

Nov. 25, 1930.

L. D. COOK

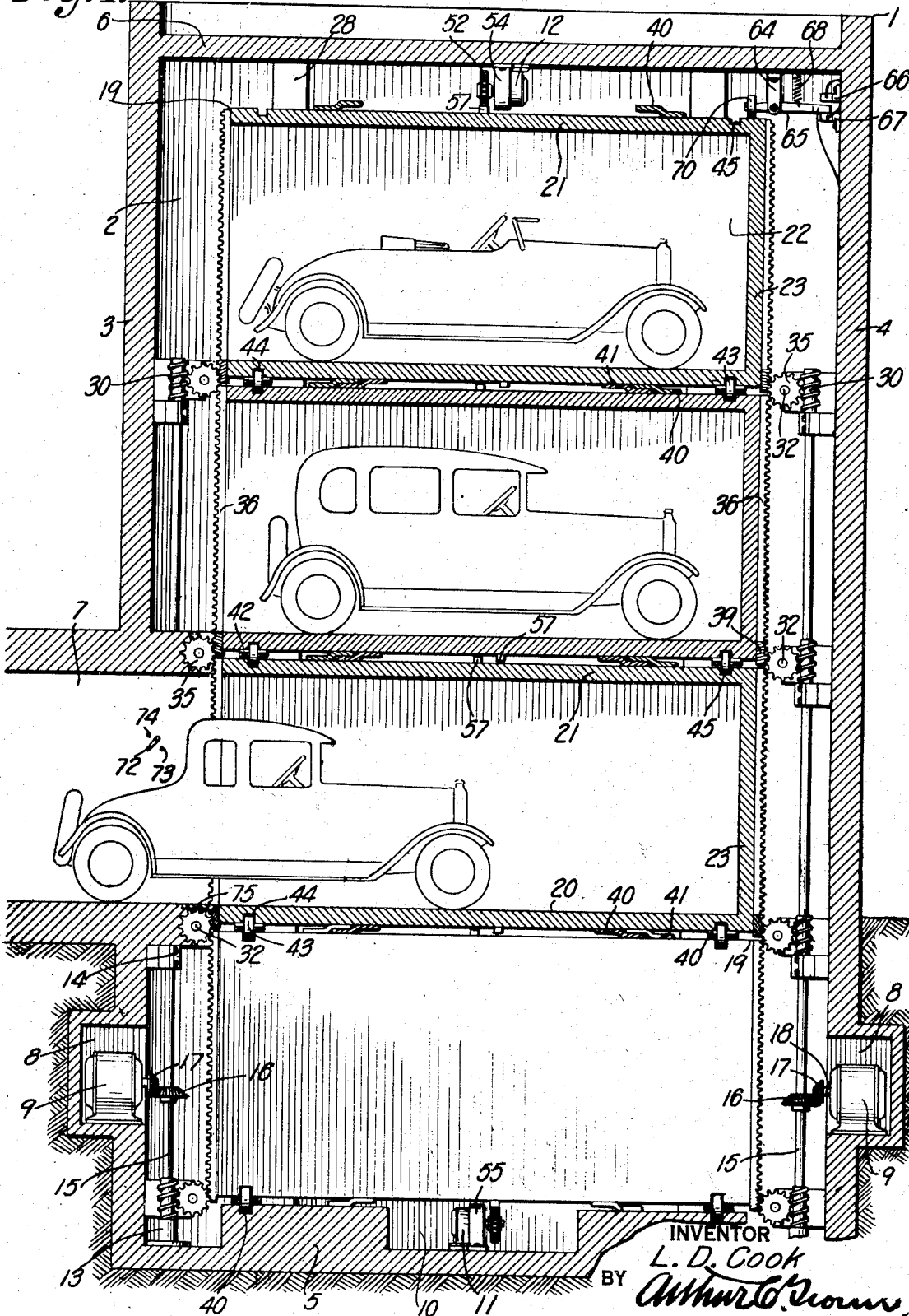
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STORAGE GARAGE

Filed Feb. 1, 1928

4 Sheets-Sheet 1

Fig. 1.



