No. 693,877. Patented Feb. 25, 1902.

P. MACRAE.

PORTABLE FIRE ESCAPE TOWER.

(Application filed June 13, 1901.)

(No Model.) 6 Sheets—Sheet 1.

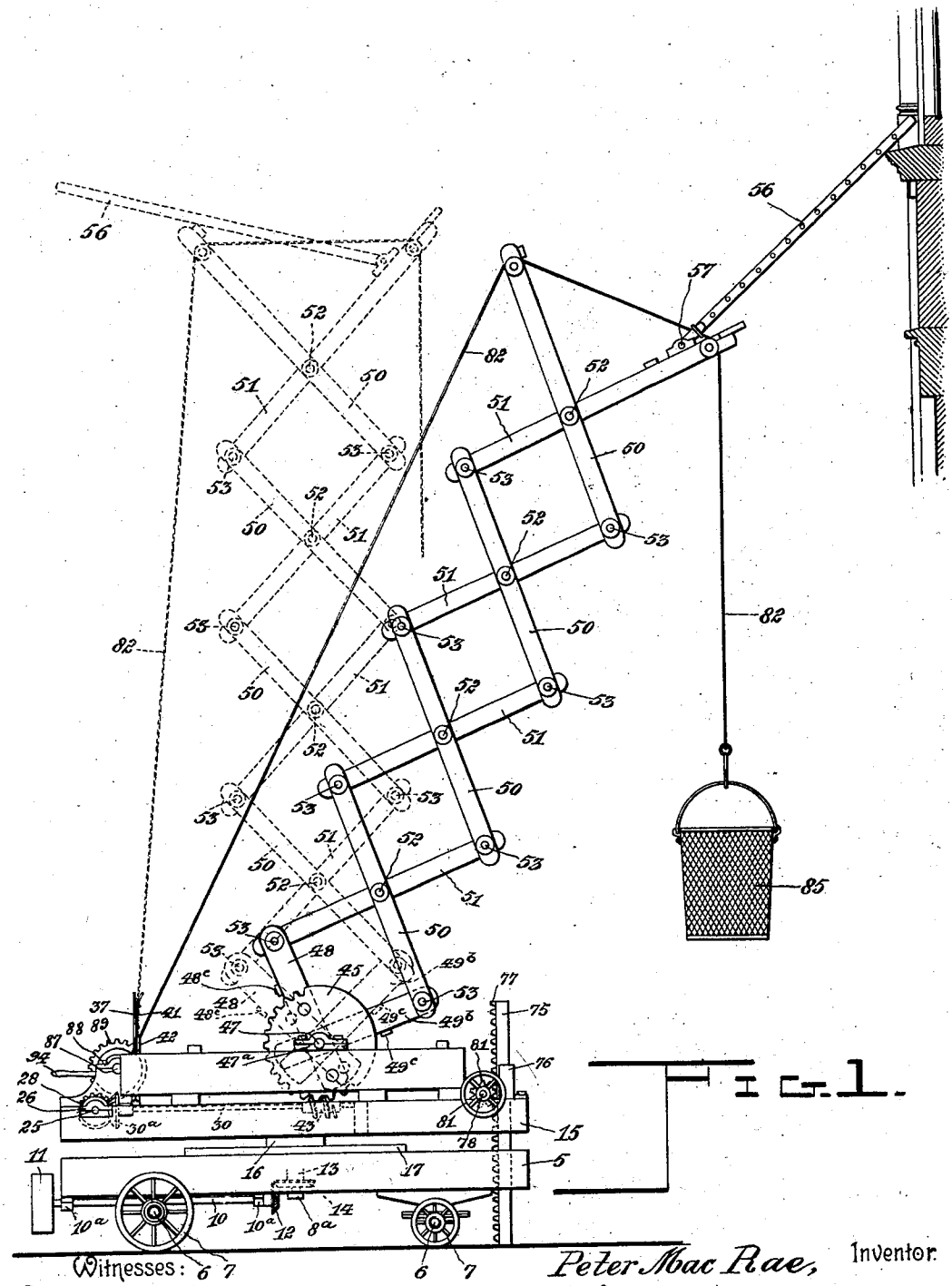


Fig. 1.

Witnesses: 6 7 6 7

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(No Model.) 6 Sheets—Sheet 2.

FIG. 9.

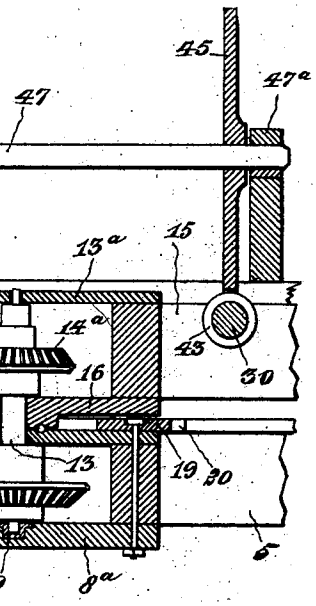


FIG. 2.

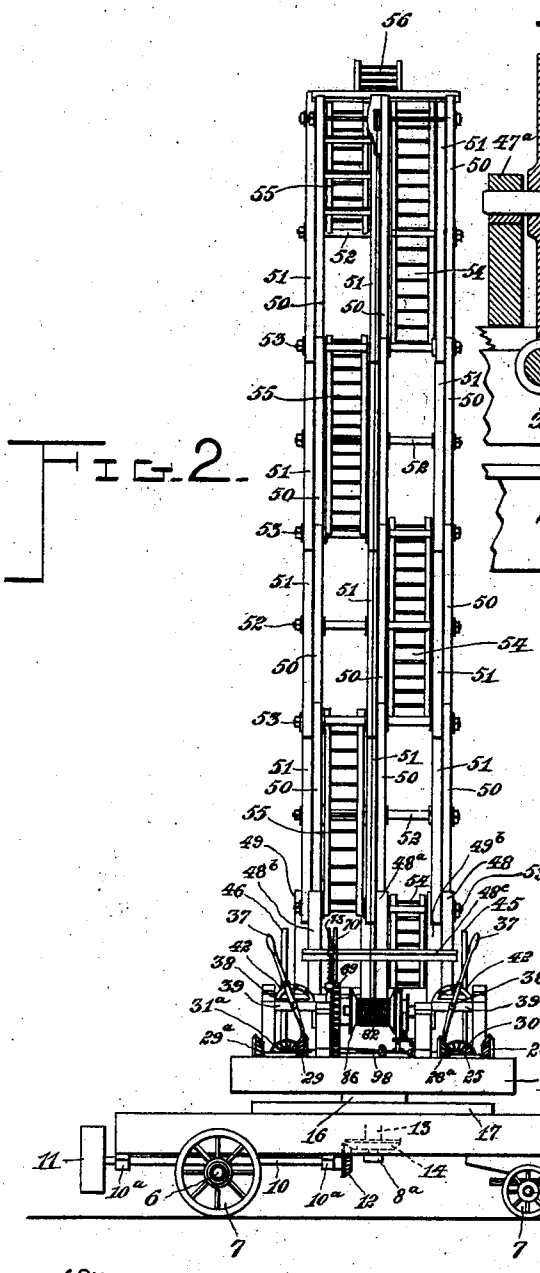
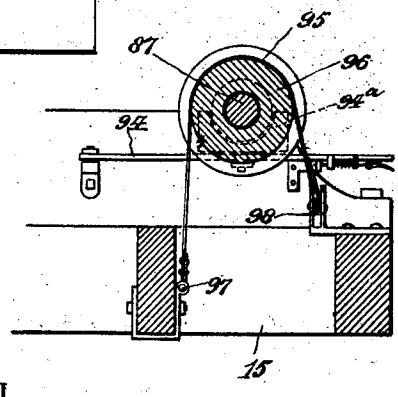


