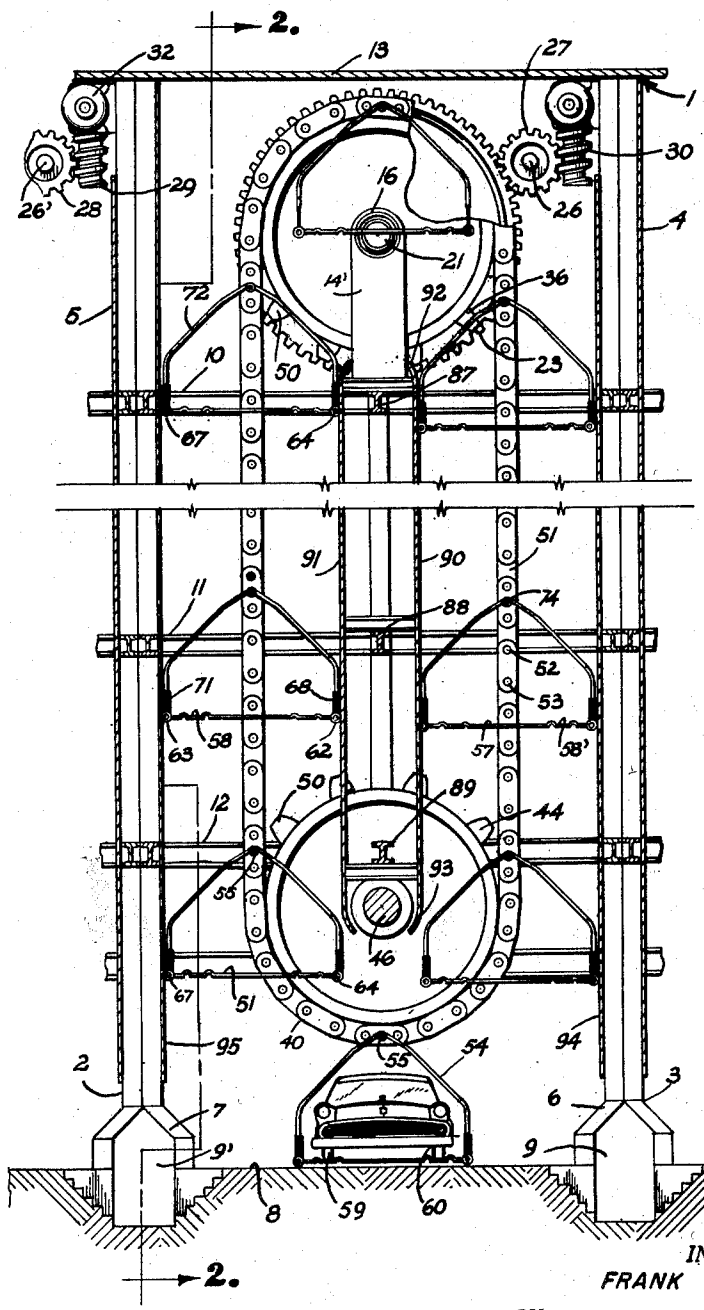
Dec. 24, 1957 F. HODOUS 2,817,446

APPARATUS FOR PARKING AUTOMOBILES

Filed May 11, 1955 3 Sheets-Sheet 1

Fig. 1.