INVENTOR

L. D. COOK

BY

Arthur C. Brown.

ATTORNEY

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L. D. COOK

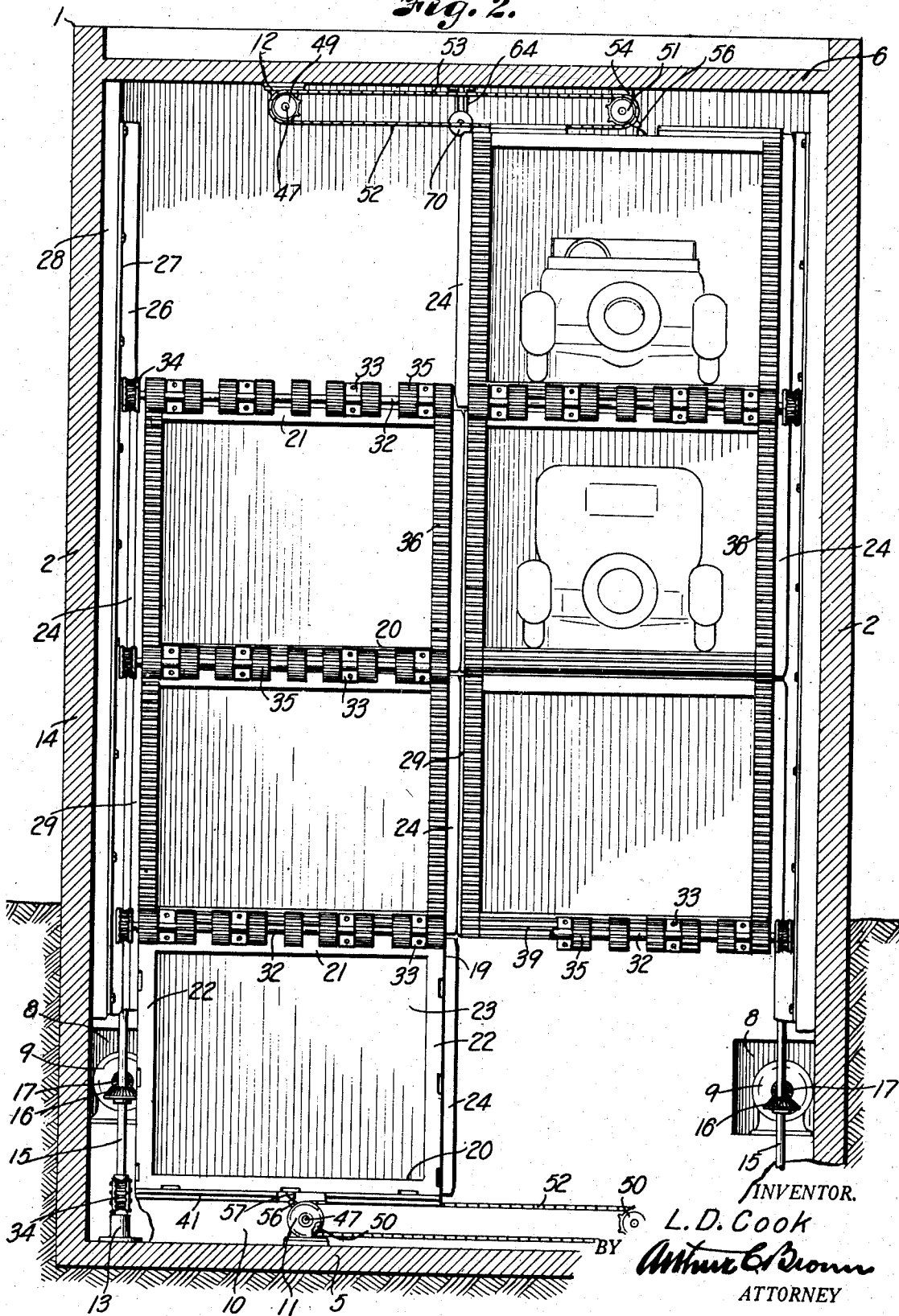
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Fig. 2.



