Aug. 29, 1933. J. E. MORTON 1,924,130

AUTOMOBILE PARKING TOWER

Original Filed Oct. 8, 1926 4 Sheets-Sheet 1

Fig. 1.

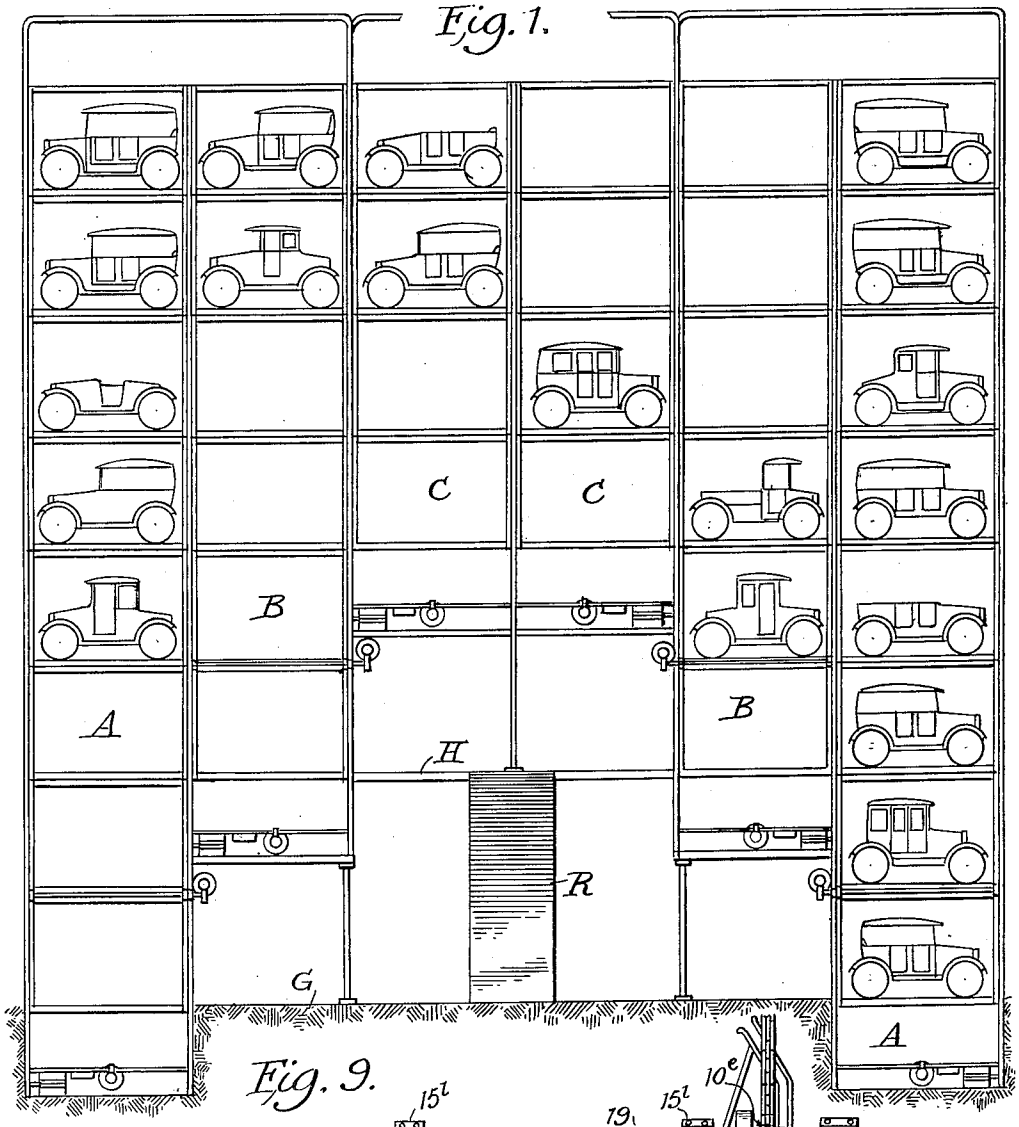
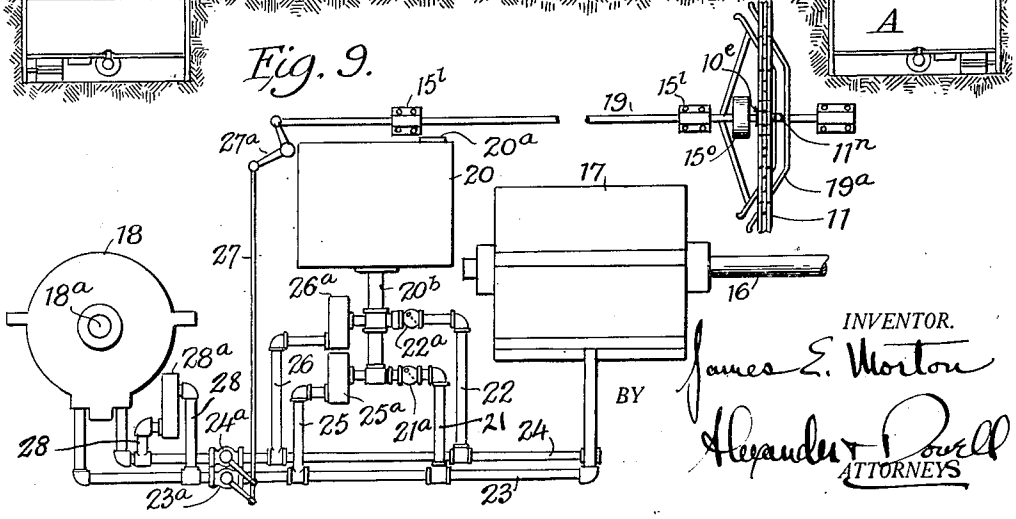


Fig. 9.