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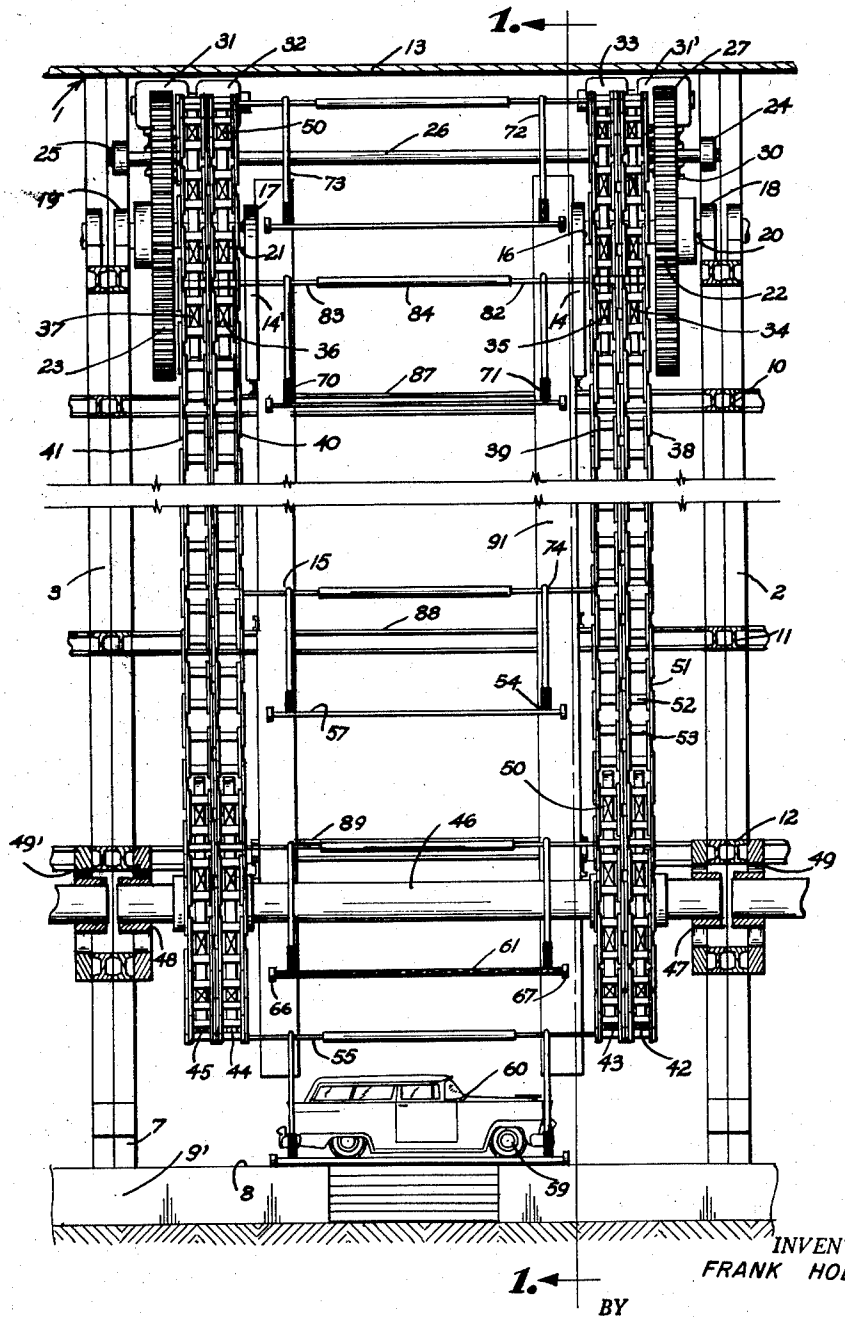
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APPARATUS FOR PARKING AUTOMOBILES

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Fig. 2.



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APPARATUS FOR PARKING AUTOMOBILES

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Fig. 4.

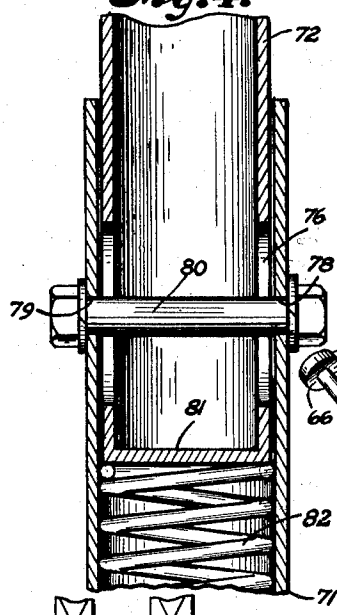


Fig. 3.