FIG. 10.



Witnesses:

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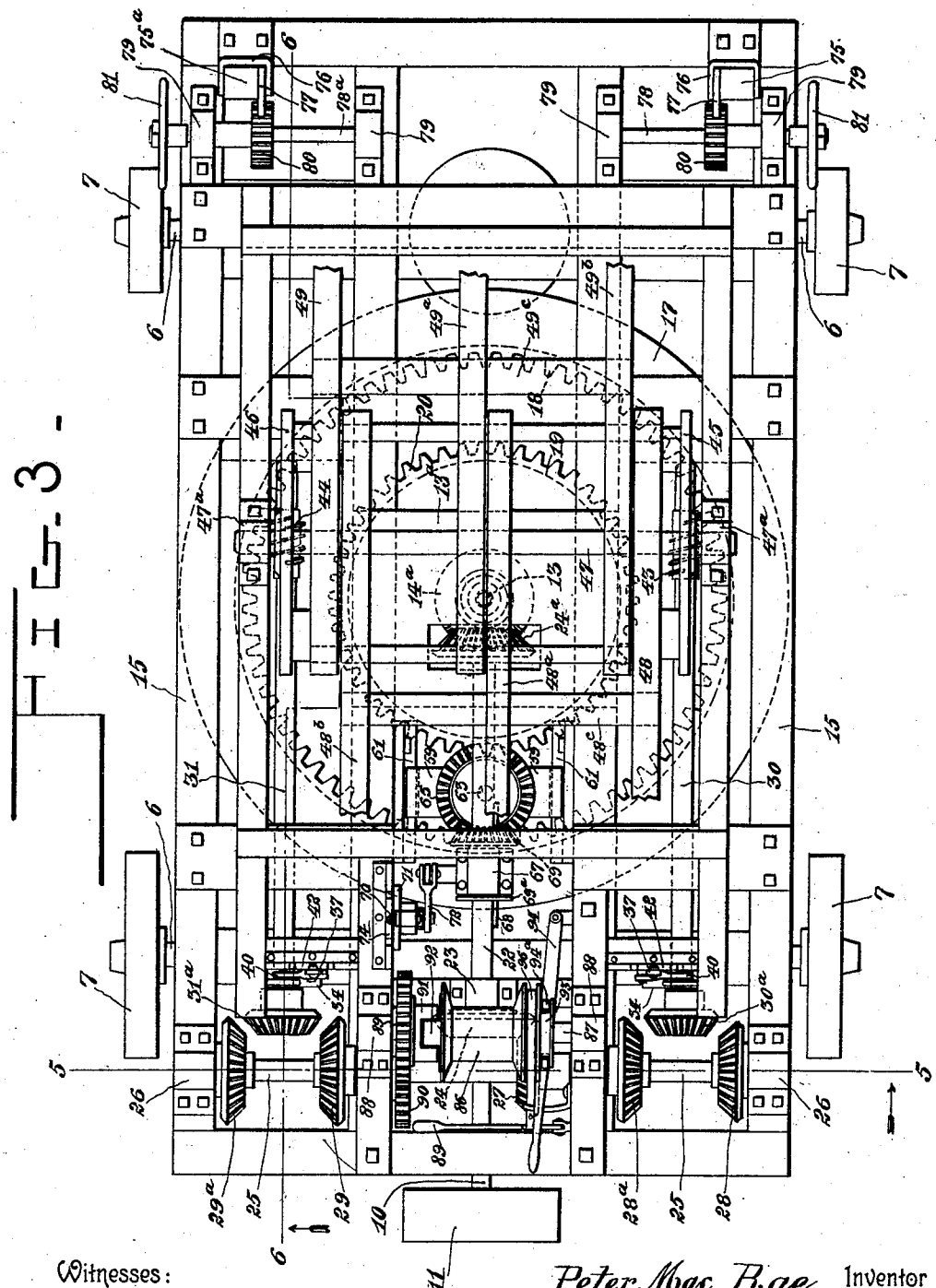
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PORTABLE FIRE ESCAPE TOWER.

(Application filed June 13, 1901.)

(No Model.) 6 Sheets--Sheet 3.

FIG. 3.



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(Application filed June 13, 1901.)

(No Model.) 6 Sheets—Sheet 4.