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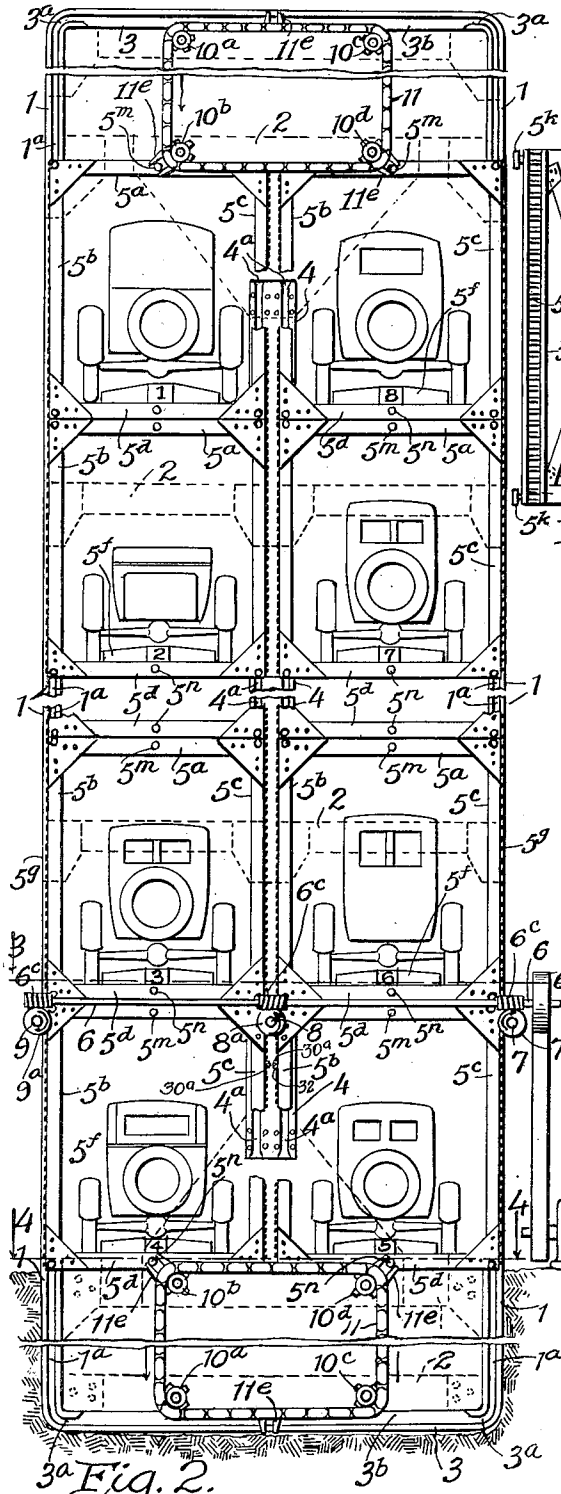


Fig. 2.

Fig. 6.

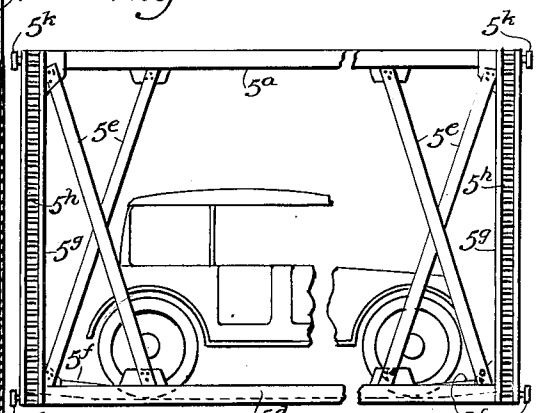


Fig. 7.

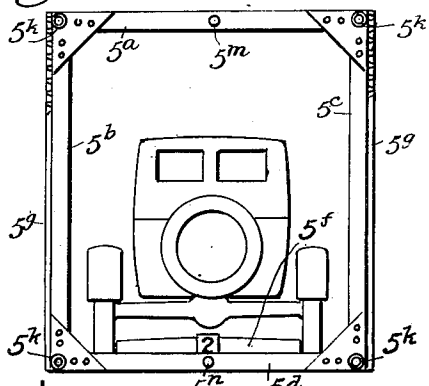
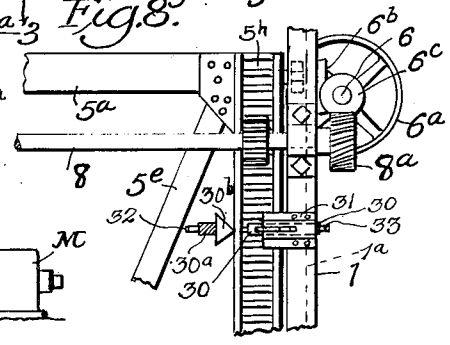


Fig. 8.



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Fig. 3.

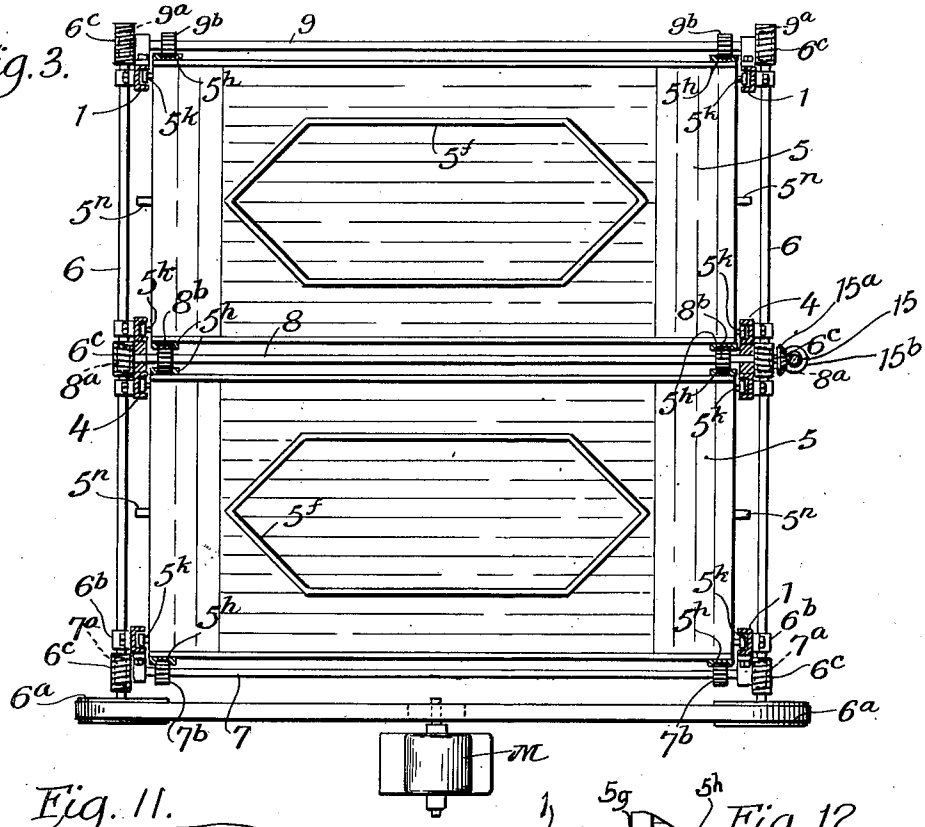


Fig. 11.