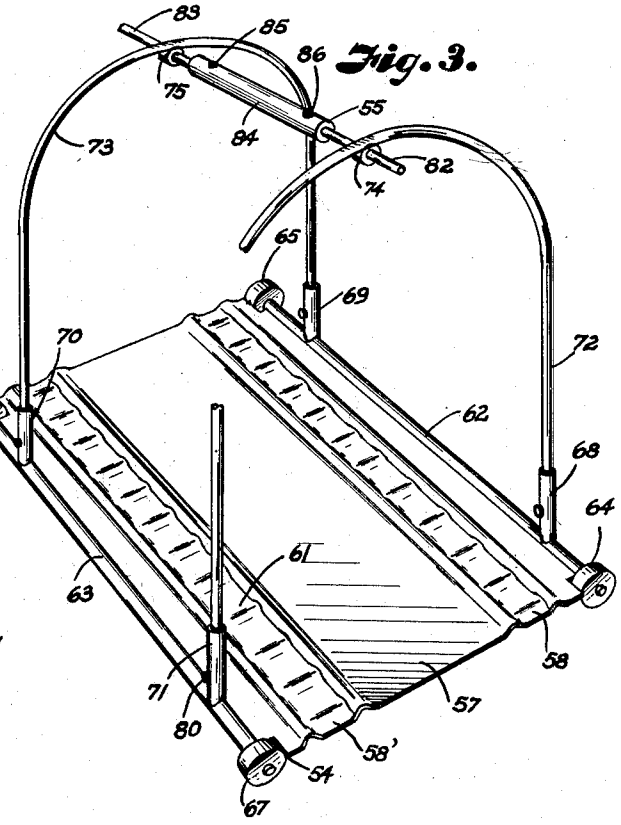
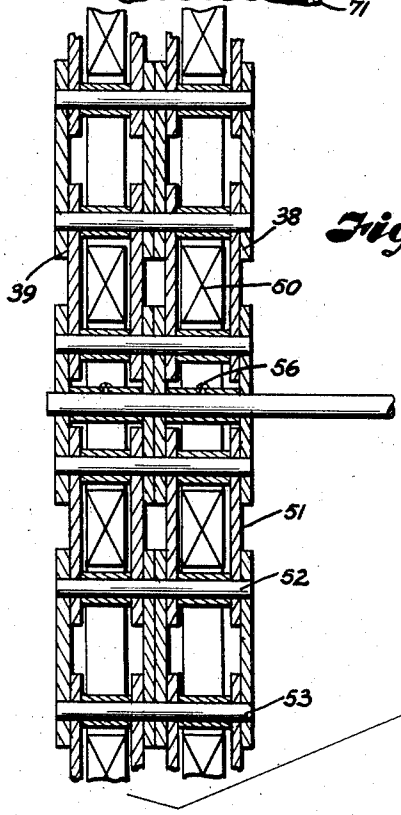
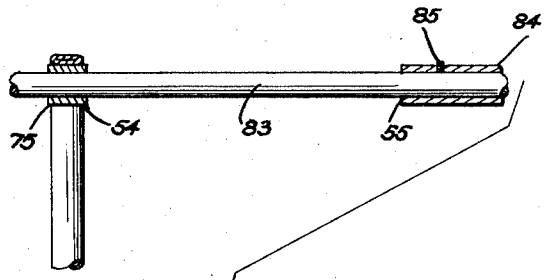


Fig. 5.





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2,817,446

APPARATUS FOR PARKING AUTOMOBILES

Frank Hodous, Billings, Mont.

Application May 11, 1955, Serial No. 507,558
7 Claims. (Cl. 214—16.1)

This invention relates to parking devices for automobiles, and the like, and for storing the same, and has particular reference to an elevator-type mechanism having a plurality of cages or the like, onto which the automobiles are driven to be elevated for storing and which may be lowered to the surface to be driven therefrom.

This invention has for its principal purpose an improved, simple, smooth, efficient and trouble-free operation of an elevator or endless conveyor type of automobile parking, whether inside or outside of a building. It may be utilized to park as great a number of cars on a given floor or ground area as any construction now known or existent, with a more rapid parking and release from parking than any other construction now known or existent.

The apparatus may be constructed in units, to which more units may be added, both sideways and lengthwise and to any height that parking conditions may require.

For illustration: In a construction of seven units lengthwise and five units sideways, thirty-five cars can be parked at the same time by merely stopping the car on the lowermost cages and the same number of cars can be released from parking at the same time by merely getting into cars and driving out in forward motion. Both parking and release from parking can be repeated in short spaces of time until the construction is either filled or vacated. It is to be noted that to maintain a trouble-free operation, a number of the parts have been duplicated and the construction is such that repairs or replacements may be made with the last possible delay and without hindrance to the parking and delivery of cars in the units.

Each unit will be separately operated by reversible motors and so electrically connected to a single panel board in a convenient location so that any car or cage may be brought to any desired position, either clockwise or counterclockwise, whichever is desired, by pressing a button on the board.