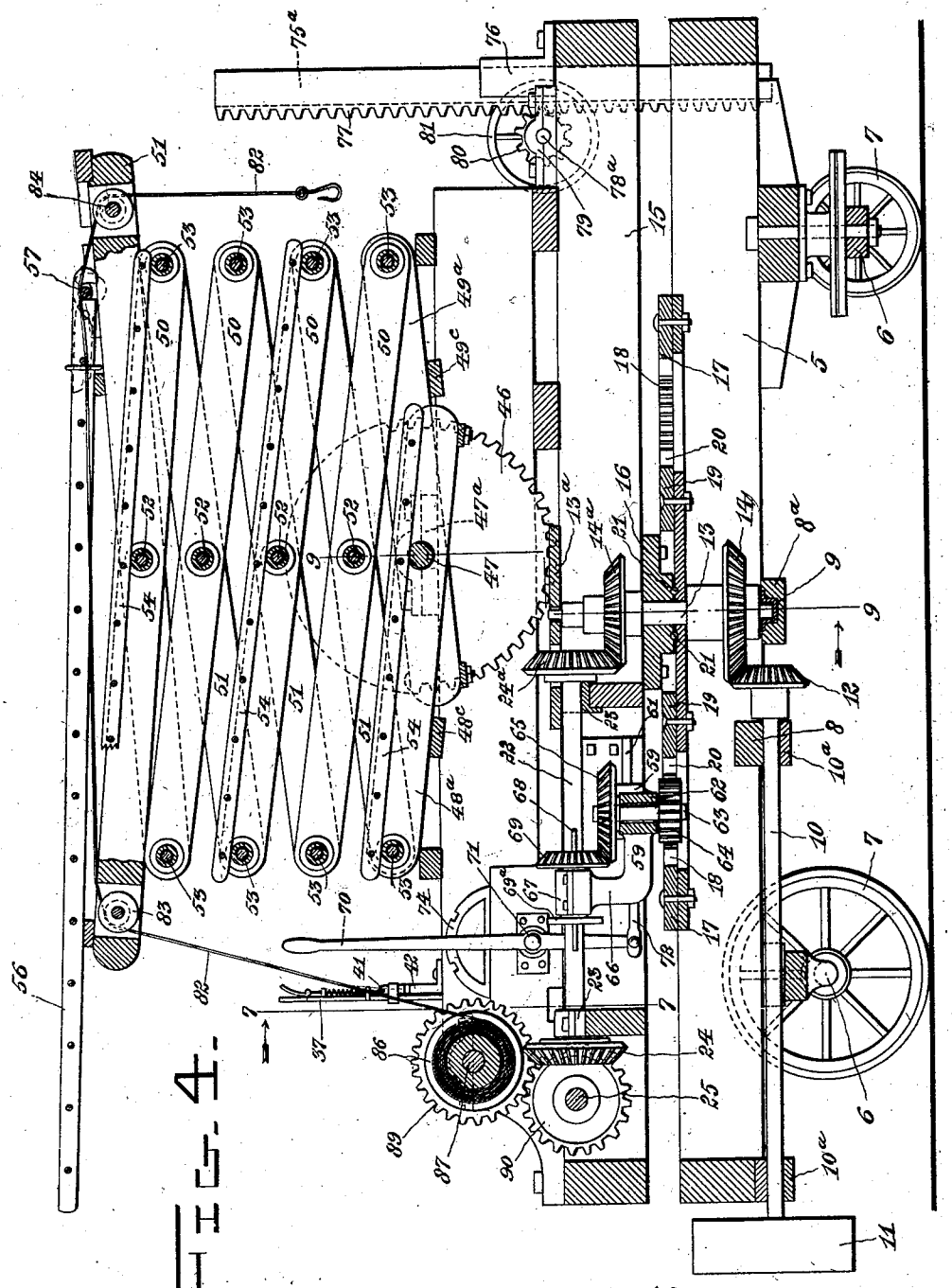


FIG. 4.

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PORTABLE FIRE ESCAPE TOWER.

(Application filed June 13, 1901.)

(No Model.) 6 Sheets—Sheet 5.

FIG. 11.

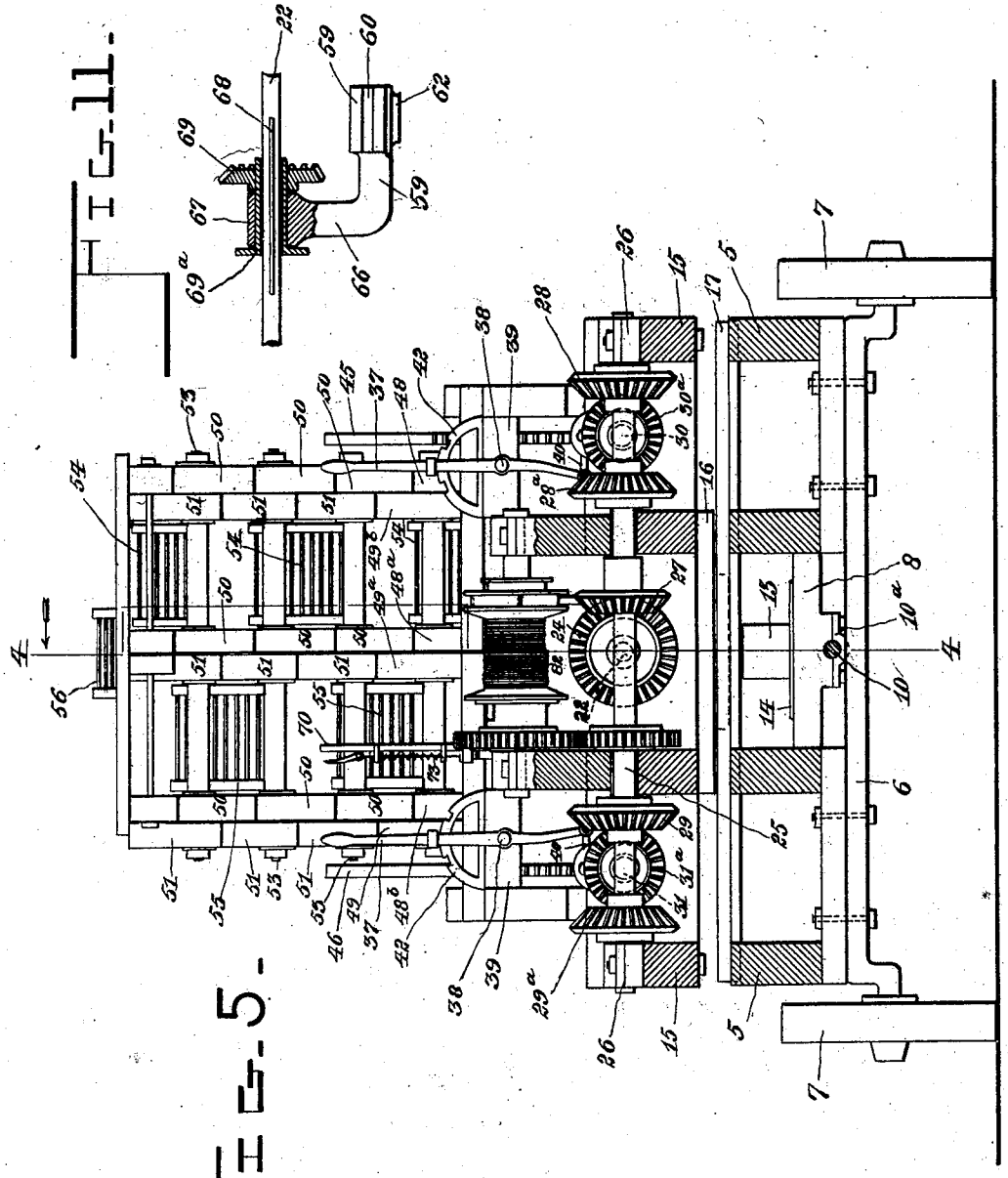


FIG. 5.