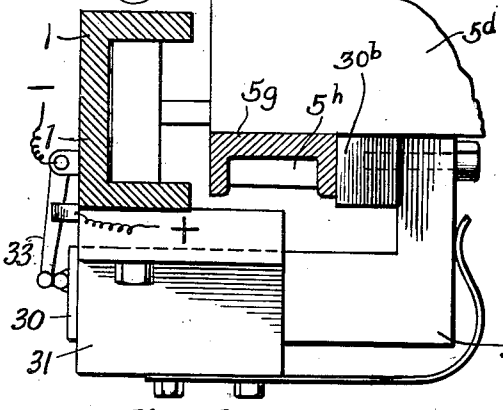


Fig. 12.

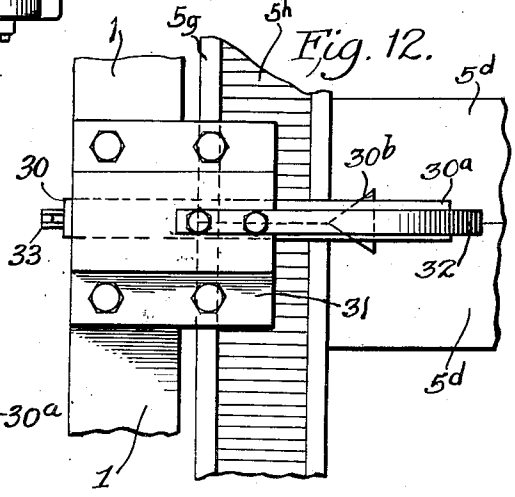
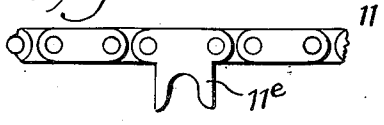


Fig. 13.



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Fig. 4.

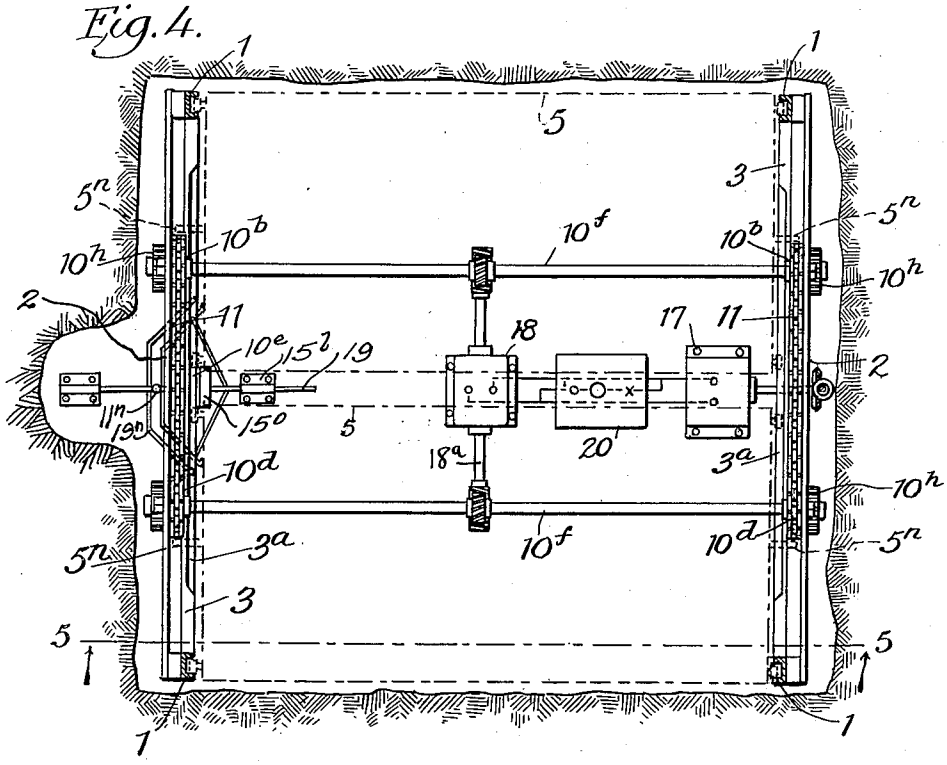


Fig. 5.

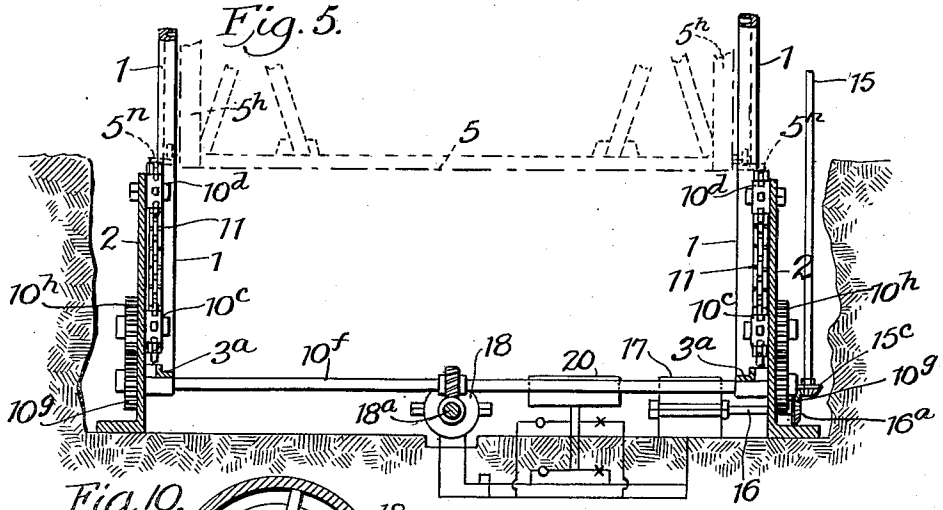
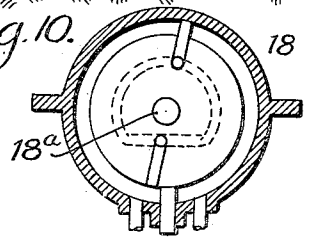


Fig. 10.



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Patented Aug. 29, 1933

1,924,130

UNITED STATES PATENT OFFICE

1,924,130

AUTOMOBILE PARKING TOWER

James E. Morton, Harvey, Ill., assignor of one-half to James H. McVeety, Memphis, Tenn., and ten one-hundredths to William J. Aitken and Thomas B. McMartin

Application October 8, 1926, Serial No. 140,290
Renewed September 9, 1932

43 Claims. (Cl. 214—16.1)

This invention is a novel improvement in automobile parking towers, and the principal object of the invention is to provide an improved construction and arrangement for parking towers, each unit of the tower being adapted to receive and support a plurality of separate automobile carrying cages in two vertical parallel columns, whereby a minimum of ground space will be required for the accommodation of a large number of automobiles. Other objects of my invention are (1) to provide novel rack and pinion means for simultaneously moving the cages in adjacent columns of each unit of the tower in opposite directions; (2) to provide novel transfer chains and mechanism for transferring the cages at the top and bottom of each unit from one column to the other; (3) to provide novel means for synchronizing the speed of the transfer mechanism with that of the rack and pinion elevating drive whereby the cages will be transferred from one column to the other synchronously with the vertical movement of the cages in the unit columns; and (4) to provide novel means whereby in case the transfer mechanism should fail to transfer the cages at the proper times and in synchronism with the movement of the cages in the columns the rack and pinion driving connections for such units will be stopped, to prevent injury to the cages or their loads.