This construction further provides a dual automatic compensation for expansion and contraction of materials used and for wear and tear of moving parts so the car cage platforms will always rest firmly on the floor, whereby cars can be driven on and off from a solid base.

Furthermore in the assemblage of any number of units of this construction, there is provided a passage or walkway so that a driver or owner can always depart after parking and return to his car to leave parking with safety from the moving parts of other units.

The principal object of the invention, therefore, is to provide a mechanism for elevating and storing of automobiles having automatic means for compensating for expansion and contraction and for eliminating wear of the elevating or moving parts.

Other objects of the present invention are to provide a frame mechanism for supporting and rotating an elevating mechanism; to provide motors mounted on a frame structure at the upper portion thereof for raising and lowering the cages in which the automobiles are housed;

to provide means for removably fastening the carriages to the lifting chains of the mechanism; to provide means in the elevating mechanism whereby the tension will remain substantially constant on the elevating mechanism; to provide means on the cages for contacting the framework structure for guiding the cages therealong; to provide cages with means for resiliently mounting the platforms therein; to provide the platform of the cages with corrugations or the like to prevent rolling of the automobiles therefrom; to provide means for lowering a cage to the surface of the floor of the building or parking space so that the vehicle may be driven directly onto the cages or off from the cages as desired, and to provide means for moving the cages from one column of the framework structure to the other and maintaining the cages in upright position.

In accomplishing these and other objects of the invention, I have provided improved details of structures, the preferred form of which is illustrated in the accompanying drawings wherein:

Fig. 1 is a vertical cross-sectional view of one unit of the invention showing the cages attached to the rotating mechanism with one of the cages in lowered position and the corner uprights of two abutting units side by side and the passageways for pedestrians.

Fig. 2 is a vertical cross-sectional view from the side of the device particularly illustrating the floating shaft for compensating for expansion and contraction and wear on the chains and the shafts across the top carrying gears for operating the elevating mechanism.

Fig. 3 is a perspective view of one of the cages illustrating the corner posts and connection to the elevating chains and the rollers at the four corners of the platform of the cage for engaging the frame when being elevated or lowered and acting as a running gear for the cage when contacting floor.

Fig. 4 is an enlarged cross-sectional view of one of the corner posts of the cages particularly illustrating the resilient mounting of the platform thereon for the purpose of recompensation of the movement of the platform when the cage is lowered to the floor.

Fig. 5 is an enlarged cross-sectional view of apparatus for attaching the cages to the elevating chains.

As stated above, the structure of this device is particularly adapted to compensate for expansion, contraction, and wear of the elevating parts, and particularly the lower shaft having bearings in sliding movement for compensation for the expansion and contraction of the chain links and the resilient mounting of the corner posts of the carriage so that when the rollers on the carriage contact the floor, as shown in Fig. 1, the resilient mounting will also compensate for the length of the rotating chains to additionally assure that the loading platform will always be constantly on the surface of the garage or parking space.

Referring more in detail to the drawings:

1 designates a parking or storage elevator embodying the improvements of this invention comprising corner posts or columns 2 and 3. While I have here illustrated only one column for the elevating of cars, it will be obvious that any number of columns may be constructed side by each, or end to end, as desired. Each column will be referred to as a unit. The posts 2 and 3 constitute the side posts of one unit, which may be affixed in a suitable manner to the posts 4 and 5 of an adjoining unit. These posts or columns are offset at their respective lower corners of the framework structure as indicated at 6 and 7, as best illustrated in Fig. 1, and mounted on a base or loading surface 8.

It will be noted that the enlarged portions provide runways 9 and 9' to provide a safe place for the customers or drivers of the automobiles to walk through the

structure to the place of entry to their automobile, or when emerging therefrom to go through such runways to the outside of the parking area.

The framework structure consists of a plurality of horizontal rails **10**, **11**, and **12**, although any number may be used, depending on the height of the structure, and a cross head **13** is provided at the top of the structure. Mounted upon the horizontal rail **10** and spaced inwardly from the posts **2** and **3** are vertical standards or the like, **14** and **14'**. These standards may be placed between each of the horizontal rails as desired. Bearings **16** and **17** are mounted upon the vertical standards **14** and **14'** and bearings **18** and **19** are mounted on the posts **2** and **3** for accommodating short shafts **20** and **21**, on which are mounted gears **22** and **23**. Gears **27** and **28** are mounted on the shafts **26** and **26'** and mesh with worms **29** and **30**, having connection with gear reduction boxes **31** and **31'**, operated from motors **32** and **33**, mounted upon the upper portions of the framework structure in a suitable manner, and also meshing with the gears **22** and **23**.