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PORTABLE FIRE ESCAPE TOWER.

(Application filed June 13, 1901.)

(No Model.) 6 Sheets—Sheet 6.

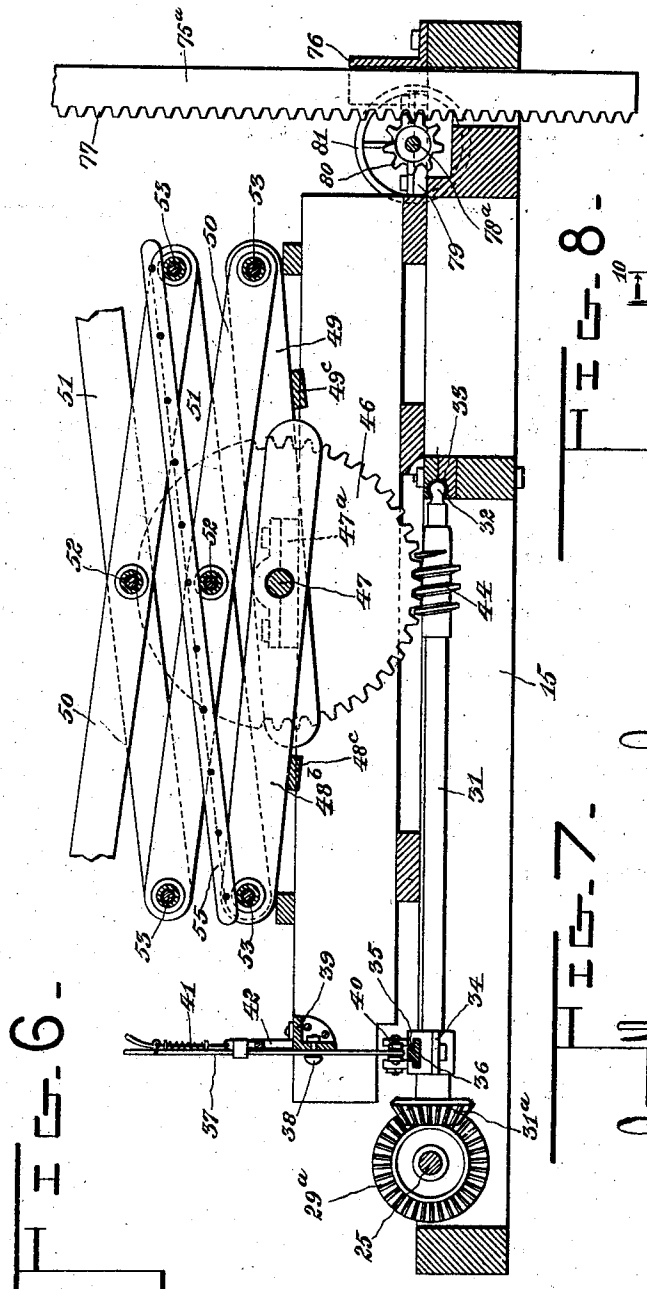


FIG. 6.

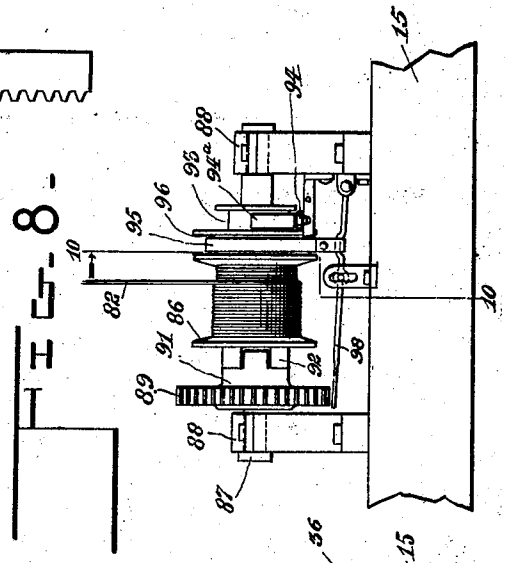


FIG. 8.

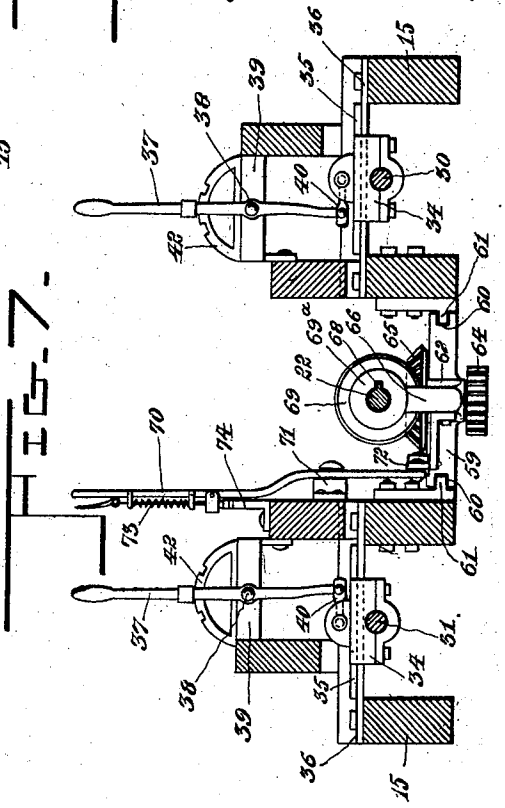


FIG. 7.

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UNITED STATES PATENT OFFICE.

PETER MACRAE, OF ESCANABA, MICHIGAN.

PORTABLE FIRE-ESCAPE TOWER.

SPECIFICATION forming part of Letters Patent No. 693,877, dated February 25, 1902.

Application filed June 13, 1901. Serial No. 64,404. (No model.)

To all whom it may concern:

Be it known that I, PETER MACRAE, a citizen of the United States of America, residing at Escanaba, county of Delta, State of Michigan, have invented certain new and useful Improvements in Portable Fire-Escape Towers; and I do hereby declare that the following is a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in portable fire-escape towers of that class which employ a lazy-tongs construction adapted to be folded compactly upon a wheeled truck.

