

Aug. 3, 1937.

J. ZRNA

2,089,047

AUTOMOBILE PARKING TOWER

Filed May 4, 1933

4 Sheets-Sheet 1

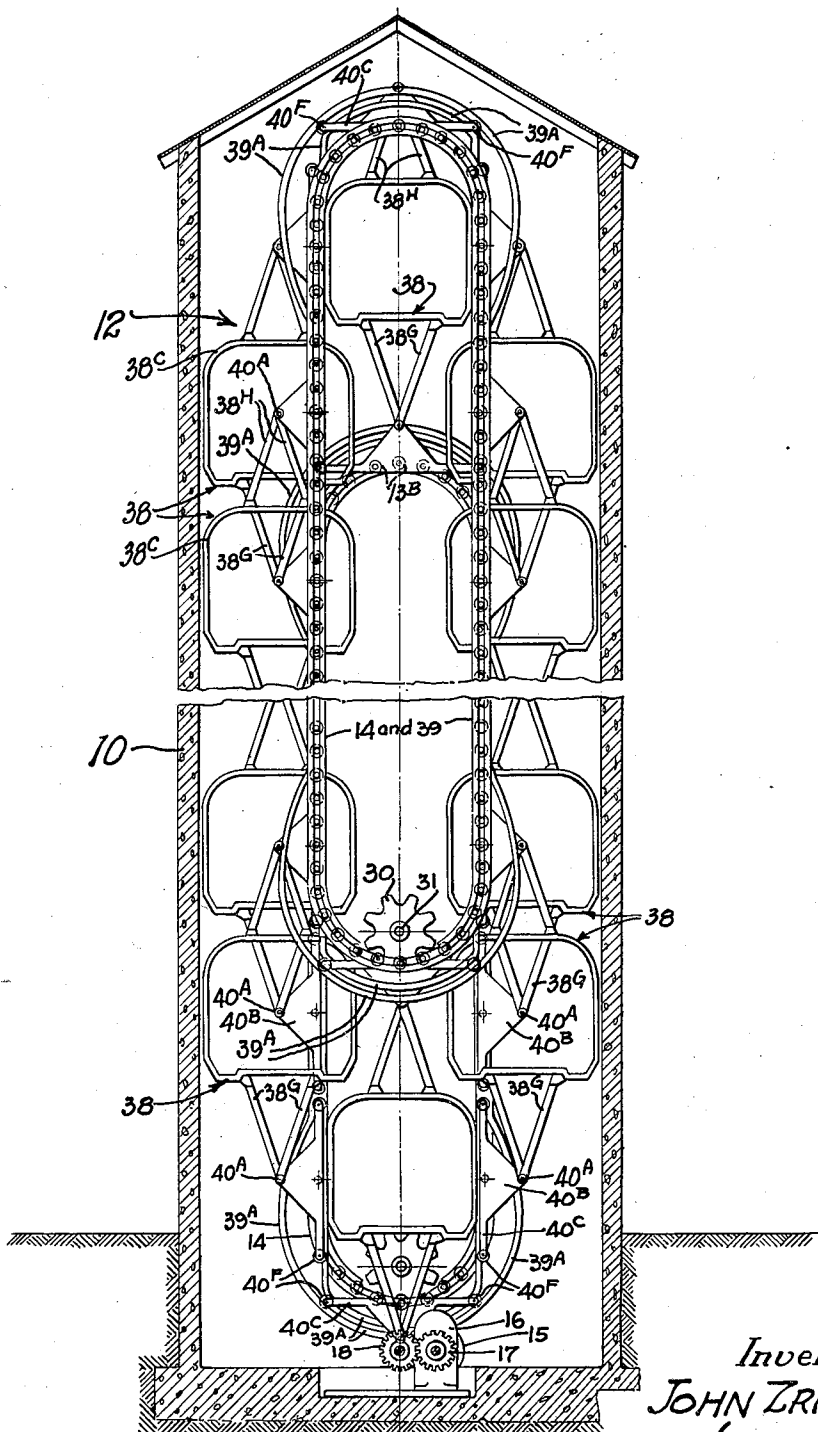


FIG. 1.

Inventor
JOHN ZRNA
By *Frank J. Schneider*
Atty.

Aug. 3, 1937.