A further object of this invention is to improve upon the constructions of the automobile parking machines set forth in my U. S. Letters Patent #1,555,692, issued September 29, 1925, and in my Letters Patent #1,564,100, issued December 1, 1925.

Other minor objects of the invention will be hereinafter set forth.

I will explain the invention with reference to the accompanying drawings which illustrate one practical embodiment thereof to enable others familiar with the art to adopt and use the same, and will summarize in the claims the novel features of construction, and the novel combinations of parts, for which protection is desired.

In said drawings:

Fig. 1 is a diagrammatic view of the lower portion of a parking tower having a plurality of units and capable of storing a large number of automobiles on a minimum ground area;

Fig. 2 is an end elevation of one unit of the tower, detached, showing a plurality of cages therein, and the general arrangement of the transfer devices at the top and bottom of the unit;

Fig. 3 is an enlarged horizontal section through the tower unit on the line 3—3, Fig. 2, showing the rack and pinion drive for raising and lowering the cages in the columns;

Fig. 4 is an enlarged horizontal section on the line 4—4, Fig. 2;

Fig. 5 is a vertical section on the line 5—5, Fig. 4;

Fig. 6 is an enlarged side elevation of one of the cages, showing an automobile retained therein; and also showing the vertically disposed racks at the corners of the cage;

Fig. 7 is an end view of the cage shown in Fig. 6;

Fig. 8 is a detail;

Fig. 9 is a diagrammatic view of the fluid motor and pump arrangement for synchronizing the transfer of the cages with the movement of the cages in the vertical columns.

Fig. 10 is a cross-section through the fluid motor.

Figs. 11 and 12 are enlarged detail views of the switch devices for stopping the main motor drive of the cages in case a transfer mechanism should fail to deliver a cage at the proper time.

Fig. 13 is a detail.

As shown in the drawings, each unit for the parking tower preferably comprises a frame constructed substantially the same as that shown in my Patent #1,564,100, said frame comprising a skeleton tower, preferably rectangular or square in cross-section and of any desired height, comprising four vertical corner-posts 1, connected together by exterior horizontal braces 2. Connecting the upper and lower ends respectively of adjacent corner-posts 1, are opposed horizontal beams 3, and in the inner faces of each of the beams 3 are horizontally disposed grooves 3*a* adapted to register with vertically disposed grooves 1*a* in the inner faces of corner posts 1, as shown in Fig. 2, the meeting ends of the grooves 1*a*, 3*a*, being rounded as shown, and the grooves being adapted to receive the rollers 5*k* mounted on the upper and lower outer corners of each end of the automobile cages 5, hereinafter referred to. Preferably the under sides of the upper frame beams 3, and the upper sides of the lower frame beams 3, are cut away as at 3*b* to the depth of grooves 3*a* as shown in Fig. 2, for the purpose hereinafter set forth, the mouths of grooves 3*a* in beams 3 being flared to facilitate entry of the rollers 5*k* thereinto.

Between the corner posts 1, on the same sides of the tower as beams 3, are intermediate vertically disposed posts 4 supported by the horizontal braces 2 as shown, posts 4 each having a pair of

spaced parallel vertical grooves 4*a* therein adapted to receive the rollers 5*k* on the upper and lower inner corners of the cages 5, the posts 4 dividing each unit of the tower into two vertical columns. The intermediate posts 4, however, are cut off at their tops and bottoms a distance from the beams 3 slightly greater than the heights of the cages 5, in order that the top cage in the upwardly moving column and the bottom cage in the downwardly moving column may be readily transferred as hereinafter explained to the opposite column. The upper and lower ends of grooves 4*a* in posts 4 are also preferably flared to facilitate entry thereinto of the rollers 5*k* of the cages.

As shown in Figs. 6 and 7 each cage 5 preferably comprises a rectangular open framework consisting of top members 5*a*, bottom members 5*d*, and corner posts 5*b*, 5*c*, said members being preferably formed of angle-irons or other structural shapes, the cage being open at its top, but having a bottom board, or boards mounted between the bottom members 5*d* of the framework. Cage 5 is of size suitable to receive an automobile therein resting on the floor boards. The cage may be strengthened by suitable cross-braces 5*e* as shown. On the bottom boards of the cage are rails 5*f* adapted to guide the wheels of the vehicle, the floor boards being preferably slightly upturned at both ends to prevent the vehicle from rolling out of the cage in case the brakes of the vehicle should be left unapplied; also the guide rails 5*f* preferably converge at both ends of the cage, as shown, to facilitate positioning of the vehicle in the cage 5, and a number plate, bearing the number of the particular cage may be positioned at each end of the cage as shown in Figs. 2 and 7.

At each corner of the cage, on the outer side thereof, is a vertically disposed channel bar 5*g* carrying in its bosom a rack 5*h* extending from top to bottom of the cage, said rack 5*h* being adapted to be engaged by a pinion, rotatably mounted, as hereinafter described, on the tower frame for the purpose of raising or lowering the cage in its respective column. At the upper and lower corners of each end of cage 5 are rollers 5*k* journaled on suitable stud-shafts projecting from the cages, said rollers 5*k* being adapted to fit in the grooves 1*a*, 3*a*, and 4*a* of frame members 1, 3, and 4, respectively, to guide the cages during their movements in the columns. Also in the center of each end of cage 5, at the top thereof, is a stud 5*m*, and at the bottom center is a stud 5*n* projecting from the cages and adapted to be engaged by the U-links 11*e* of the transfer chains (hereinafter described) at the top and bottom of each unit, in order to transfer the cages from one unit column to the other.

Each tower unit, adjacent the lower end thereof, is provided with a pair of horizontally disposed parallel drive shafts 6 (Figs. 2, 3 and 8) rotated through suitable pulleys or sprockets 6*a* from a suitable source of power, preferably an electric motor M, said shafts 6 being mounted in bearings 6*b* attached to the outer sides of frame members 1 and 4, the shafts 6 being disposed exterior to the tower framework, and being driven at the same speed and in the same direction of rotation.