One object of the invention is to provide a simple construction of lazy-tongs tower equipped with ladders which are foldable and extensible with the tower members and adapted to serve as the means by which firemen may enter a burning structure or as the means for the escape of the occupants from such a structure.

A further object is to provide improved means for quickly raising the tower to its operative position and to effect the folding of the tower without injury thereto, the raising and lowering of the tower being performed by or from a single prime shaft, which is driven in one direction only during the period when it is in service.

A further object is to provide means operable from the single prime shaft for giving a shiftable adjustment to the lazy-tongs tower independent of the raising or lowering thereof, whereby the tower may be moved in a transverse direction, so as to assume a leaning position, and having its upper end lie close to a building while the truck may be stationed in the middle of the street.

A further object of the invention is to provide means for swinging the tower to different angular positions relative to the wheeled truck, such swinging mechanism being driven from the single prime shaft, so as to give the desired adjustment to the tower or to return it to normal position, and such mechanism being operable independently of the raising and lowering mechanism and of the tower-shifting mechanism.

A further object of the invention is to provide an improved escape mechanism by which women, children, and men may be safely and quickly lowered from an elevated story to the ground, the escape cage or basket being raised for another load by motion derived through a train of gearing from the single prime shaft.

Further objects and advantages of the invention will appear in the course of the subjoined description, and the novelty in the combination of mechanisms and in the construction and arrangement of parts will be defined by the claims.

In the drawings hereto annexed, forming a part of this specification, Figure 1 is a side elevation of my improved fire-escape tower, the dotted line illustrating the tower raised to a position perpendicular to the base and the full lines representing the tower in a leaning position, the bed occupying a normal relation to the wheeled truck. Fig. 2 is a side elevation of the tower in the position shown by dotted lines in Fig. 1, except that the bed is shifted to a position at right angles to the wheeled truck. Fig. 3 is an enlarged plan view of the apparatus with a portion of the lazy-tongs tower removed. Fig. 4 is a vertical longitudinal sectional elevation taken in the plane of the dotted line 4 4 on Fig. 5, showing the lazy-tongs tower in its lowered or collapsed condition. Fig. 5 is a vertical transverse sectional elevation through the front part of the apparatus in the plane of the dotted line 5 5 on Fig. 3 and looking in the direction of the arrow to show the tower in its lowered condition. Fig. 6 is a vertical longitudinal sectional elevation in the plane of the dotted line 6 6 on Fig. 3 looking in the direction of the arrow. Fig. 7 is a vertical transverse section through a part of the shiftable bed, taken in the plane of the dotted line 7 7 on Fig. 4, looking in the direction of the arrow. Fig. 8 is an enlarged detail view, in front elevation, of the drum associated with the cable for the fire-escape cage. Fig. 9 is a vertical transverse section in the plane of the dotted line 9 9 on Fig. 4 looking in the direction of the arrow. Fig. 10 is a vertical cross-section in the plane of the dotted line 10 10 on Fig. 8, also looking in the direction of the arrow. Fig. 11 is a detail vertical section

through the tubular shaft and the shiftable gear for the bed-shifting mechanism, showing a part of the counter-shaft.

The same numerals of reference denote like parts in each of the several figures of the drawings.

5 designates the wheeled truck, having the axle 6, provided with the carrying-wheels 7, whereby the apparatus is made portable. This truck is provided with the cross-rails 8 8ª, (see Fig. 4,) and the latter-mentioned cross-rail has the step-bearing 9, which is adapted to accommodate the lower end of the vertical shaft 13. The frame of the truck and the cross-rail 8 thereof have alined shaft-bearings 10ª, in which is journaled the horizontal prime shaft 10, the same being provided at its front end with the driving-pulley 11, which may be rotated by a belt from an engine or other source of power, although any suitable means may be provided for the operation of the shaft 10. The inner portion of this shaft is provided with a bevel-gear 12, which has intermeshing engagement with a similar bevel-gear 14, that is secured near the lower portion of said vertical shaft 13. (See Fig. 4.)

15 designates the bed of the tower, the same being provided with a central bearing-plate 16. The wheeled truck has an annular metallic rack 17 secured to its upper side, and the central bearing-plate 16 of the bed 15 is arranged very close to the central portion of this annular rack, whereby the bearing-balls 21 may be interposed between the central portion of the annular rack and the bearing-plate 16, so that the bed may be turned upon the wheeled truck. The vertical shaft 13 passes loosely through the central portion of the annular rack 17, the center of the bearing-plate 16, and the framework of the shiftable bed 15, the upper end of said vertical shaft being journaled in a suitable bearing-plate 13ª, secured to the upper side of the bed, and this shaft 13 is adapted to serve as the axis on which the bed 15 may be turned in a horizontal plane, and said shaft also serves to transmit the motion of the prime shaft 10 to the horizontal counter-shaft 22. The annular fixed rack 17 is provided with the internal gear-teeth 18, and to said rack 17 is fastened the fixed gear 19, the latter having the teeth 20 on its external periphery. The gear-teeth of the annular rack 17 and of the fixed gear 19 are practically in opposing relation, so that a gear 64 of an adjusting-shaft 63 may be made to mesh either with the rack 17 or with the fixed gear 19 for the purpose of changing the relation of the bed to the wheeled truck, all as will be hereinafter more fully described. The counter-shaft 22 is arranged in a horizontal position above the prime shaft 10, and it is mounted in suitable bearings 23, which are provided on the bed, whereby the counter-shaft is mounted on and is shiftable with the bed. The rear portion of the counter-shaft is provided with a bevel-gear 24ª, which has intermeshing engagement with a similar bevel-gear 14ª, secured to the upper portion of the vertical central shaft 13, and the front portion of said counter-shaft 22 is provided with another bevel gear-wheel 24. It will be noted that the shaft 13 transmits the motion of the prime shaft 10 to the counter-shaft 22 and that the gears 14ª 24ª of the shafts 13 22 remain in mesh with each other at all points in the adjustment of the bed 15 upon the wheeled base 5.

25 designates a horizontal transverse shaft which is arranged at the front portion of the shiftable bed 15 and is journaled in suitable bearings 26, said transverse shaft lying at right angles to the counter-shaft 22 and being shiftable with the bed 15, so as to always maintain its operative relation to said counter-shaft and to the worm-shafts, which will be presently described. Said transverse shaft 25 is provided with a bevel-gear 27, that has intermeshing engagement with the bevel-gear 24 on the counter-shaft 22, and the transverse shaft 25 is furthermore provided with two sets of bevel-gears, one set of which is indicated at 28 28ª and the other set at 29 29ª. (See Fig. 3.) All these gears are made fast with the shaft, so as to rotate therewith, and the gears of each set are disposed in opposing relation, so that they will face each other.