INVENTOR.

L. D. Cook

BY *Arthur C. Brown*

ATTORNEY

Nov. 25, 1930.

L. D. COOK

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Fig. 5.

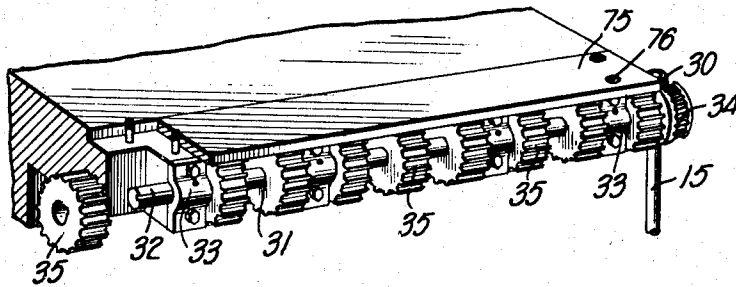


Fig. 6.

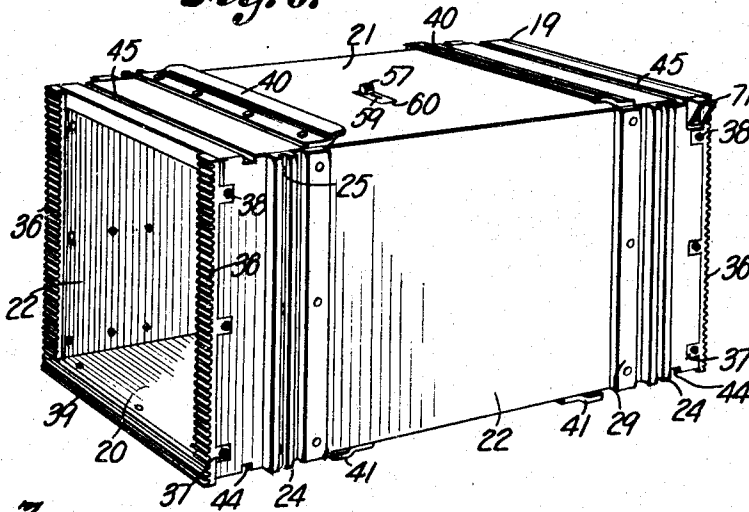
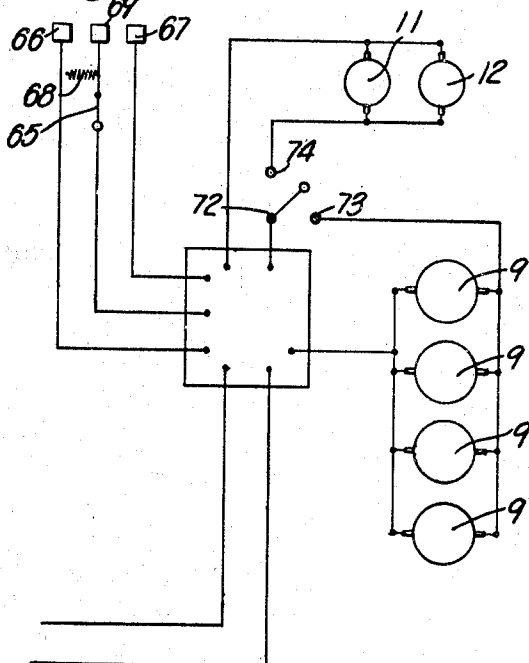


Fig. 7.



INVENTOR.
L. D. COOK
BY *Arthur B. Brown*
ATTORNEY

UNITED STATES PATENT OFFICE

L. D. COOK, OF KANSAS CITY, MISSOURI

STORAGE GARAGE

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My invention relates to storage garages and particularly to that type of garages wherein motor vehicles are conducted to different elevations and disposed in storage spaces in individual cages; the principal objects of the invention being to facilitate the disposition of the cages in and return of the cages from the storage spaces, and to provide for such disposal of the cages as to secure a maximum storage capacity within a given space.