Mounted below the drive shafts 6 and at right angles thereto are three parallel horizontally disposed pinion shafts, 7, 8, and 9, shafts 7 and 9 being mounted in suitable bearings on the frames 1 and having worm gears 7*a*, 9*a* at their ends respectively meshing with worms 6*c* on the ends of drive shafts 6; and shaft 8 being interposed between the cages 5, and mounted in suitable bearings in the intermediate frame members 4, as shown in Figs. 2 and 3, and having worm gears 8*a* on its ends meshing with worms 6*c* at the center of shafts 6, the shafts 7 and 9 being geared to rotate in the same direction and at the same speed, by shafts 6, while shaft 8 is geared to rotate at same speed, but in the opposite direction of rotation from shafts 7 and 9.

On each of the shafts 7 and 9 are pinions 7*b*, 9*b*, meshing with the racks 5*h* on the outer faces of the cages 5 and on shaft 8 are pinions 8*b* interposed between and meshing with the opposed racks 5*h* on the inner faces of the cages 5 between the columns, whereby as the shafts 7, 8, and 9 are rotated by shafts 6 the cages in one column will be moved upwardly, while the cages in the other column of each unit will be simultaneously moved at the same speed and a corresponding amount downwardly, as shown by the arrows on shafts 7, 8, and 9, in Fig. 2, the cages in the right hand column being driven upwardly by shafts 7 and 8, and the cages in the other column being driven downwardly by shafts 8 and 9.

At the bottom of each unit (as shown in Figs. 2, 4, 5, and 9) is a transfer mechanism for transferring the lowermost cage from the downwardly moving column and placing the cage immediately below the lowermost cage in the upwardly moving column, said mechanism preferably comprising sets of chain sprockets 10*a*, 10*b*, mounted below and at the center of each end of the left hand column (Fig. 2) and sprockets 10*c*, 10*d* mounted below and at each end of the right hand column, said sprockets being mounted on suitable stud-shafts projecting inwardly from the braces 2 of the tower, the sprockets 10*a* and 10*c* being disposed slightly above and outside the grooves 3*a* in lower frame member 3, and the sprockets 10*b*, 10*d*, being disposed above their respective sprockets 10*a*, 10*c*. Around each set of sprockets 10*a*, 10*b*, 10*c*, and 10*d* runs a chain 11 having special U-links 11*e* thereon (Figs. 2 and 13) adapted to engage the studs 5*n* at the bottom of the cages, at proper times, lowering the cages and transferring the same over to the opposite or upwardly moving column, and then raising the cages until they contact with the underside of the bottom cage in the upwardly moving column. The studs 5*n* of the cages roll into the U-links 11*e* of the transfer chains 11 slightly before the racks 5*h* of the lowermost cage 5 roll out of contact with the pinions 8*b*, and 9*b*, but the chains 11 support the lowermost cage 5 in the downwardly moving column when freed from the rack pinions 8*b*, 9*b*, lowering the cage in the frames 1 to the bottom of the tower until the lower rollers 5*k* thereof rest in the grooves 3*a* of the frame member 3, then chains 11 shift the cage into position under the upwardly moving column, later raising the cage until its upper side contacts with the lower side of the lowermost cage in the upwardly moving column, and until the rack pinions 7*b*, 8*b* of said column engage the racks 5*h* of such cage, after which time the studs 5*n* pass out of the U-links 11*e* of chain 11 and the cage is then again entirely supported by the rack and pinion elevating device.

The chains 11 of the transfer mechanism are both driven at the same speed and in the same direction by means of parallel shafts 10*f*, (Fig. 4)

extending between the braces 2 below members 3 and carrying gears 10*g* on their outer ends, meshing with gears 10*h* on the stud shafts of sprockets 10*a*, 10*c*, respectively, shafts 10*f* being positively and synchronously driven as hereinafter described from the shaft 8 of the rack and pinion elevating mechanism.

As shown in Fig. 3, pinion shaft 8 is provided with a bevel gear 15*a* on one end exterior to the column frame, gear 15*a* meshing with a bevel gear 15*b* on a shaft 15 extending from the top to the bottom of the tower and suitably journaled on the exterior of the tower frame. On the lower end of shaft 15 is a bevel pinion 15*c* (Fig. 5) meshing with a bevel gear 16*a* on a pump shaft 16 for driving a fluid pump 17 (Fig. 9) which pump in turn drives through suitable pipe connections a fluid motor 18 interposed between the shafts 10*f*, said motor 18 driving shafts 10*f* through suitable gearing as shown in Fig. 4 from the motor shaft 18*a*. Pump 17 delivers approximately three times as much fluid per revolution as motor 18 requires per revolution, and consequently motor 18 normally rotates approximately three times as fast as pump 17 in order to transfer the cages of one column synchronously with the movement of the cages in the column. Both pump 17 and motor 18 revolve in the same direction, but at any instant when the movement of the cages in the columns is stopped, pump 17 will also stop, and cause motor 18 to stop instantly; also if the direction of travel of the cages in the columns is reversed at any point, the direction of travel of the transfer mechanism pump and motor is likewise instantly reversed.

Means are provided for throttling the speed of the transfer chains just before a transferred cage contacts with the cage ahead of it in the column. At some position preferably slightly in advance of the point where the transferred cage would bump the cage ahead of it, is located a throttling mechanism, which is operated by a roller 11*n* (Fig. 9) mounted on the side of the transfer chain 11 to reduce the speed of travel of the transfer chains 11 to the same as the speed of the cages moving in the columns, roller 11*n* entering into a channel guideway 19*a*, mounted on a throttle rod 19 slidably mounted in bearings at right angles to the run of chain 11, whereby as roller 11*n* engages the guideway 19*a* the throttle rod 19 will be shifted to operate the fluid throttle valves hereinafter described. Between pump 17 and motor 18 is a fluid reservoir 20 having a filler cap and breathing opening 20*a* in its upper end, said reservoir being connected by pipe 20*b* with pipe lines 21, 22, connected with the main pipes 23, 24, between pump 17 and motor 18. Suitable check valves 21*a*, 22*a*, are interposed in pipes 21, 22, as shown. Also between reservoir pipe 20*b* and pipes 23, 24, are pipes 25, 26, having relief valves 25*a*, 26*a*, interposed therein. In pipes 23, 24, adjacent the motor 18 are the main fluid throttling valves 23*a*, 24*a*, which are operated by levers connected with a rod 27 connected through a bell-crank 27*a* with the sliding rod 19 whereby as the rod 19 is shifted the valves 23*a*, 24*a*, will be simultaneously opened or closed. A high pressure double acting relief valve 28*a* is interposed in a pipe 28 connecting pipes 23, 24, intermediate the valves 23*a*, 24*a*, and motor 18. By the above arrangement, after the transfer has been made, and the transferred cage is ready to be delivered to the lifting cogs 7*b*, 8*b*, 9*b*, of the column, the rod 19 is shifted closing valves 23*a*, 24*a*, and a strong pressure is exerted by the motor 18 on the transferred cage, because of the by-passing through one of the relief valves 25*a*, 26*a*, of excess fluid delivered by pump 17. This excess pressure insures that the rack of the transferred cage will be brought into contact and engagement with the pinions 7*b*, 8*b*, 9*b*, at the proper times. By the proper curvature of guideway 19*a* a similar strong pressure is maintained against the next cage to be transferred during the time the lifting cogs are delivering this cage over to the transfer chains. This last mentioned pressure is brought by closing both throttle valves 23*a*, 24*a*. Motor 18 then resists rotation because the oil must be forced through the high pressure relief valve 28*a*. Pump 17 must at all times revolve while the cages are in motion, and the movement of oil, in either direction which always passes through the pump 17 can be traced through the check valves 21*a*, 22*a*, and the relief valves 25*a*, 26*a*. Throttling action is desired only when the cages are in nearly the position shown in Fig. 2. Consequently, the guideway 19*a* is held down out of engagement with roller 11*n* while the bottom of the cage, which is being transferred, passes over the roller (15*o*). A coil spring (not shown) is used to otherwise hold the guideway 19*a* in position.