Also mounted upon the shafts **20** and **21** are sprockets **34**, **35**, **36**, and **37**, respectively, for accommodating pairs of link chains, or the like, **38**, **39**, **40**, and **41**, respectively.

The lower end of the chains **38**, **39**, **40**, and **41** operate over pairs of sprockets **42**, **43**, **44**, and **45**, mounted upon a shaft **46** having its ends engaging in bearings **47** and **48**, which in turn are slidably engaged in bearings **49** and **49'** secured to the frame upright posts **2** and **3** and horizontal beam **12**, so as to provide for vertical sliding movement of the shaft **46** to compensate for expansion and contraction of the chains running over the sprockets.

The sprockets are provided with teeth **50** over which the endless chains **38**, **39** and **40—41** run at the respective upper and lower portions of the framework structure. The chains are composed of links **51**, assembled with pins **52—53**, as is the usual practice. At spaced intervals the chains pivotally mount a plurality of cages **54** through a sleeve ridge pole or rod **55**. It is understood that the links are provided with what is known as "blind" and "open" link parts, through which the sleeved ridge pole of the cage is extended. The pole **55** is connected to the "blind" portion of the links by set screws or the like **56** and the poles are removably connected therein so that each individual cage may be removed for repair or otherwise as desired without disassembling the elevating mechanism.

Each cage comprises a platform or base **57** having runways **58** and **58'** for the wheels **59** of an automobile **60**, the runways being corrugated as indicated at **61** to prevent the automobiles from rolling therefrom without power should the brakes become loosened. The platform comprises side rails **62** and **63**, provided with rollers **64**, **65**, **66** and **67** at each corner of the platform. Mounted on the side rail **62** and **63** are upright tubular members **68**, **69**, **70** and **71**.

Substantially U-shaped tubular members **72** and **73** have their respective free ends telescoped in the tubular members **68**, **69**, **70** and **71**, respectively, with the curved upper portions secured to the ridge pole **55** through suitable bearings **74** and **75** welded or otherwise suitably secured to the underside of the upper portions of the U-shaped member, as best illustrated in Fig. 3. The free ends of the tubular members **72** and **73** are provided with aligned slots as indicated at **76** (Fig. 4) and the tubular members **64**, **65**, **66**, and **67**, have aligned openings **78** and **79** adapted to receive a pin or bolt **80** to telescopingly mount the respectively tubular members together. The lower ends of the tubular members **72** and **73** are closed as indicated at **81**, Fig. 4, and a coil spring **82** engages against the end **81** and against the side rails **62** or **63** of the platform, so that when the rollers **64**, **65**, **66** and **67** contact the surface of the garage, pressure will be exerted on the spring **82** to recompensate for expansion and contraction of the chain elevating mechanism.

The ridge pole **55** comprises two rods **82** and **83** extending through the bearings **74** and **75** respectively and are sleeved into a tubular member **84**. The outer ends of the rods are secured in the links **51** by the set screws **56**. The ends of the rods **82** and **83** are spaced apart in the tubular member **84** and are held by set screws or the like, **85** and **86**, so that when it is desired to remove a cage from the assembly, the set screws **56** and **85** and **86** may be loosened and the rods **82** and **83** may slide therein and through the bearings **74** and **75** to remove the ridge pole from the chains without dismantling the chains.

The rollers also perform the function of contacting the surface or floor of the base structure **8** of the garage or parking area immediately upon the cage descending thereto to provide a running gear for the cage and a firm base for the automobile to be driven onto and off of the platform of the cage.

Secured to the respective cross members **10**, **11**, and **12** of the framework structure by suitable means and running transversely thereof, are beams or members **87**, **88**, and **89**, and mounted thereon are inner guide members **90** and **91**, as best illustrated in Fig. 1. The respective ends of the guide members are turned slightly inwardly, as indicated at **92** and **93**. Also secured to the side posts **2** and **3** are outer guide members **94** and **95**.