30 31 designate the worm-shafts, the same being arranged in horizontal positions on opposite sides of the counter-shaft 22 and journaled in proper bearings on the bed 15, so as to occupy a shiftable relation to the sets of opposing gears on the transverse shaft 25, each worm-shaft having means associated therewith so as to change its relation to the set of bevel-gears independently of the other worm-shaft. The worm-shaft 30 is provided at its front portion with a bevel-gear 30ª, which is adapted to be shifted into intermeshing engagement with either the bevel-gear 28 or 28ª, and in like manner the other worm-shaft is provided with a bevel-gear 31ª, which may be adjusted to mesh with either of the gears 29 or 29ª. The front portion of each worm-shaft being shiftable with relation to one set of the bevel-gears, I have provided means for supporting the rear portion of said shaft in a manner to permit of its shiftable adjustment, and this is attained by the employment of a rounded head 32, which is loosely fitted in a socket or cavity 33, which is provided on the bed 15. (See Fig. 6.) The front portion of each shaft 30 and 31 is journaled in a shiftable bearing 34, which is constructed to engage with a guideway 35 on the cross-bar 36, the latter being secured to the framework of the bed 15. (See Figs. 6 and 7.) The adjustment of this slidable bearing 34 and the front portion of each worm-shaft is effected by a lever 37, which is fulcrumed at 38 on a cross-bar 39, provided on the framework of the bed, and the lower portion of this adjusting-lever 37 is connected operatively with the slidable shaft-bear-

ing 34 by a link 40. The lever is held in its adjusted position by a latch 41, that is mounted on the lever and is arranged to engage with a notched segment 42, which is secured on the cross-bar 39 of the bed 15. Each worm-shaft is adapted to be shifted by its lever 37 to either of three positions—to wit., when the lever is thrown over to the right in Fig. 7 the bearing 34 and the worm-shaft 30 are shifted to the left, so that the bevel-gear on said worm-shaft will have intermeshing engagement with one of the opposing bevel-gears on the transverse shaft 25. By reversing the position of the lever 37 or moving it to the left in Fig. 7 the bearing 34 and the front portion of the worm-shaft are shifted to the right in order that the bevel-gear on said worm-shaft may have intermeshing engagement with the other bevel-gear of the set on the transverse shaft 25; but when the lever 37 is adjusted to a vertical position, as shown by Fig. 7, the slidable bearing and the front portion of the worm-shaft are positioned midway between the opposing bevel-gears of the set, thus throwing the worm-shaft bevel-gear out of engagement with either of the opposing bevel-gears.

The worm-shafts 30 31 are provided near their rear ends with the worms 43 44, respectively, and said worms are arranged to intermesh with the worm-gears 45 46, which are loosely mounted near the opposite end portions of a pivotal shaft 47, the latter being mounted in suitable bearings 47^a, provided on the framework of the shiftable bed near the middle portion thereof. Each of the shafts being shiftable independently of the other worm-shaft by proper adjustment of the lever 37, it is evident that the two worm-shafts may be driven simultaneously in the same direction in order to turn the worm-gears 45 46 in the same direction; or one worm-shaft may be thrown out of operation and the other worm-shaft may remain in service and in engagement with one of the set of bevel-gears, so as to operate one of the worm-gears 45 46, for a purpose which will hereinafter be described. The pivotal shaft 47 serves to support the weight of the tower, which is of the lazy-tongs construction shown by the drawings, and in view of this fact it is necessary to make said shaft 47 quite substantial in construction.

48 48^a 48^b designate one set of the tower members or links, which are made fast one with the other and with the worm-gear 45, because the member 48 is secured rigidly to said worm-gear 45, and all of the members or links 48 48^a 48^b are united solidly together by a cross-bar 48^c, all of said members or links having their inner portions fitted loosely on the pivotal shaft 47. The other set of links or tower members 49, 49^a, and 49^b are made fast with the other worm-gear 46 and with each other because the member 49 is secured firmly to the worm-gear 46, and the members 49^a 49^b are joined firmly to each other and to the member 49 by another cross-bar 49^c, all of the second set of members 49 49^a 49^b being loosely fitted on the pivotal shaft 47. It will thus be seen that the inner portions of the two sets of members or links are fitted loosely on the pivotal shaft in crossing relation, while one set of the members is fast and movable with one worm-gear, and the other set of members is fast and movable with the other worm-gear. The tower is built up of the links or members 50 51, arranged in crossing relation, pivoted together by the rods 52 and pivoted to the lower members by the other rods 53, and this construction is continuous throughout the height of the tower in order to make the latter extensible to the desired height.

I prefer to equip the lazy-tongs tower with a series of ladders, (indicated by the numerals 54 55,) as represented more clearly by Fig. 2. Each ladder 54 extends parallel with the links 48 50, while the other ladders 55 are parallel to the links or members 51. Each ladder has one end attached or connected in a suitable way to one of the cross-rods 53, while its other end rests upon the other cross-rod, and the ladders provide means whereby a fireman may ascend or descend the tower in a zigzag path. The upper portion of the tower is equipped with an auxiliary ladder 56, which is pivotally connected at 57 to the upper members 51 of the tower, and this ladder is adapted to be adjusted beyond the tower, as represented by Fig. 1, or it may be folded over upon the tower, as shown by Fig. 4.

I will now proceed to describe the means by which the shiftable bed 15 may be adjusted across the wheeled truck or back to its normal position.

