15 is a sectional view taken substantially along the line 15-15 of Fig. 14; and

Fig. 16 is a sectional view taken substantially along the line 16-16 of Fig. 15.

Referring now to the drawings, and more particularly to Figs. 1-12, I have there disclosed an apparatus 10 embodying my invention and comprising a combined extensible fire ladder 12 and elevator 14 mounted on a supporting structure 16, such as the wheeled chassis of a fire ladder truck, which includes a heavy turntable base 18 held by bolts 20 (Fig. 5) to the chassis 16. Said base is provided with an apertured par-

tion 22 in the form of a ring gear and a top clamp plate 24.

The extensible ladder 12 consists essentially of a plurality of ladder sections, such for example as the lower or fixed ladder section 26, and the upper or extensible ladder section 28. The lowermost ladder section 26 includes a pair of spaced U-shaped channels 30, 32 (Fig. 7), whose open sides face each other. Rungs 34 (Fig. 5) are mounted in any suitable fashion, as for example welding, to the front face of the front flanges of the channels 30, 32. Mounting ears 36 (Fig. 6) are rigidly secured in aligned relationship to the rear flanges of the channels 30, 32 adjacent the bottom of the ladder, said ears receiving and being permanently fixed to a rocking shaft 38. This shaft extends beyond the ears to either side of the ladder and is journaled in trunnions 40 which are carried on pedestals 42 (Figs. 5 and 9). The shaft is fixed by a pair of collars 44, 46, one of which has an integral driving arm 48 (Figs. 3 and 9) which is used to angularly raise the ladder. The pedestals 42 are bolted to a turntable top 50 having a depressed annular periphery 52 which is seated between the partition 22 in the turntable base 18 and the clamp plate 24. The partition 22, turntable periphery 52 and plate 24 are severally provided with grooved ball bearing races in which there are disposed heavy duty ball bearings 54 which permit the ladder 12 to be easily swung about the base 18.

The extensible ladder section 28, which may have a configuration generally similar to that of the fixed ladder section 26, comprises a pair of spaced U-shaped channels 56, 58 (Fig. 8) whose open sides face each other. The rungs 60 carried on the uppermost section 28, however, are secured to the rear face of the front flange so as not to interfere with the rungs 34 on the lowermost ladder section 26. The webs of the channels 56, 58 are bellied inwardly to accommodate and conceal cables, hereinafter described, for lifting the elevator 16. The channels 56, 58 of the uppermost ladder section are snugly and telescopically received within the channels 30, 32 of the lowermost section and the rear flanges of the several channels have their tips in registration (Fig. 8) so as to provide a continuous rail surface for the elevator in all positions of the two ladder sections.

The elevator 14 (Figs. 4 and 5) may comprise an open box of rectangular shape which is slidable along the extensible ladder 12 and pivotally movable relative thereto so that it freely can swing to vertical position when the ladder 12 is inclined. Any suitable elevator mounting may be provided for this purpose, for example, that shown and described in my United States Letters Patent No. 2,249,900, dated July 22, 1941. Another suitable mounting comprises a truck 62 (Fig. 9) including an H-frame 64 (Figs. 8 and 9) on the ends of whose four arms co-planar rollers 66 are journaled. The truck has an integral rearwardly extending arm 68 to which there is pivotally attached a lug 70 welded to the top of the elevator car 14. A short ladder 72 may be pivotally mounted to an edge of the elevator floor adjacent one of the side walls, said ladder being adapted to be swung down to the position illustrated in Fig. 5, when the car is in its lowermost position, to facilitate discharge of passengers. A tailboard 74 may also be pivotally connected to the rear edge of the floor, said board being adapted to be swung over a window-sill of a building, as illustrated in Fig. 3, in order to bridge the

space between the building and car when passengers are entering the elevator. Both the tailboard and ladder may have simple gravity latches 76 which are adapted to cooperate with catches 78 on the car to retain the same in upright position when they are not being used. It will be noted that in this position they serve to close the open side of the car. If desired, a dashpot mechanism 80, pivotally connected to and interposed between the truck 62 and the elevator car, may be employed to dampen swaying of the car.