J. ZRNA

2,089,047

AUTOMOBILE PARKING TOWER

Filed May 4, 1933

4 Sheets-Sheet 2

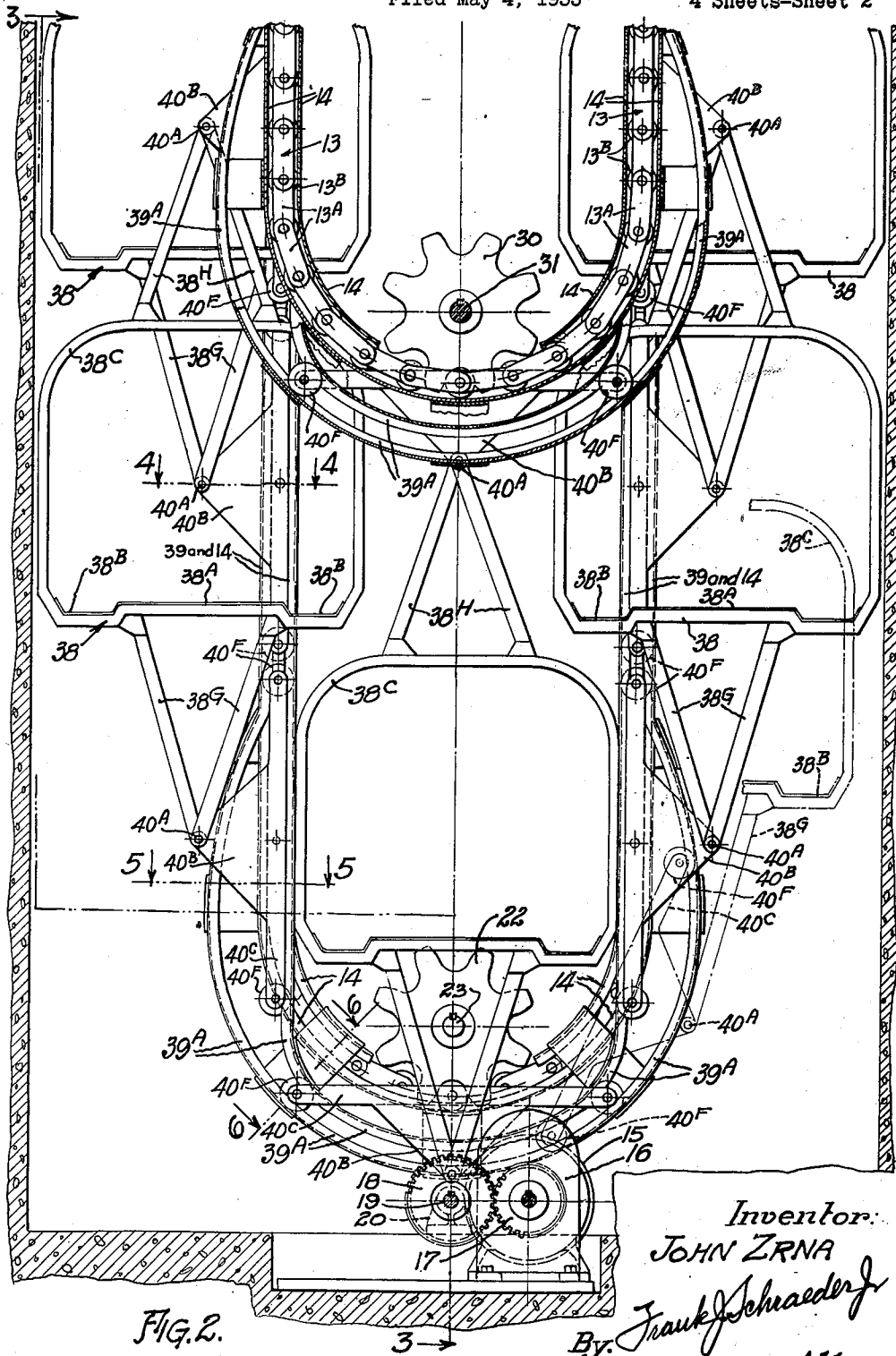


FIG. 2.

Inventor:
JOHN ZRNA
By: *Frank Schneider*
Atty.

Aug. 3, 1937.