In accomplishing such objects of my invention I provide for elevation and return of the individual vehicle cages in separate vertical tiers between which the cages may be shifted to effect the maximum storage and facilitate selection of the cages for delivery.

In the accompanying drawings wherein I have illustrated a preferred form of the invention:

Fig. 1 is a vertical section through a storage garage and one tier of elevator cages on the line 1—1, Fig. 3.

Fig. 2 is a vertical section on the line 2—2, Fig. 3.

Fig. 3 is a cross section on the line 3—3, Fig. 2, particularly illustrating the elevator mechanism.

Fig. 4 is a fragmentary elevational view of a conveyor chain, illustrated in engagement with a hook on the roof of an elevator cage.

Fig. 5 is a fragmentary perspective view of the entrance and exit-runway illustrating its relation to a series of elevator gears and their mountings.

Fig. 6 is a detail perspective view of an elevator cage.

Fig. 7 is a wiring diagram of the elevating and conveyor motors.

Referring more in detail to the drawings: 1 designates the building constituting the garage and including side walls 2, front and rear walls 3—4, a floor 5, here shown as located below the ground level as when the building includes a basement, 6 a roof covering the space enclosed by said walls, and 7 a driveway opening to the interior of the building through which vehicles may enter and leave the storage space.

Located in the front and rear walls 3—4, near each corner of the building and preferably adjacent the floor 5, are recesses 8, each containing a motor 9, and located in the floor 5 is a pit 10 containing a motor 11; the motor 9 being adapted for operating the elevator mechanism hereinafter mentioned and the motor 11 for shifting the elevator cages laterally at the bottom of the storage space. A motor 12 is suspended from the roof 6 and adapted for shifting the cages laterally at the top of the space, all as previously described.

Supported in bearing sockets 13 on the floor 5, adjacent each corner of the building and guided in bearing brackets 14 on the front and rear walls 3—4 is a vertical shaft 15 having a bevel gear wheel 16 thereon, meshing with a pinion 17 on the shaft 18 of an adjacent motor 9, whereby the shafts may be rotated in unison when the motors are in operation.

19 designates cages, each a duplicate of another and of dimensions to receive a motor vehicle when its open end is in registration with the runway, and of a number to substantially fill the storage space in two vertical tiers, except for the two idle spaces herein-after mentioned.

Each cage comprises a rectangularly shaped box, open at one end, having a floor 20, a roof 21, side walls 22, and a closed end wall 23.

In order to retain the tiers of cages in proper vertical alignment, pairs of grooved guide members 24 are secured, as by bolts 25, in vertical position to the side walls 22 of each cage, and adapted to receive the flanges 26 of fixed vertical guide rails 27 bolted to inwardly projecting vertical flanges 28 integral with the side walls 2 of the building, and forming with the building a supporting frame in which the cages operate. Guide bars 29 of substantially half the thickness of the grooved guide members 24, and fixed to the cage walls parallel to said members and in slightly spaced relation thereto, serve as guides between the walls of adjoining cages; the grooved guide members and the guide bars being reversed in their respective posi-

tions on the opposite walls of each cage as illustrated in Fig. 3, so that the grooved guide member of one cage contacts the guide bar of an adjoining cage.

Means for effecting vertical movement of the cages includes worms 30 fixed at regular spaced intervals to the shafts 15 adjacent the bearing sockets 13 and brackets 14 and adapted for cooperation with transverse gear units 31, each including a shaft 32 supported in bearings 33 on the inner faces of the end walls 3—4, and provided with a worm gear 34 keyed to its end adjacent a side wall 2 of the building for engagement with a respective worm on the vertical shaft 15. Gear wheels 35 fixed at spaced intervals on the shafts 32 mesh with gear racks 36 secured to ends of the cages by lugs 37 attached to the sides of the cages by bolts 38. Rack sections 39 are fastened in like manner to the ends of the cage floors 20 for a purpose presently described.