In accordance with my invention, novel means is provided to extend and retract the ladder rapidly without using cables or the like near the rungs where they might impede firemen's ascent and descent of the ladder. Such means comprises a long threaded rod 82 (Fig. 5) which engages a tapped collar 84 at the end of a fishtail 86 (Fig. 9) pendant from the bottom of the uppermost ladder section 28. A tube 88, carried by the plates 89 (Fig. 8) extending rearwardly from the rungs 60 on said extensible ladder section, completely houses the threaded rod 82 when the two ladder sections are fully telescoped (Fig. 5) and at such time supports the entire rod. When the ladder sections are extended this support is unnecessary because the rod then has two widely spaced bearing points, one of which is the tapped collar 84 and the other a journal box 90 (Figs. 5 and 6) in which a reduced end portion 92 of the rod 82 is borne. Said bearing box is bolted to a strip 94 bridging the channels 30, 32 of the lowermost ladder section 26 near the rocking shaft 38. The rod 82 is driven through a gear train comprising a cogwheel 96 and pinion 98 by a reversible electric motor 100 having self-contained reduction gearing and housed in a casing 102 secured to the bottom of the lowermost ladder section. A counter-weight (not shown) may also be enclosed in the casing. It will be obvious that upon rotation of the shaft 82 and motor 100 in one direction the upper ladder section 28 will be extended, and upon reversal of the direction of rotation of the motor said section will be retracted.

Means is also provided to swing or traverse the ladder about the base 18. Said means may comprise a reversible electric motor 104 (Figs. 5 and 10) having a self-contained reduction gearing and supported on the bottom of the turntable 50. The drive shaft 106 of said motor extends vertically and is provided with a pinion 108 adapted to mesh with the ring gear 22.

A feature of the invention resides in the novel means provided to raise and lower the ladder, that is, to revolve the ladder about a horizontal axis comprising the rocking shaft 38. Said means includes a reversible electric motor 110 (Fig. 10) having a self-contained reduction gearing and mounted on the bottom of the turntable 50. This motor has a vertical drive shaft 112 which is coupled to a threaded rod 114 (Figs. 1, 3 and 6) journaled intermediate its ends in a thrust bearing 116 fixed to the turntable top and at its tip in another thrust bearing 118 carried by an arm 120 extending from one of the pedestals 42. A tapped collar 122, which is threadedly received on the rod 114, has an offset lug 124 pivotally connected by a link 126 to the driving arm 48 of the rocking shaft 38. It will be apparent that when the rod 114 revolves in one direction the collar 122 will move vertically upward rotating the shaft 38 in a clockwise direction (as viewed from Figs. 1 and 3) to raise the ladder, and that when the direction of rotation

of the rod 114 is reversed, the ladder will be brought down to horizontal position.

Further in accordance with my invention I provide a unique means for moving the elevator along the ladder, which means is so constructed and arranged that extension or retraction of the uppermost ladder section 28 will not affect the vertical position of the elevator car unless the car is at the top of said section. Such means includes a reversible electric motor 128 (Fig. 10) having self-contained reduction gearing and depending from the turntable 50. This motor is provided with a horizontal drive shaft 130 carrying a winch drum 132 (Figs. 5 and 10) which operates a wire cable 134. Said cable runs from one side of the drum through an aperture 136 in the turntable top and thence through a hardened eye 138 (Figs. 5 and 9) in a strip 140 on the lowermost ladder section. From here it is guided by an idling pulley 142, journaled on said section, to the elongated passageway 143 (Figs. 8 and 9) between the flat base flange of one of the channels 30 of the lowermost section and the bellied base flange of one of the channels 56 of the uppermost section. After emerging from the top of said passageway the cable is directed back into the passageway by the pulleys 144, 146. The cable is then led around a large sheave 148 journaled on the fishtail 86 of the extensible section 26 which guides the cable up into the elongated passageway 149 on the opposite side of the ladder. This vertical run of the cable is supported at its top end by a pulley 150 mounted on the top of the uppermost ladder section 28 and tilted about the longitudinal axis of the ladder to cause the cable leaving said pulley to clear the back of the ladder. From this pulley the cable extends down behind the tube 88 and shaft 82 to a yoke 152 pinned to the elevator truck 62. The other end of the cable 134 runs from the winch drum 132 through an aperture 154 in the turntable 50 and between two pulleys 156, 158 to a heavy tension spring 160 depending from the bottom of the elevator truck 62.