59 designates a slidable carriage which is arranged in a horizontal position between two of the rails of the bed-frame 15, and said carriage is provided in its side edges with the grooves 60, the same adapted to receive the guide-ribs 61, which are made fast with the frame of the shiftable bed, as more clearly shown by Fig. 7. The carriage 59 is thus mounted on the shiftable bed, so as to move therewith, and it is capable of a limited slidable adjustment in a horizontal plane. At one end the carriage is provided with a vertical shaft-bearing 62, in which is journaled a vertical adjusting-shaft 63, the lower portion of which is provided with a spur-gear 64, while the upper portion is equiped with a bevel-gear 65. (See Fig. 4.) The spur-gear 64 of said shaft is arranged between the internally-toothed rack 17 and the fixed gear 19 and according to the position of the carriage 59, and this gear 64 is adapted to mesh with the fixed gear 19 or with the rack 17. The adjusting-shaft 63 is adapted to be driven from the counter-shaft 22, which, it will be recalled, is driven by the shaft 13 from the prime shaft 10, and to accomplish this end I provide the slidable carriage 59 with an upstanding arm 66, which is constructed with a bearing 67, that is sleeved on the counter-shaft 22. The counter-shaft 22 is provided

with a longitudinal key or feather 68, and in the bearing 67 is loosely fitted a tubular shaft 69^a, the same having a groove which receives the feather 68, and said tubular shaft is furthermore provided with a bevel-gear 69, that is arranged to have intermeshing engagement with the bevel-gear 65 on the vertical adjusting-shaft 63. It will be observed that the shaft 63 and its two gears are adjustable with the carriage and that the tubular shaft 69^a, with the gear 69, is also adjustable with the carriage; but the tubular shaft and its gear being splined to the counter-shaft the motion of the latter will be transmitted by the gears 69 and 65 to the adjusting-shaft 63 at all points of its adjustment, whereby the gearing will transmit the motion of the counter-shaft 22 to the pinion 64 when it is desired to shift the position of the bed.

The adjustment of the carriage 59 and its contained parts may easily be effected through the medium of a lever 70, which is fulcrumed at a point intermediate of its length on a stud of a plate 71, that is fixed to a portion of the framework of the shiftable bed. The lower portion of this lever is connected by a link 72 to the carriage, and the upper portion of said lever is equipped with a latch 73, arranged to have engagement with a notched segment 74, which is secured to the bed-frame. By moving the lever in one direction the carriage will be adjusted to make the gear 64 intermesh with the fixed gear 19, and the motion of the shaft 22 will cause the bed to swing or turn in one direction around the axis afforded by the vertical shaft 13, whereby the entire bed 15 and the extensible tower may be adjusted to a position at right angles to the length of the wheeled truck, as shown by Fig. 2. A reversal of the lever 70, however, will draw the carriage in an opposite direction and make the gear 64 mesh with the internally-toothed rack 17, and the described train of gearing transmits the motion of the counter-shaft 22 to the pinion 64 for the purpose of swinging the bed 15 back to its normal alined relation to the truck 5. Of course the carriage 59 may be adjusted in a position which places the pinion 64 free from engagement with the rack 17 and the gear 19, thus allowing the bed 15 to remain at rest.

It is desired to provide means which will lock the shiftable bed in its adjusted position, so as to maintain it steadily in place, and as one means for accomplishing this end I have equipped the bed 15 with the locking-posts 75 75^a, the same arranged at the rear corners of the apparatus and fitted in suitable guides 76, provided on the shiftable bed. Each post is furthermore provided with a toothed rack 77, each rack having intermeshing engagement with a gear-pinion 80. The gear-pinions associated with the two posts are made fast with the shafts 78 78^a, which are journaled in proper bearings 79, secured to the shiftable bed, each shaft having a suitable hand-wheel 81 for its convenient manipulation. When the apparatus is in service with the shiftable bed adjusted to its alined position relative to the truck or adjusted transversely thereto, as shown by Fig. 2, the hand-wheel 81 may be rotated in order to make the gears lower the posts 75 75^a firmly into engagement with the ground, whereby said posts serve to steady the bed in its adjusted positions.

With the apparatus I have associated fire-escape devices adapted to quickly and safely transport a person from an upper story of a burning building to the ground, and these devices are operable independently of the other services for which the apparatus is designed. I employ an escape-cable 82, which is guided by suitable sheaves 83 84 at the front and rear upper portions of the tower, one end of this cable being connected to a suitable basket or cage 85. The other end of the cable is coiled around a drum 86, that is loosely mounted on a shaft 87, so as to be free to slide endwise thereon and to rotate on its axis. This shaft is journaled in suitable bearings 88, provided on the frame of the shiftable bed, as shown more clearly by Fig. 8, and to the shaft is secured a gear-pinion 89, which has intermeshing engagement with a spur-gear 90, that is made fast with the transverse shaft 25, (see Figs. 3 and 4,) whereby the drum-shaft may be driven by motion derived from said transverse shaft 25. This shaft 87 is also provided with a fast clutch member 91, that is in opposing relation to a shiftable clutch member 92, which is provided on the drum 86, and this drum is provided at its opposite end portion with a groove 93, that is arranged to receive the pins 94^a of a shipper-lever 94, the latter being fulcrumed to the framework of the bed and having its handle end disposed in convenient position, as shown more clearly by Fig. 3. The drum is furthermore provided with a brake-surface 96, which is partially encompassed by a brake-band 95, the latter being secured or fastened at one end, as at 97 in Fig. 10, and having its opposite end portion secured to a treadle-lever 98. When the cage is occupied by one or more persons, the lever 94 is in a position wherein the drum is unclutched from the shaft and the brake-treadle 98 is depressed, so as to draw the brake-band tightly around the drum. The pressure on the treadle-lever may now be released, so as to permit the basket and its load to descend by gravity, and thereby draw on the cable 82, so as to uncoil said cable from the drum. After the load is discharged from the basket or cage the brake is released and the lever 94 is adjusted in a direction to move the drum 86 to a position wherein the clutch member 92 will engage with the clutch member 91. The drum is thus made fast with the shaft, and the latter is rotated through the gears 89 90, whereby the cable 82 may be coiled on the drum, so as to raise the cage or basket 85 into position to receive another load.