A similar transfer mechanism is located at the top of the columns, the U-links 11*e* of chains 11 engaging the studs 5*m* at the tops of the cages. The operation of the transfer mechanism at the top of the columns is identically the same as that above described for the lower transfer mechanism and hence need not be specifically described

Suitable means are also provided for breaking the circuit through the driving motor M for the purpose of stopping the motion of the cages in the columns in case a transfer mechanism should fail to deliver the cages from one column to another at the proper time. This mechanism comprises a slidable bolt 30 mounted in a housing 31 at the top of the downwardly moving column, said bolt 30 being preferably L-shaped and adapted to have its free leg 30*a* overlying the outer smooth sides of the channels 5*g* of the cage racks, said free leg being provided with a detachable hardened steel wedge piece 30*b*, which when the cages are in motion rides on the smooth outer surfaces of the channels 5*g* in which the racks 5*k* of the cages are mounted. A spring 32 normally urges the end 30*a* of bolt 30 towards the housing 31. Plunger 30 is connected with a suitable electrical switch 33 connected in series with the main motor M of the rack drive. One such circuit breaker is placed at both top and bottom of each column of cages, and since the wedge piece 30*b* rides on the sides of the channels 5*g*, if the transfer mechanism should fail to deliver a cage at the proper time the wedge 30*b* will run off the channel of the last moving cage and plunger 30 will be shifted inwardly opening switch 33 and cutting off the motor M. When however the plunger 30*b* again engages the next cage channel, the switch 33 will be again closed, and the motor M will again revolve.

While I have shown and described my parking tower as built of skeleton frame work, I do not limit my invention to such construction, for obviously the grooves 1*a*, 3*a*, 4*a* for rollers 5*k* of the cages may be formed in the walls of a building, or any other construction may be used; also other means for synchronizing the transfer of cages from one column to the other may be used; and other means may be used for stopping the motor M in case a cage should fail to be transferred at the proper time.

In Fig. 1 a general layout for a large parking tower is illustrated in which the entrance to the tower is at the ground level G. Above the entrance is a second elevation H connected with ground level G by a ramp R of usual type. Six rows of towers are here used, and the entrance to towers A is on the ground level G; the entrance to towers B is on the upper level H; and in order to pass the vehicles in towers C it is necessary to transfer same from towers B above the level H. If four rows of towers were used instead of six as shown in Fig. 1, no ramp R would be necessary, and the entrance could be at the level H. The ground level or entrance however may be any desired point. Obviously other arrangements of towers may be used.

I do not limit my invention to the exact form shown in the drawings for obviously changes may be made therein within the scope of the claims.

I claim:

1. In a parking tower a pair of adjacent columns; a plurality of cages movably mounted in said columns; and means for moving the cages in the columns in opposite directions comprising aligned racks mounted on the outer and inner sides of said cages; a pair of shafts mounted in said columns adjacent the outer sides of the cages; a third shaft mounted intermediate the columns; pinions on said shafts engaging said racks; the pinions of the third shaft engaging the racks on the inner sides of the cages of both columns; and means for simultaneously rotating said shafts the third shaft being rotated in a direction opposite to that of the first mentioned shafts.

2. In a parking tower as set forth in claim 1, and means at each end of the column for transferring the cages from one column to the other, said transferring means comprising pairs of endless chains having their opposite runs disposed parallel with the axes of the columns; means on said chains for automatically engaging and disengaging the cages; and means for simultaneously driving the chains from the cage moving means in the columns, the chains supporting the cages being transferred.

3. In a parking tower as set forth in claim 1, and means at each end of the column for transferring the cages from one column to the other—said transferring means comprising pairs of endless chains having their opposite runs disposed parallel with the axes of the columns; means on said chains for automatically engaging and disengaging the cages; means for normally driving the chains at a greater speed than that of the cage moving means in the columns; and means for automatically throttling the speed of the chains just before the transferred cage contacts with the next preceding cage.

4. A parking tower comprising a pair of adjacent columns; a plurality of removable cages movably mounted in said columns; rack and pinion means for simultaneously moving the cages in the columns in opposite directions; means at each end of the columns for transferring the cages from one column to the other synchronously with the movement of the cages in the columns; and means for stopping the movement of the cages in the columns in case the transfer means should fail to transfer a cage at the proper time.

5. In a parking tower as set forth in claim 4 said stopping means comprising a member slidably mounted at the end of the tower, and having one end adapted to slide upon the sides of the aligned cage racks; means for yieldingly maintaining the member in contact with said racks; and means connected with said member for interrupting the drive for the rack and pinion means when the member is shifted.

6. A parking tower comprising a pair of adjacent columns; a plurality of cages movably mounted in said columns; aligned racks mounted on the outer and inner sides of said cages; a pair of shafts mounted in said columns adjacent the outer sides of the cages; a third shaft mounted intermediate the columns; pinions of the third shaft engaging said racks, the pinions of the third shaft engaging the racks on the inner sides of the cages of both columns; and means for simultaneously rotating said shafts, the third shaft being rotated in a direction opposite to that of the first mentioned shafts.

7. A parking tower, comprising a pair of adjacent columns; said columns having guideways in their sides, tops, and bottoms; the inner guideways at the top and bottom of the columns being cut away a distance slightly greater than the height of the cages; a plurality of superimposed cages movably mounted in said columns; said cages having means engaging the guideways; aligned racks mounted on the outer and inner sides of said cages; a pair of parallel shafts mounted in said column adjacent the outer sides of the cages; a third shaft parallel with said pair of shafts mounted intermediate the columns; pinions on said shafts engaging said racks, the pinions of the third shaft engaging the racks on the inner sides of the cages of both columns; means for simultaneously rotating said shafts the third shaft being rotated in a direction opposite to that of the first mentioned shafts; and means for transferring the cages at each end of the columns from one column to the other synchronously with the movement of the cages in the columns.