The foregoing combination of sheaves, pulleys, cable, and drum comprises a cable drive which is so compensated that the cable run between the pulleys 158 and 150 will not move, although its length will change when the extensible ladder section 28 is moved. The change in length of this run is compensated for by shortening of the run between the pulley 146 and sheave 148. Due to the use of such a compensating drive the elevator may be raised or lowered, and the ladder may be extended or retracted independently of each other's operation. This set-up is of considerable assistance in the manipulation of the ladder and elevator, since it permits the ladder to be raised with great rapidity without the necessity of watching or controlling the car, a factor which heretofore has always affected extension of the ladder. It will be understood that the elevator is raised or lowered by simply turning the motor 128 in the proper direction, this operation being independent of extension or retraction of the ladder.

Normally, the spring 160 supplies sufficient tension to securely snub the cable 134 around the winch drum so that the drum serves as an anchor to firmly hold ends of the cable extending therefrom and acts as a fixed point in the compensating drive. However, when the car 14 is near the top of the uppermost ladder section 28, and such section is retracted, the tension of

the cable run from the pulley 150 to the winch drum will be slightly lessened since said pulley will engage the truck 62 and slack off this run. This will permit the cable to slip about the winch drum so that, as the top ladder descends with the car at the top thereof, the car will come down without snapping the cable. As soon as the retraction of the ladder stops, the spring 160 will absorb any slack.

Each of the electric motors 100, 104, 110, and 128 is provided with two circuits for energizing the same from a source of electric power, one of the circuits being for forward drive and the other for reverse. The circuits each include, in addition to a motor and source of power, a limit switch, hereinafter described, and a plurality of manually operable, electrically interlocked, remote control switches consisting of push buttons P (Fig. 3) on a panel 162 in the turntable base 18, push buttons P' (Fig. 5) on a panel 164 in the elevator car 14, and push buttons P'' (Fig. 3) on a hand grip 166 connected in the circuit by an electric cable 168. These switches are of any type, well known to the art, such that, if any of them, for example the button which would cause the ladder section 28 to be extended, is pushed, no button on either of the panels 162, 164, or grip 166, whose actuation would cause the said ladder section 28 to be retracted, can be depressed or, if it can be depressed, it would not cause the motor 100 to be stopped or reversed. In other words, the switches are such that when one of them, whose actuation would cause a motor to turn in one direction, is operated no other switch, which would cause that motor to turn in the opposite direction, can be effectively operated.

The reversible motors may be of any type well known to the art, as for example of the reversing field type or the type having two fields which can be independently energized. The circuits for each motor may be wholly independent of each other or may include a common lead in accordance with standard practice.

If desired, certain of the remote control switch buttons may be omitted from the elevator panel 164 or a master control provided which is operable from the turntable base 18 and which can cut out either or both the controls on the elevator panel 164 and hand grip 166.

As indicated above, means is provided to limit the various movements of the elevator and ladder. Such means comprises a plurality of limit switches which, in general, may each include two normally closed pairs of contacts, one series-connected in each motor control circuit, and a mechanism which opens the proper pair of contacts when the elevator or ladder associated therewith nears a predetermined position.

The limit switch for defining the upper and lower angular positions of the ladder section 26 consists of a housing 170 (Fig. 12) having pairs of normally closed electrical contacts 172, 174 at its lower and upper ends respectively. A plunger 176, mounted for reciprocation in said housing, has means, such as insulating separating fingers 177, on its upper and lower surface which are adapted to open either one of the pairs of closed contacts 172, 174 when brought into engagement therewith. The plunger is biased to engagement with the lower pair of the closed contacts 172 by a spring 179 and is operated by a shaft 178 which projects from the top of the housing 170. A cam rider 180, fixed on the plunger shaft 178, rests on a rocker arm 182 carried by the rocking shaft 38,

the spring 179 serving to maintain said rider and arm in contact. Said rocker arm is so angularly arranged on the rocking shaft that when the ladder 12 is disposed intermediate its extreme predetermined upper and lower positions the plunger 176 will engage neither of the contacts 172, 174, but that when it reaches either such position it will engage and open the proper contacts and energizing circuit which causes the motor 112 to move the ladder section 28 in such direction.

The other limit switches may be of an essentially similar construction, although the particular means for correlating their operation with the predetermined limit of movement of the element being controlled may be somewhat modified. Thus, the limit switch for controlling movement of the turntable 50 includes a casing 184 (Fig. 10) whose operating shaft 186 extends vertically through the turntable 50 and terminates in a horizontal arm 188 (Fig. 6). Two pairs of normally closed contacts are contained within the housing 184. The actuating element for opening such spaced contacts is normally biased to a position intermediate said contacts, but will be moved to engage and separate the contacts when the arm 188 is moved through a predetermined angle from its normal position. To turn the arm 188 in such manner a pair of pins 190 are mounted upon the clamp plate 24 in the path of movement of said arm. These two pins are about 180° apart since this is all the swinging movement required of the turntable. When the arm 188 encounters one of the pins, it turns the shaft 186 and opens the circuit causing the motor 104 to drive the turntable in that direction. The opposite action takes place when the arm contacts the other pin.