In order to elevate an entire tier as a single unit, the cages are linked together by pairs of flanges 40 and 41, bolted to the roof and floor respectively, of each cage, the interlocking of these flanges being accomplished by the lateral movement of a cage from one tier to another, as will now be described.

Suspended from bearings 42 on each cage floor 20 near the ends of the floor are pairs of rollers 43, the upper portions of which project into downwardly facing transverse grooves 44 in the floor; upwardly facing grooves 45 in the cage roof 21 serving as guides and tracks for the rollers of superimposed cages. Grooves 46 in the floor 5 of the building serve the same purpose for cages reaching their lower limit of travel. By means of these rollers and tracks the power required for effecting horizontal movement of the cages is reduced to a minimum and is supplied by the conveyor motors 11 and 12 secured to the roof and floor respectively, as described, approximately at the transverse center of the tiers of cages. The shafts 47 of the motors 11—12 are provided with sprocket wheels 48—49 cooperating with idler sprocket wheels 50—51 at the bottom and top of the storage space to support and drive the endless chain belts 52—53; the idler sprocket wheel 51 for the motor 12 being suspended from the roof 6 by a hanger bearing 54 and the sprocket wheel 50 for the motor 11 being mounted on a standard 55 on the floor 5 of the building.

Hooks 56 on the endless chains 52—53 are adapted to engage complementary hooks 57 attached to the roof and floor of each cage, as illustrated in Fig. 4, each hook 57 comprising a shank 58 extended through a slot 59 in a cover plate 60 attached to the roof of the cage, and a guide portion 61 secured to the shank 58 slidable in a groove 62 below the

cover plate and engaged by an expansion cushioning spring 63. The hooks 57 are secured to the roofs and floors of the cages approximately midway between the side walls but are slightly offset in opposite directions from a central transverse line to prevent interference of adjacent hooks when a cage is shifted from one tier to another.

When a cage has reached the vertical limit of its travel the elevator motors are stopped and the conveyor motors started in a manner presently described.

A hook 56 in its travel with an endless chain driven by one of the conveyor motors engages a hook 57 and shifts a cage from one tier to another. Simultaneously with this movement the flange 40 of one cage is moved out of engagement with the flange 41 of an adjoining cage and into engagement with the flange 41 of a parallel cage in the opposite tier. At the same time the rack section 39 engaging a series of elevating gears 35, slides along the same, effecting an additional support and guide for the cage during its horizontal travel.

Means for controlling the elevating and conveyor motors includes a primary control mechanism in an upper corner of the garage, comprising a support 64 secured to the roof 6, to which is pivotally attached an arm 65, the longer portion thereof being adapted to close a circuit with either of contact members 66 or 67 fixed to the front wall 3. A spring 68 fastened to the arm and to the roof 6, normally closes the circuit through the contact 69 on the arm 65 and the upper contact member 66. Mounted on the end of the shorter portion of the contact arm 65 and transversely thereto is a roller 70. During the horizontal travel of the upper cage, roller 70 contacts the roof of the cage, a projection 71 secured to the side wall and in alignment with the roof of the cage serving to bridge the space between the tiers.

A two-way switch 72 having contact points 73 and 74 and located near the entrance in the front wall of the garage affords means for controlling each set of motors.

An extension plate 75 fixed to the runway floor by bolts 76 covers the local gear unit 31, providing a smooth surface from the runway onto a cage floor.