The rollers **64**, **65**, **66**, and **67**, respectively, engage the guide members **90**, **91**, **94**, and **95**, respectively, for guiding of the cages in their path of travel upwardly and downwardly in the column as best illustrated in Fig. 1 and prevent sidewise tipping of the cages during the ascending or descending movement.

It will be obvious the lower shaft **46** is suspended in the bearings **49** and **49'** through the sprocket and chain arrangement from the upper shafts **20** and **21**. In the event there should be expansion or contraction in the chain elevating structure, this will be compensated for through the sliding bearings arrangement of the lower shaft **46**, and when the cage approaches the floor, the rollers will contact the same and rotation of the chain will carry the cage with the automobile thereon to the lowermost position shown in Fig. 1 so that the car may be removed therefrom. The spring loaded tubular members of the cage will automatically recompensate for the expansion and contraction of the elevating mechanism so that the platform of the cage will always remain flush with the surface of the parking area or garage floor.

It will be obvious that the motors **32** and **33** through the rear gear reduction box and worm gears **29** and **30** meshing with the gears **27** and **28**, which in turn meshes with the sprockets will rotate the cage structure including the chain links to elevate and lower the cages as desired.

Operation of a device constructed and assembled as described is as follows:

The cage **54** is placed in the lowermost position on the surface **84** of the garage and an automobile, or the like, driven directly onto the platform of the cage by the attendant or by the owner. The motors **32** and **33** are then energized through suitable control means (not shown), to operate the gears and the sprockets to drive the shafts **20** and **21** and **26**, causing the chains to rotate on the sprockets to move the cages carrying the automobile either in a clockwise or anti-clockwise direction, one of the principal features of my invention being to provide a structure wherein one automobile parked part way up on the left-hand side of the column may be lowered therefrom, instead of going over the top and down the opposite side, as is the usual practice. Upon descent of the cage to the floor, the automobile is driven from the platform as desired.

It will be obvious that the cages may be stopped at any position in the structure, or reversed, at the will of the

operator. When the owner calls for his car, the attendant will lower the cage to the bottom position in the shortest direction to the surface of the garage.

It will be obvious that my structure may be built to any desired height or as many columns, side by each, or end to end, as desired, and it will also be obvious that the owners of the automobiles may enter the structure and move from their automobiles or return thereto through the runways without danger from moving structures.

It will be obvious from the foregoing that I have provided an improved, simple, efficient, and trouble-free operation of an elevator construction for parking and storage of automobiles or the like.

What I claim and desire to secure by Letters Patent is:

1. An automobile parking device comprising, a framework structure forming spaced vertical columns interconnected at their ends, a floor at the lower connected ends, coaxial bearing members carried by said framework structure at the upper portion thereof, elongated bearing members near the lower portion of said framework structure above said floor, shafts rotatably supported in said bearing members, the upper shafts being in fixed position and the lower shaft being slidable in the said elongated bearing member, pairs of sprockets on the respective ends of the upper and lower shafts, pairs of endless chains having pivotally connected links operating over the respective aligned upper and lower sprockets, each chain having a path of movement in a vertical plane defined by the respective upper and lower sprockets, a plurality of horizontal rods extending between the respective chains, means for removably securing the rods to the chains, cages having floors and open ends for carrying automobiles pivotally suspended from the horizontal shafts between the chains, means resiliently mounting the cage floors to the cages, said cages resting on the floor at the lower connected end of the columns at the lowest point of travel of the chains, rollers on the respective corners of the platform for contacting the sides of the columns and for guiding said cages in their path of travel and for contacting the floor when the cage is at its lowest point of travel, gear drive means mounted on the upper portion of the frame structure having connection with said sprockets, and means for driving said drive means for rotating said sprockets to rotate the upper shafts and effect simultaneous movement of the chains for raising and lowering the cages.