The limit switch for controlling extension and retraction of the top ladder section 28 likewise includes a switch casing 192 (Fig. 11) in which the usual normally closed contacts are housed. The operating shaft 194 for this limit switch lies in the passageway 143 and is slidably supported at its upper end by a guide 196. Two stop pieces 198 are secured to said rod 194, the distance therebetween equalling the desired travel of the upper ladder section 28. An apertured ear 200 at the bottom of the top ladder section 28 encircles said shaft so that, when the ladder 28 approaches the top of its travel, the ear 200 will lift the shaft 194, separating the upper pair of normally closed contacts, and when the ladder 28 approaches the bottom of its travel the ear will depress said shaft, separating the lower pair of contacts. The plunger, which is supported by said shaft and carries the separating fingers, is biased to a normal position intermediate the contacts.

The limit means for preventing overtravel of the elevator 14 preferably comprises two normally closed push button type switches S, S', one near the tip of the top ladder section and the other near the base of the bottom ladder section, one of the switches being connected in each of the two opposite driving energizing circuits for the motor 128.

Each of the electric motors 100, 104, 110, and 128 for effecting movement of the ladder and elevator has a non-reversible gear element, of large friction loss, comprising a worm gear W and worm wheel W', in its self-contained reduction train so that when a motor is deenergized by operation of a limit switch or button the elevator or ladder will stop and the same will not slide back.

The source of electric energy for the electric motors preferably comprises a generator G driven

by a shaft from the same motor (not shown) as that employed to run the fire truck. A clutch C may be interposed between said generator and motor.

It will be noted that ordinarily the elevator car 14 hangs vertically from the tip of the truck arm 68. Although this is conducive to safe operation, it detracts from rigidity and compactness of the elevator-ladder combination during transportation to or from a scene of action. In order to obviate this difficulty I have provided means for automatically causing the elevator to lie flat against the ladder when it is fully lowered and the ladder extends horizontally, with its tip resting on the support 202. Such means may comprise a pair of spaced cams 204 (Fig. 5) which cooperate with a pair of rollers 206 extending from opposite sides of the elevator car 14. The cam is so arranged that if the elevator is at the bottom of its travel and the ladder then angularly lowered, the rollers will contact the tips of the cams 204 and be guided down to stops 208 at the bases of said cams, this latter position being indicated by the dotted lines in Fig. 5.

In Figs. 13 through 16 I have disclosed a modified form of my invention comprising an apparatus 300 which is essentially similar to the apparatus 10, just described, in all details except those now set forth.

Said apparatus 300, instead of two ladder sections, includes three ladder sections, to wit: a bottom ladder section 302, an intermediate ladder section 304, and a top ladder section 306, which may all be telescoped from fully extended position, indicated in Fig. 13, to fully retracted position, indicated in Fig. 14.

The bottom ladder section 302 includes a pair of spaced channels 308, 310 whose webs 312 (Fig. 16) are outwardly belled. Rungs 314 (Fig. 14) are welded to the front faces of the front flanges of said channels. The intermediate ladder section includes two spaced channels 316, 318 having flat webs, and the top section 306 includes two spaced channels 322, 324 having inwardly belled webs 326. The several channels of the ladder sections 302-306 are arranged in nested relationship to facilitate telescoping. Due to the bellying of the channels, a pair of elongated passageways 328, 330 are formed on both sides of the ladder which enclose and conceal the cable which is used to raise and lower the elevator car.

The means for extending and retracting the ladder sections includes an electric motor 332 mounted on the bottom of the lower ladder section 302 and housed in a casing 333. Said motor drives a capped and externally threaded shaft 334 through a pinion 335 and cogwheel 336. This shaft, which is journaled at its lower end in a bearing 337, is threadedly received in a tapped collar 338 at the base of a hollow externally threaded shaft 339 having a top flange 340. Said second shaft is threadedly received in a tapped collar 342 at the base of another hollow shaft 344 which is pinned at its upper end to a lug 346 at the top of the top ladder section 306. The shafts 334, 339, 344 are heavily oiled to prevent vibration and chattering. Obviously, rotation of the inner shaft 334 will cause the three shafts to triple their telescoped length, separation thereof being prevented by abutment of the cap, flange and collars. The intermediate ladder section 304 will be raised, after the top ladder section 306 has moved beyond it, by lugs 347 at the base of said top section which engage and lift ears 348 at the top of said intermediate section.