Assuming the parts to be constructed and assembled as described, operation would be as follows:

The floor of a cage being on a level with the runway floor, a car is driven through the entrance into the cage, as illustrated in Fig. 1. When the switch is moved to the contact point 73, the circuit is closed through the elevating motors and the tier including the cage in which the car has been driven is lowered while the opposite tier is being elevated. Upon reaching their respective limits of vertical travel, the upper cage of one

tier engages the roller on the contact arm breaking the circuit through the elevating motors, simultaneously bringing the contact 69 on the arm 65 together with the lower contact member 67. Moving the switch to the contact point 74 then closes the circuit through the conveyor motors and the respective upper and lower cages begin to move longitudinally in opposite direction. When their horizontal limit of travel has been reached, the roller no longer engages the roof of the cage and automatically breaks the circuit through the conveying motors. The runway 7 being of a width equal to the interior width of the garage, permits entrance of a car into or delivery from either of two cages on a level with the runway floor, thereby avoiding the necessity for a complete cycle of operation when the car to be delivered is in a cage at the bottom of the garage.

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

1. In a storage garage, supports for vehicles, linkage means on the supports for connecting the supports in tiers, means for moving the supports vertically in tiers including means adapted to support the supports during horizontal movement, means for effecting horizontal movement of the supports, and means for controlling said movements.

2. In a storage garage, vehicle supports including floors, roofs and walls, means for connecting the floor of one support with the roof of an adjoining support, means for moving the supports vertically in tiers, means for effecting horizontal movement of the supports including rollers mounted in the floor of a support, guides on the roof of a support for receiving said rollers of a superimposed cage, and means for controlling said movements.

3. In a storage garage, supports for vehicles, means for moving the supports vertically in adjoining tiers, means including cooperating guide members on the supports for retaining the supports in vertical alignment, said guide members cooperating with guides in adjacent tiers, means for simultaneously moving the supports in the respective tiers in opposite directions, conveying mechanism for simultaneously moving said supports horizontally from tier to tier in opposite directions, and means for controlling said vertical and horizontal movements.

4. In a storage garage, supports for vehicles, linkage means on the supports for connecting the supports in tiers, motors supported in the garage, vertical shafts positioned adjacent the motors, said motors having driving connection with the vertical shafts, horizontal shafts mounted transversely to the vertical shafts, means for driving the horizontal shafts with said vertical shafts, gear racks on the ends of the supports, gear wheels on the horizontal shafts meshing

with said racks, means for effecting horizontal movement of the supports, and means for controlling said movements.

5. In a storage garage, vehicle supports including floors, roofs and walls, means for connecting the floor of one support with the roof of an adjoining support, means for moving the supports vertically in tiers, means for retaining the tiers in vertical alignment, including guide rails in the garage, grooved guide members fixed to the side walls of the supports, and adapted to slide on said rails, guide bars fixed parallel to said guide members, the guide members and guide bars being reversed in their respective positions on the opposite walls of a support for sliding contact of guide members on one support with the guide bars of an adjoining support, means for effecting horizontal movement of the supports, and means for controlling said movements.

6. In a storage garage, supports for vehicles, linkage means on the supports for connecting the supports in tiers, means for moving the supports vertically in tiers, means for effecting horizontal movement of the supports, and means for controlling said movements including a circuit making and breaking device, comprising a contact arm pivotally mounted between two contact points and adapted for controlling the limit of travel of both the elevating and conveying mechanisms in conjunction with a manually operated two-way switch.

7. A storage garage including a frame, actuating means including a horizontal shaft having gears, a plurality of cages in the frame arranged in vertical tiers, and means including rack sections on the cages engageable by said gears for supporting the cages while moving from one tier to another.

8. A storage garage including a frame, and actuating means including a horizontal shaft having gears at opposite ends and means for moving a cage horizontally, a cage in said frame having vertical rack sections, said end gears being engageable with said rack sections for moving the cage vertically, a horizontal rack section on the cage, and intermediate racks on said shaft adapted to engage said horizontal rack sections for slidably supporting the cage during horizontal movement.

9. A storage garage including a frame, cages mounted on adjacent tiers in the frame with sides of cages in contacting relation, means for moving the cages vertically in the frame, and means for moving cages from one tier to another.

In testimony whereof I affix my signature.

L. D. COOK.