2. An automobile parking device comprising, a framework structure forming spaced vertical columns interconnected at their ends, a floor at the lower connected ends, shafts rotatably supported on the framework structure at the upper and lower connected ends, the lower shaft being located above said floor, bearing members for said shafts carried by the framework structure, the lower bearing member being elongated to allow the shaft to slide therein, pairs of sprockets on the respective ends of said upper and lower shafts, said upper and lower sprockets having a fixed diameter substantially equal to one-half the spacing of the vertical centers of the columns, pairs of endless chains having pivotally connected links operating over the respective aligned upper and lower sprockets, each chain having a path of movement in a vertical plane defined by the respective upper and lower sprockets, said chains traveling in opposite directions in the columns and in curved paths at the interconnected ends, said elongated bearings at the lower end of the structure allowing movement of the lowermost shafts to accommodate for expansion and contraction of said chains, a plurality of horizontal shafts extending between the respective chains, means removably connecting the horizontal shafts to said links whereby one of said shafts may be removed without affecting operation of the remaining shafts, cages having floors and open at the ends for carrying automobiles pivotally suspended from the horizontal shafts between the chains, said cage floors being resiliently mounted on the cages and substantially resting on the floor at the lower connected end of the columns at the lowest point of travel in the lower curved path of movement of the chains, gears fixed to the upper shafts in spaced relation to the ends of the cages, a drive gear, means for mounting said drive gear in relation to the driven gear, and drive means for rotating the driving gear to drive the upper shaft and effect simultaneous movement of the chains for raising and lowering the cages.

3. An automobile parking device comprising, a framework structure forming spaced vertical columns interconnected at their ends, a floor at the lower connected ends, bearing members carried by said framework structure at the upper and lower ends thereof, the lowermost bearing being elongated, shafts rotatably supported in the bearing members, the upper shafts being in fixed position and the lower shaft being slidable with respect to the lowermost bearing members, the lower shaft being located above said floor, pairs of sprockets on the respective ends of the upper and lower shafts, pairs of endless chains having pivotally connected links operating over the respective aligned upper and lower sprockets, each chain having a path of movement in a vertical plane defined by the respective upper and lower sprockets, a plurality of horizontal rods extending between the respective chains, means for removably securing the rods to the chains, cages having floors and open ends for carrying automobiles pivotally suspended from the horizontal rods between the chains, means resiliently mounting the cage floors to the cages, said cages resting on the floor at the lower connected end of the columns at the lowest point of travel of the chains, gear drive means mounted on the upper portion of the frame structure having connection with said sprockets, and means for driving said drive means for rotating said sprockets to rotate the upper shafts and effect simultaneous movement of the chains for raising and lowering the cages.

4. An automobile parking device comprising, framework structures each forming spaced vertical columns interconnected at their upper ends, said framework structures being capable of being arranged in side-by-side relation forming a plurality of vertical parking spaces, adjacent columns of the frameworks in side-by-side relation being secured together, the lower ends of the columns in each framework being sloped inwardly and downwardly relative to the respective parking spaces forming base members, a floor adjacent the lower ends of the columns adapted for movement of motor vehicles thereover between said columns, said floor having portions at a lower level extending between the base members of adjacent mating columns providing passageways below the vehicle supporting floor for the occupants of the vehicles to move to and from said vehicles, shafts rotatably supported on the framework structure at the upper and lower ends, the lower shaft being located above said floor, bearings in said framework structure for said shafts located at the upper and lower portions thereof, the lowermost bearings being elongated, pairs of sprockets on the respective ends of said upper and lower shafts, said upper and lower sprockets having a fixed diameter substantially equal to one-half the spacing of the vertical centers of the columns, pairs of endless chains having pivotally connected links operating over the respective aligned upper and lower sprockets, each chain having a path of movement in a vertical plane defined by the respective upper and lower sprockets, movement of the lowermost shaft in said elongated bearing member accommodating expansion and contraction of said chains, a plurality of horizontal shafts extending between the respective chains, means connecting the said horizontal shafts to said links, cages having floors and open at the ends for carrying vehicles pivotally suspended from the horizontal shafts between the chains, gears fixed to the upper shafts in spaced relation to the ends of the cages, a drive gear, means for

mounting said drive gear in relation to the driven gear, and drive means on the upper portion of the structure for rotating the driving gear to drive the upper shafts and effect simultaneous movement of the chains for raising and lowering the cages.