A cable 350, which is driven by a winch drum and electric motor (not shown), operates the elevator 351 through an H-truck 352. The compensating pulley system for said cable differs somewhat from the earlier described cable system in that it is necessary, where three ladder sections are moved, to compensate for both the intermediate section and the top section. To this end, the cable 350, after leaving the winch drum and passing through the top plate of the turntable, runs in the following manner: through a central hardened eye 354 at the base of the bottom ladder section 302, over an idling pulley 356 at the base of the same section and adjacent the channel 308, up a passageway 328 on one side of the ladder, over an idling pulley 358 and around an idling pulley 360 at the top of said channel, back down the passageway 328, around a compensating pulley 362 at the bottom of the intermediate ladder section 304, up the passageway 328 on the opposite side of the ladder, over an idling pulley 364 and around an idling pulley 366 at the top of the intermediate ladder section, down the passageway 330 on the same side of the ladder, around a compensating pulley 368 at the bottom of the top ladder section, up the opposite passageway 330, around the rearwardly inclined pulley 370 at the top of the top ladder section, and finally down to the top of the elevator truck 352.

The other end of the cable is attached to a spring 372 dependent from the bottom of the truck 352 and is guided by a pulley 374 back down through the top of the turntable plate to the winch.

This cable compensating system operates to maintain the elevator 351 at a constant height despite extension and retraction of the ladder sections, the run of the cable from the pulley 370 to the pulley 374 changing in length but not moving as the ladder sections are extended and retracted. This change in length is compensated for by the change in length of the cable runs between the pulley 360 and compensating pulley 362 and the pulley 366 and compensating pulley 368.

It will thus be seen that I have provided devices which achieve the several objects of this invention and which are well adapted to meet the conditions of practical use.

As various possible embodiments might be made of the above invention, and as various changes might be made in the embodiments above set forth, it is to be understood that all matter herein set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

1. In combination in an extensible fire ladder, a plurality of elongated ladder sections adapted to be moved along their longitudinal axes relative to one another, a support for said sections, means to pivotally mount one of said sections on said support for rotation about a horizontal axis, means including an electric motor to exclusively relatively longitudinally move said sections, means including a second electric motor to exclusively swing said first named sections on said support about said horizontal axis, a base, means to mount said support on said base for rotation relative thereto about a vertical axis, and means including a third electric motor for exclusively rotating said support about said axis.

2. A fire ladder as set forth in claim 1 wherein a gear train is disposed between each of the electric motors and its associated operating means, said gear train being drivable by said motors but not by their associated operating means.

3. A fire ladder as set forth in claim 1 wherein all of the electric motors are remotely controllable by a person or the ladder.

4. A fire ladder as set forth in claim 1 wherein all the electric motors are optionally operable by remote control from a plurality of stations.

5. A fire ladder as set forth in claim 1 wherein all the electric motors are optionally but non-conflictably operable by remote control from a plurality of stations.

6. A fire ladder as set forth in claim 1 wherein means is provided to predeterminedly limit the relative movement of the ladder sections by cutting off electric power to the motor causing relative movement of the ladder sections when the predetermined limits of movement of said sections are reached.

7. A fire ladder as set forth in claim 1 wherein there are provided an elevator car to move up and down the ladder, an electric motor for moving said car, and means to predeterminedly limit the movement of said car by cutting off electric power to said motor when the predetermined limits of movement of said car are reached.

8. A fire ladder as set forth in claim 1 wherein the electric motor for effecting relative movement of the ladder sections is mounted on the first named ladder section and the remaining electric motors are mounted on the support.

9. A fire ladder as set forth in claim 1 wherein the means for effecting relative movement of the ladder sections comprises an elongated shaft rotated by the electric motor included in said means and means mounted on one of said ladder sections and cooperating with said shaft to translate rotative movement into linear movement.

10. A fire ladder as set forth in claim 1 wherein at least three ladder sections are provided, all of which are relatively longitudinally movable by the same means.

11. A fire ladder as set forth in claim 1 wherein the ladder is mounted on a wheeled chassis having a motor and wherein the source of electric power for the electric motors comprises a generator supported on said chassis and driven by said motor.