8. A parking tower comprising a pair of adjacent columns; a plurality of cages movably mounted in said columns; aligned racks mounted on the outer and inner sides of said cages; a pair of shafts mounted in said columns adjacent the outer sides of the cages; a third shaft mounted intermediate the columns; pinions on said shafts engaging said racks; the pinions of the third shaft engaging the racks on the inner sides of the cages of both columns; means for simultaneously rotating said shafts, the third shaft being rotated in a direction opposite to that of the first menioned shafts; means at each end of the columns for transferring the cages from one column to the other synchronously with the movement of the cages in the columns; and means for stopping the movement of the cages in the columns in case the transfer means should fail to transfer a cage at the proper time.

9. A parking tower comprising a pair of adjacent columns, a plurality of superimposed cages movably mounted in said columns; means for simultaneously moving the cages in the columns in opposite directions; pairs of endless chains mounted on sprockets at each end of the tower, said chains having their opposite runs disposed parallel with the axes of the columns; means on the chains for engaging and disengaging the cages; said chains being adapted to engage the outermost cage in one column and transfer said cage to the other column; a fluid pump driven by the cage driving means; a fluid motor; pipe connections between the pump and motor; said pump being of greater capacity than the motor;

driving connections between the motor and chain sprockets; and means for reducing the speed of the chains to that of the cage driving means as the chains pick up and drop the cages.

10. In a parking tower as set forth in claim 9; said speed reducing means comprising a rod slidably mounted adjacent the chain; a guideway mounted on said rod; means on the chain for engaging the guideway to shift the rod; throttling valves interposed in the pipe connections between the pump and motor; and means operatively connecting said valves with the slidable rod, whereby as the valves are closed the speed of the motor will be reduced.

11. In combination with a parking tower as set forth in claim 6,—transferring means at each end of the columns comprising pairs of endless chains having their opposite runs disposed parallel with the axes of the columns; means on said chains for automatically engaging and disengaging the cages; and means for normally driving the chains at a greater speed than that of the cage moving means in the columns; and means for automatically throttling the speed of the transfer chains just before a transferred cage contacts with the next preceding cage.

12. In a parking tower as set forth in claim 7, means for normally operating the transfer means at a greater speed than that of the cage moving means in the columns, and means for automatically reducing the speed of the transfer means just before a transferred cage contacts with the preceding cage.

13. A parking tower for automobiles, comprising a series of detached superimposed cages arranged in adjacent columns; each cage adapted to receive an automobile and rack and pinion means for moving the cages in the columns in opposite directions and for supporting all the cages in each column; and means for transferring a cage from one column to the other while the series of cages are in motion.

14. A parking tower for automobiles comprising an endless series of cages arranged in adjacent parallel columns; each cage adapted to receive an automobile; means for moving the cages in the respective columns in opposite directions; and means at the ends of the columns for engaging the end cage in one column and quickly transferring same to the adjacent end of the other column, while the cages in the columns are in motion; said cage moving means comprising aligned racks on said cages; shafts mounted intermediate said columns and at each side thereof, pinions on said shafts engaging said racks; and means for simultaneously rotating said shafts.

15. A parking tower for automobiles comprising an endless series of cages arranged in adjacent parallel columns; each cage adapted to receive an automobile; means for moving the cages in the respective columns in opposite directions; and means at the ends of the columns for engaging the end cage in one column and quickly transferring same to the adjacent end of the other column, while the cages in the columns are in motion; said transferring means comprising pairs of endless chains having their opposite runs parallel with the axes of the columns; means on said chains for automatically engaging and disengaging the cages; and means for synchronously driving the chains from the cage moving means in the columns; the chains supporting the cage being transferred.

16. A parking tower for automobiles comprising a pair of adjacent columns; a plurality of detached superimposed cages guided in said columns and adapted to each hold an automobile; means for moving the cages in the columns in opposite directions; and means at each end of the columns for engaging the end cage in one column and quickly transferring it to the other column synchronously with the movement of the cages in the columns while the latter are in motion.

17. In a parking tower as set forth in claim 16 said transferring means comprising pairs of endless chains having their opposite runs parallel with the axes of the columns; means on said chains for automaticaly engaging and disengaging the cages; and means for driving the chains from the cage moving means in the columns, the chains supporting the cages being transferred.

18. In a parking tower as set forth in claim 16, said transferring means comprising pairs of endless chains having their opposite runs parallel with the axes of the columns; means on said chains for automatically engaging and disengaging the cages; means for normally driving the chains at a greater speed than that of the cage moving means in the columns; and means for automatically throttling the speed of the transfer chains just before a transferred cage contacts with the next preceding cage.

19. In a parking tower, a series of movable cages movably mounted in adjacent parallel columns, means for simultaneously moving the series of cages in the columns in opposite directions; means at each end of the columns for transferring cages from one column to the other; and means for stopping the movement of the cages in the columns in case the transfer means should fail to transfer a cage at the proper time.

20. In a parking tower as set forth in claim 7, means for normally operating the transferring means at a greater speed than that of the cage moving means in the columns; and means for automatically reducing the speed of the transferring means before the transferred cage is released thereby.

21. In a parking tower as set forth in claim 8,—means for operating the transferring means to move the cage at greater speed than it is moved in the column; and means for automatically lessening the speed of the transfer chains before a transferred cage contacts with the next preceding cage.

22. A parking tower comprising a pair of adjacent columns; a plurality of superimposed cages movably mounted in said columns; means for simultaneously moving the cages in the columns in opposite directions; pairs of endless chains at each end of the tower, said chains having their runs disposed parallel with the axes of the columns; means on the chains for engaging and disengaging the cages; means for normally driving the chains at a greater speed than that of the cages moving in the columns; and means for reducing the speed of the transfer chains just before a transferred cage contacts with the next preceding cage.

23. In a parking tower as set forth in claim 22, said chain driving means comprising a fluid pump; a fluid motor of less capacity than the pump; driving connections between the cage moving means in the columns and the pump; pipe connections between the pump and motor; and driving connections between the motor and the chain sprockets.

24. In a parking tower as set forth in claim 22, said speed reducing means comprising a rod

slidably mounted adjacent the chain; a guideway mounted on said rod; means on the chain for engaging the guideway to shift the rod; and means connected with said rod for retarding the drive of the chains.

25. In a parking tower for automobiles, a series of superimposed cages each adapted to receive an automobile; provided with vertically disposed racks adjacent each corner of the cage; and driven gears adapted to engage said racks and to support and elevate or lower the cages.