The operation of the apparatus may be sum-

marized as follows: With the drum-shaft 10 constantly rotating in one direction it is necessary to shift the levers 37 to the positions indicated in Fig. 2 when it is desired to raise the tower to a vertical position, which is indicated by dotted lines in Fig. 1. The adjustment of the levers 37 to the prescribed positions moves the shafts 30 31, so that the gears 30ª and 31ª will have intermeshing engagement with the gears 28 and 29, whereby the shafts 30 31 will both be brought into service for rotation in a common direction and adapted to drive the two worm-gears 45 46 with equal angular velocity. These worm-gears will be turned in corresponding directions and impart motion to the lazy-tongs tower, whereby the latter will be extended or unfolded in a plane perpendicular to the shiftable bed 15 and as represented by dotted lines in Fig. 1. To lower the tower to its folded compact position upon the truck, (shown by Fig. 4,) the levers 37 are adjusted in order to reverse the positions of the shafts 30 31 and make the bevel-gears 30ª 31ª have intermeshing engagement with the gears 28ª 29ª on the transverse shaft, whereby the two worm-shafts will be simultaneously rotated in the reverse direction, so as to impart like motion, and with equal angular velocity, to the worm-gears. One advantage of the worm-gear between the shafts 30 31 and the lower elements of the tower is that the parts of the tower will be locked in position, which is especially advantageous when the tower is extended or adjusted for service, because the worm-gearing dispenses with separate locking mechanism. If the tower is raised to its vertical position and it is desired to give a leaning appearance thereto in a direction toward the rear part of the apparatus, as shown by full lines in Fig. 1, the worm-shaft 31 is adjusted for its bevel-gear 31ª to lie between and out of mesh with the set of bevel-gears 29 29ª, whereas the other worm-shaft 30 is adjusted so as to make its bevel-gear 30ª engage with the bevel-gear 28. The motion of the transverse shaft 25 is thus transmitted, through the gears 28 30ª, to the shaft 30, which turns one worm-gear 45 of the two worm-gears 45 46 on the pivotal shaft, and thus the members 48 48ª 48ᵇ of the tower will be raised and the other parts of the tower will be shifted, so as to make the structure assume the leaning position represented by Fig. 1. To bring the tower back to its vertical position, it is necessary to reverse the worm-shaft 30 in a direction to bring its gear 30ª into mesh with the other gear 28 of the set of opposing bevel-gears on the transverse shaft, and thus the tower may be given the leaning adjustment or brought back to normal position by motion derived from the prime shaft.

The position of the bed 15 on the truck may be changed either when the tower is in its unfolded position or in its extended position, and when it is desired to swing the bed-tower around to the position of Fig. 2 the lever 70 is adjusted for the gear 64 to mesh with the fixed gear 19; but to reverse the bed the lever 70 is moved in an opposite direction and the gear 64 meshes with the rack 17. The locking-posts 75 75ª may be brought into service when the bed is shifted to its transverse position, and the escape-cage and its cable may also be employed at any period in the adjustment or service of the tower except when the latter is folded.

Changes within the scope of the appended claims may be made in the form and proportion of some of the parts while their essential features are retained and the spirit of the invention is embodied. Hence I do not desire to be limited to the precise form of all the parts as shown, reserving the right to vary therefrom.

Having thus described my invention, what I claim as new is—

1. In an apparatus of the class described, the combination with a lazy-tongs tower, of a pivotal shaft on which the lower members of the tower are mounted, gear elements secured fast to different sets of the tower members and adapted to independently or simultaneously actuate the same, adjusting-shafts operatively connected with said gear elements, a single transverse shaft disposed adjacent to said adjusting-shafts and provided with sets of facing gears adapted to mesh separately with gears on the adjusting-shafts, means for rotating the transverse shaft in one direction, and means for individually shifting the adjusting-shafts into meshing relation to either of the sets of gears on the transverse shaft, as and for the purposes described.

2. In an apparatus of the class described, the combination of a wheeled truck, a bed shiftably mounted thereon, a lazy-tongs tower supported by the bed, a prime shaft mounted on the truck, a transverse shaft and a counter-shaft mounted on the bed and driven from the prime shaft, shiftable tower-adjusting shafts mounted on the bed and adapted to be driven individually or collectively from the transverse shaft for raising, lowering or inclining the tower by motion derived from the prime shaft, and bed-adjusting devices having means geared to the counter-shaft and to the truck for swinging the bed and its contained tower on a vertical axis, substantially as described.

3. In an apparatus of the class described, the combination of a pivotal shaft, the worm-gears loosely mounted thereon, a lazy-tongs tower having its lower members loosely mounted on the pivotal shaft and with the different sets of lower members made fast with the worm-gears individually, the worm-shafts loosely supported at one end and operatively connected with the worm-gears, a transverse shaft provided with different sets of facing bevel-gears, and means for shiftably

supporting the free ends of the worm-shafts with relation to said facing sets of bevel-gears, substantially as described.

4. In an apparatus of the class described, the combination of a pivotal shaft, worm-gears individually mounted thereon, a tower having its lower members made fast with the worm-gears respectively, a transverse shaft provided with sets of facing gears, cross-bars adjacent to the transverse shaft, shaft-bearings slidably mounted on the cross-bars and having suitable means for individually operating the same, worm-shafts loosely supported at one end, journaled at their other ends in the shiftable shaft-bearings and having intermeshing engagement with the worm-gears, and bevel-gears on the worm-shafts and arranged to be engaged with either bevel-gears of the sets and to be free from engagement therewith, substantially as described.

5. In an apparatus of the class described, the combination of a wheeled truck, a shiftable bed thereon, a prime shaft carried by the truck, a lazy-tongs tower mounted on the bed, the transverse shaft on the bed, the shiftable worm-shafts mounted on the bed and geared to worm-gears on the tower-sections and adapted to be driven by the transverse shaft, a counter-shaft geared to the transverse shaft and to the prime shaft, opposing gears mounted on the truck and a shiftable carriage, and a shaft journaled in the carriage and driven from the counter-shaft and adapted to engage with either of said opposing gears, substantially as described.

6. In an apparatus of the class described, the combination of a wheeled truck, a bed shiftable thereon, a tower supported by the bed, a prime shaft, a vertical shaft geared to the prime shaft, a counter-shaft driven from the vertical shaft, the fixed gear and the annular rack supported by the wheeled truck, a shiftable carriage supported by the bed, and a shaft driven from the counter-shaft and adapted to be adjusted with the carriage and carrying a gear to engage either with the fixed gear or with the rack, substantially as described.

7. In an apparatus of the class described, the combination of a wheeled truck, a shiftable bed mounted thereon and carrying a tower, a fixed gear on the truck, an internally-toothed rack fixed to the truck, a slidable carriage on the bed, a shaft mounted in the carriage and having a gear arranged to mesh either with the fixed gear or with the annular rack, means for adjusting the carriage, and means for rotating the shaft in the carriage, substantially as described.

8. In an apparatus of the class described, the combination of a wheeled truck, a shiftable bed thereon, a fixed gear on the truck, an internally-toothed rack fixed to the truck, a counter-shaft mounted on the bed and provided with a spline, a tubular shaft engaging with the counter-shaft and its spline and having a bevel-gear, a carriage slidably fitted on the bed and provided with two bearings, one of which supports the tubular shaft, an adjusting-shaft mounted in the carriage and having a bevel-gear which intermeshes with the first-named bevel-gear and provided with a spur-gear arranged to engage either with the rack or with the fixed gear, a lever connected with the carriage, and means for rotating the counter-shaft, substantially as described.

In witness whereof I have hereunto set my hand in the presence of two witnesses.

PETER MACRAE.

Witnesses:
GEORGE GALLUP,
ALBERT ELLSWORTH, Sr.