12. In combination in an extensible fire ladder, a plurality of elongated ladder sections adapted to be moved along their longitudinal axes relative to one another, a support for said sections, means to pivotally mount one of said sections on said support, means to relatively longitudinally move said sections, means to swing said first section about said support, a base, means to mount said support on said base for rotation relative thereto about a vertical axis, means for rotating said support about said axis, an extensible track associated with said sections, an elevator car which rides along said track, and means including an electric motor to move said car along said track.

13. In combination in an extensible fire ladder, a plurality of elongated ladder sections adapted to be moved along their longitudinal axes relative to one another, a support for said sections, means to pivotally mount one of said sections on said support, means to relatively longitudinally move said sections, means to swing said first section about said support, a base, means to mount said support on said base for rotation relative

thereto about a vertical axis, means for rotating said support about said axis, an extensible track associated with said ladder sections, an elevator car which rides along said track, and means to move said car along said track, said last named means including a compensating cable system.

14. In combination in an extensible fire ladder, a plurality of elongated ladder sections adapted to be moved along their longitudinal axes relative to one another, a support for said sections, means to pivotally mount one of said sections on said support, means to relatively longitudinally move said sections, means to swing said first section about said support, a base, means to mount said support on said base for rotation relative thereto about a vertical axis, means for rotating said support about said axis, an extensible track associated with said ladder sections, an elevator car which rides along said track, and means to move said car along said track, said last named means including a compensating cable system which maintains said elevator at a constant height while said ladder sections are being relatively moved.

15. In combination in an extensible fire ladder, a plurality of elongated ladder sections adapted to be moved along their longitudinal axes relative to one another, a support for said sections, means to pivotally mount one of said sections on said support, means to relatively longitudinally move said sections, means to swing said first section about said support, a base, means to mount said support on said base for rotation relative thereto about a vertical axis, means for rotating said support about said axis, an extensible track associated with said ladder sections, an elevator car which rides along said track, and means to move said car along said track, said last named means including a compensating cable system the cable whereof is contained in all longitudinal runs except that which directly supports the car between adjacent longitudinally extending portions of said ladder sections.

16. In combination in an extensible fire ladder, a plurality of elongated ladder sections adapted to be moved along their longitudinal axes relative to one another, a support for said sections, means to pivotally mount one of said sections on said support, means to relatively longitudinally move said sections, means to swing said first section about said support, a base, means to mount said support on said base for rotation relative thereto about a vertical axis, means for rotating said support about said axis, an extensible track associated with said ladder sections, an elevator car which rides along said track, and means to move said car along said track, said last named means

including a compensating cable system which is resiliently maintained under tension.

17. In combination in an extensible fire ladder, a plurality of elongated ladder sections adapted to be moved along their longitudinal axes relative to one another, a support for said sections, means to pivotally mount one of said sections on said support, means to relatively longitudinally move said sections, means to swing said first section about said support, a base, means to mount said support on said base for rotation relative thereto about a vertical axis, means for rotating said support about said axis, an extensible track associated with said ladder sections, an elevator car which rides along said track, said car being freely pivotally mounted whereby it automatically remains in upright position, and means to swing said car to horizontal position against said ladder when said ladder is lowered to horizontal position and the elevator is at the bottom of said ladder.

18. In combination in an extensible fire ladder, a plurality of elongated ladder sections adapted to be moved along their longitudinal axes relative to one another, a support for said sections, means to pivotally mount one of said sections on said support, means to relatively longitudinally move said sections, means to swing said first section about said support, a base, means to mount said support on said base for rotation relative thereto about a vertical axis, means for rotating said support about said axis, an extensible track associated with said ladder sections, an elevator car which rides along said track, said car being freely pivotally mounted whereby it automatically remains in upright position, and damping means to prevent swaying of said car.

19. In combination in an extensible fire ladder, a plurality of elongated ladder sections adapted to be moved along their longitudinal axes relative to one another, a support for said sections, means to pivotally mount one of said sections on said support, means to relatively longitudinally move said sections, means to swing said first section about said support, a base, means to mount said support on said base for rotation relative thereto about a vertical axis, means for rotating said support about said axis, an extensible track associated with said ladder sections, an elevator car which rides along said track, and means to move said car along said track, said last named means including a cable system the cable whereof is contained in all longitudinal runs except that which directly supports the car between adjacent longitudinally extending portions of said ladder sections.

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