26. A parking tower for automobiles, comprising a series of detached superimposed cages arranged in adjacent columns, each cage adapted to receive an automobile; and rack and pinion means adjacent each of the four corners of the cages in the columns for moving the cages in the columns in opposite directions and for supporting the cages.

27. In a parking tower of the character specified the combination of a plurality of cages, each adapted to receive and carry an automobile, said cages being arranged in two parallel ascending and descending series; primary means for simultaneously raising the cages in one series and lowering the cages in the other series; and secondary means including endless members having runs parallel with the series adapted to take control of a cage when it reaches the end of one series and advance such cage with increased speed in alignment with such series; then transfer such cage into alignment with the other series, and then advance such cage in alignment with such other series and deliver said cage into the control of the primary means for moving the cages in such series.

28. In a parking tower, the combination of a plurality of cages, each adapted to receive and carry an automobile, arranged in two parallel ascending and descending series; primary means for simultaneously raising the cages in one series and lowering the cages in the other series; secondary means for transferring each cage when it reaches the end of one series to the other series; means for normally operating the secondary means at a speed greater than that of the cages in the series; and devices for reducing the speed of the secondary means to that of the cages in the series at the points of taking charge of and delivering the cages.

29. In a parking tower as set forth in claim 28, said primary means comprising aligned racks on the cages, pinions mounted in the columns engaging the racks; and means for simultaneously rotating the shafts.

30. In a parking tower as set forth in claim 28, said secondary means comprising endless chains having their opposite runs disposed opposite the columns; and devices on the chains for engaging and disengaging the cages.

31. In an automobile parking tower, the combination of a plurality of cages, each adapted to receive and carry an automobile; arranged in two parallel ascending and descending series; primary means for simultaneously raising the cages in one series and lowering the cages in the other series; secondary means for transferring each cage when it reaches the end of one series; and means whereby the secondary means will gradually affect position changes of the cages being transferred relative to and during the movement of the cages in the series.

32. In an automobile parking tower, the combination of a plurality of cages, each adapted to receive and carry an automobile; arranged in two parallel ascending and descending series; primary means for simultaneously raising the cages in one series and lowering the cages in the other series; secondary means for transferring each cage when it reaches the end of one series to the other series; and means whereby the secondary means will first accelerate the cage movement to a speed greater than the normal speed of the cages in the series, transfer the cage from one series to the other at the increased speed and then decelerate the cage back to the normal speed of the cages in the series.

33. In a parking tower, the combination of a plurality of cages, each adapted to receive and carry an automobile, arranged in two parallel ascending and descending series; primary means for simultaneously raising the cages in one series and lowering the cages in the other series; secondary means for transferring each cage when it reaches the end of one series to the other series; and means for operating said secondary means at a variable speed whereby the speed of said secondary means is increased and decreased during the handling of the cage between the points of taking charge of and delivering the cage.

34. In a parking tower, the combination of a plurality of cages, each adapted to receive and carry an automobile, arranged in two parallel ascending and descending series; primary means for simultaneously raising the cages in one series and lowering the cages in the other series; secondary means for transferring each cage when it reaches the end of one series to the other series; and means for operating said secondary means at a variable speed during the transfer of the cage from one series to the other.

35. In a parking tower, the combination of a plurality of cages, each adapted to receive and carry an automobile, arranged in two parallel ascending and descending series; primary means for simultaneously raising the cages in one series and lowering the cages in the other series; secondary means for transferring each cage when it reaches the end of one series to the other series; and means for operating said secondary means simultaneously with the operation of the primary means at a variable speed whereby the speed of said secondary means is increased and decreased during the handling of the cage between the points of taking charge of and delivering the cage.

36. In a parking tower, the combination of a plurality of cages, each adapted to receive and carry an automobile, arranged in two parallel ascending and descending series; primary means for simultaneously raising the cages in one series and lower the cages in the other series; secondary means for transferring each cage when it reaches the end of one series to the other series; and means for operating said secondary means simultaneously with the operation of the primary means at a variable speed during the transfer of the cage from one series to the other.

37. In a parking tower, the combination of a plurality of cages, each adapted to receive and carry an automobile, arranged in two parallel ascending and descending series; primary means for simultaneously raising the cages in one series and lowering the cages in the other series; secondary means for transferring each cage when it reaches the end of one series to the other series; means for operating said secondary means simultaneously with the operation of the primary means at a variable speed whereby the speed of said secondary means is increased and decreased

during the handling of the cage between the points of taking charge and delivering the cage, and driving means operatively interconnecting said primary means with said secondary means.

38. In a parking tower, the combination of a plurality of cages, each adapted to receive and carry an automobile, arranged in two parallel ascending and descending series; primary means for simultaneously raising the cages in one series and lowering the cages in the other series; secondary means for transferring each cage when it reaches the end of one series to the other series; means for operating said secondary means simultaneously with the operation of the primary means at a variable speed during the transfer of the cage from one series to the other, and driving means for operatively interconnecting said primary means with said secondary means.

39. A conveyor comprising a plurality of containers, means for moving the containers in synchronized relation to one another in adjacent paths, separate transfer means for transferring the containers from one path to another, and means operably responsive to the movement of said transfer means, for controlling the movement of the containers during their transfer from one path to another.

40. A conveyor comprising a plurality of supports movable in adjacent paths, means for simultaneously moving said supports in said paths in opposite directions, transfer means at both ends of said paths arranged for simultaneously transferring said supports in opposite directions from one path to the other, driving means for said transfer means, and speed control means controlled by said transfer means for varying the speed of said driving means.

41. A conveyor comprising a plurality of supports movable in opposite directions in two paths, means for moving said supports, conveyors at both ends of said paths arranged for simultaneously transferring said supports in opposite directions from one path to the other, driving means for said conveyors, and speed control means responsive to the movement of said transfer conveyors for varying the speed of said driving means.

42. An automobile parking tower comprising a series of superimposed supports arranged for vertical movement in opposite directions in adjacent columns, said supports being detached one from the other, each of said supports being adapted to receive and carry an automobile, means for moving said supports in said columns, means for guiding said supports during the vertical movement, separate means at both ends of said columns for transferring said supports from one column to the other column, means for guiding said supports during their transfer from one column to the other column, driving means for propelling said transfer means, and automatically controlled speed control means including means associated with said transfer means for regulating the speed of said driving means and said transfer means.

43. A conveyor including a plurality of supports movable in opposite directions in two paths, means for moving said supports in said paths, transfer means at both ends of said paths for simultaneously moving said supports in opposite directions from one path to the other, and operating means for operating said transfer means with a variable speed whereby the movement of said supports from one path to the other is increased and decreased in speed.

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