5. In a motor vehicle parking apparatus, a framework structure forming spaced vertical columns interconnected at their ends, a floor at the lower end adapted for movement of motor vehicles thereover between said columns, upper and lower shafts in the framework, bearing means fixed adjacent the upper end of the framework rotatably supporting the upper shafts on a fixed axis, bearing means adjacent the lower end of the framework rotatably and slidably mounting the lower shaft for vertical movement relative said framework, pairs of sprockets on the respective ends of the upper and lower shafts, pairs of endless chains having pivotally connected links operating over the respective aligned upper and lower sprockets whereby said chains support the lower sprockets and shaft in suspended relation to the upper shafts and the lower shaft will move vertically in response to expansion and contraction of said chains and framework, open ended cage frames having spaced upright members, a cage floor on each cage frame, means mounting said cage floors on the cage frames for vertical movement of the cage floors relative to the cage frames, means in the cage frames limiting relative downward movement of the respective cage floors, means attached to the respective chains and adapted to travel therewith for pivotally suspending the cage frames between said chains, said lower shaft being spaced above the floor, each chain having a path of movement in a vertical plane defined by the upper and lower sprockets whereby at the lowest point of travel of the chains portions of the cage floors of the cage frames will always engage the floor by the cage floor portions being moved automatically vertically relative to the cage frames so as to level and position said cage floor relative to said floor between said columns, and power means operatively connected with the upper shafts for rotating same and effecting simultaneous movement of the chains for raising and lowering the cage frames.

6. In a motor vehicle parking apparatus, a framework structure forming spaced vertical columns interconnected at their ends, a floor at the lower end adapted for movement of motor vehicles thereover between said columns, upper and lower shafts in the framework, bearing means fixed adjacent the upper end of the framework rotatably supporting the upper shafts on a fixed axis, bearing means adjacent the lower end of the framework rotatably and slidably mounting the lower shaft for vertical movement relative said framework, pairs of sprockets on the respective ends of the upper and lower shafts, pairs of endless chains having pivotally connected links operating over the respective aligned upper and lower sprockets whereby said chains support the lower sprockets and shaft in suspended relation to the upper shafts and the lower shaft will move vertically in response to expansion and contraction of said chains and framework, open ended cage frames having spaced upright members, a cage floor on each cage frame, means mounting said cage floors on the cage frames for vertical movement of the cage floors relative to the cage frames, means in the cage frames limiting relative downward movement of the respective cage floors, means attached to the respective chains and adapted to travel therewith for pivotally suspending the cage frames between said chains, said lower shaft being spaced above the floor, each chain having a path of movement in a vertical plane defined by the upper and lower sprockets whereby at the lowest point of travel of the chains portions of the cage floors of the cage frames will always engage the floor by the cage floor portions being moved automatically vertically relative to the cage frames so as to level and position said cage floors relative to said floor between said columns, power means operatively connected with the upper shafts for rotating same and effecting simultaneous movement of the chains for raising and lowering the cage frames, and a plurality of spaced corrugations extending transversely of the cage floors and adapted to engage the vehicle wheels for retaining the vehicles against movement relative thereto during raising and lowering of the cage frames.

7. In a motor vehicle parking apparatus, a framework structure forming spaced vertical columns interconnected at their ends, a floor at the lower end adapted for movement of motor vehicles thereover between said columns, upper and lower shafts in the framework, bearing means fixed adjacent the upper end of the framework rotatably supporting the upper shafts on a fixed axis, bearing means adjacent the lower end of the framework rotatably and slidably mounting the lower shaft for vertical movement relative said framework, pairs of sprockets on the respective ends of the upper and lower shafts, pairs of endless chains having pivotally connected links operating over the respective aligned upper and lower sprockets whereby said chains support the lower sprockets and shaft in suspended relation to the upper shafts and the lower shaft will move vertically in response to expansion and contraction of said chains and framework, open ended cage frames having spaced upright members, a cage floor on each cage frame, means mounting the cage floors on the cage frames for vertical movement of the cage floors relative to the cage frames, means in the cage frames limiting relative downward movement of the respective cage floors, means attached to the respective chains and adapted to travel therewith for pivotally suspending the cage frames between said chains, said lower shaft being spaced above the floor, each chain having a path of movement in a vertical plane defined by the upper and lower sprockets whereby at the lowest point of travel of the chains portions of the cage floors of the cage frames will always engage the floor by the cage floor portions being moved automatically vertically moved relative to the cage frame so as to level and position said cage floors relative to said floor between said columns, power means operatively connected with the upper shafts for rotating same and effecting simultaneous movement of the chains for raising and lowering the cage frames, spaced track members on the cage floors of the cage frames for receiving the wheels of motor vehicles moved thereon, and a plurality of spaced corrugations extending transversely of the track members and adapted to engage the vehicle wheels for retaining the vehicles against movement relative thereto during raising and lowering of the cage frames.

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