J. ZRNA

2,089,047

AUTOMOBILE PARKING TOWER

Filed May 4, 1933

4 Sheets-Sheet 3

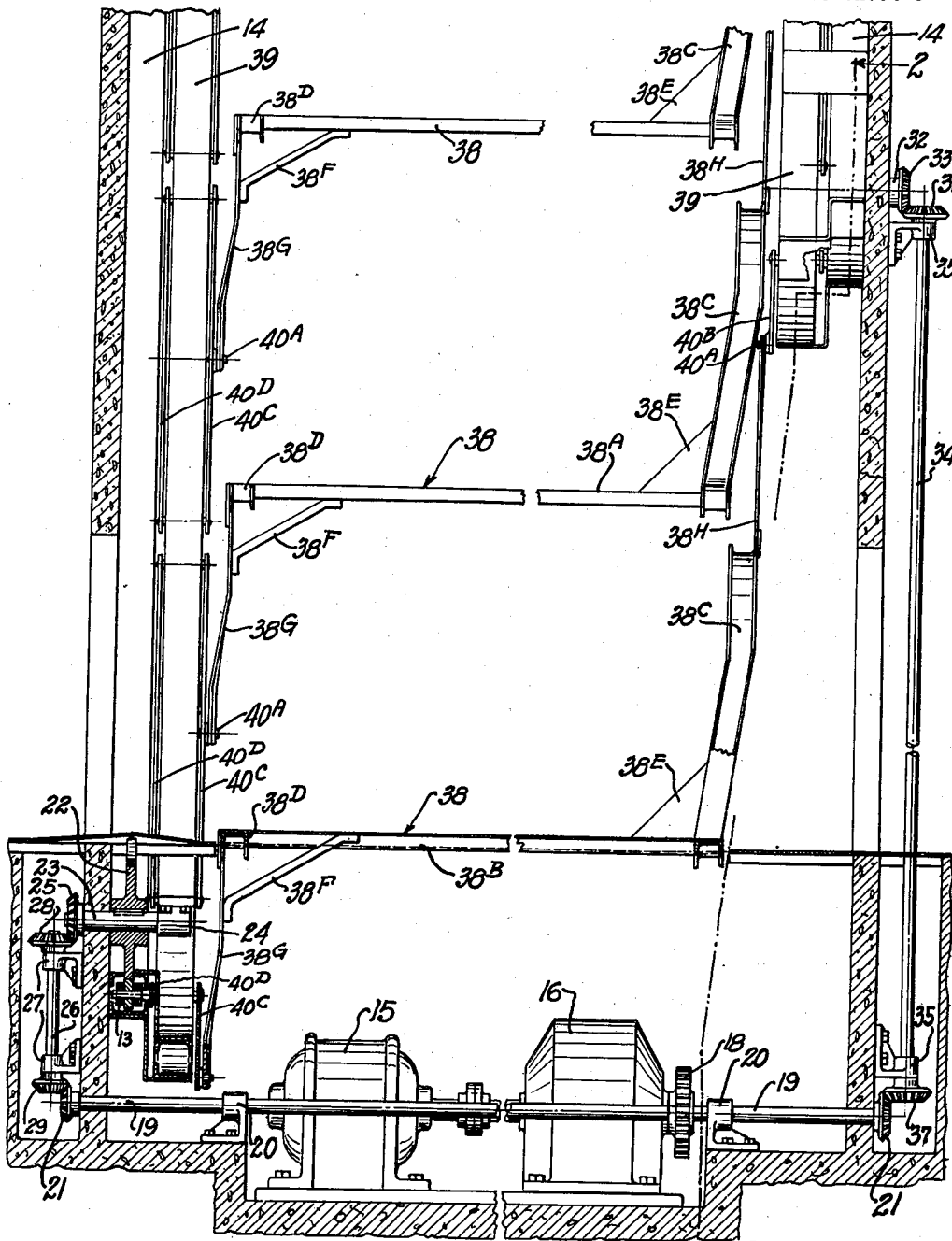


FIG. 3.

Inventor:
JOHN ZRNA
By: Frank J. Schneider
Att'y.

Aug. 3, 1937.

J. ZRNA

2,089,047

AUTOMOBILE PARKING TOWER

Filed May 4, 1935

4 Sheets-Sheet 4

FIG. 4.

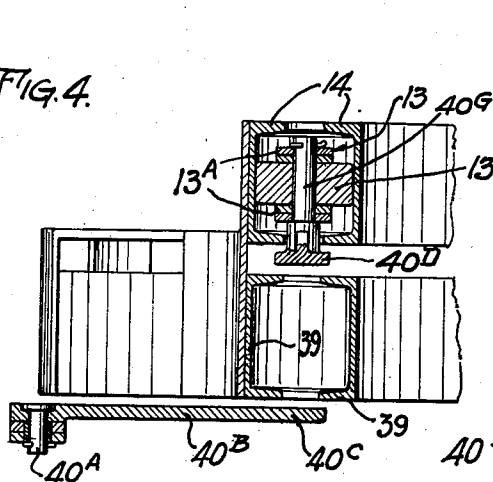


FIG. 5.

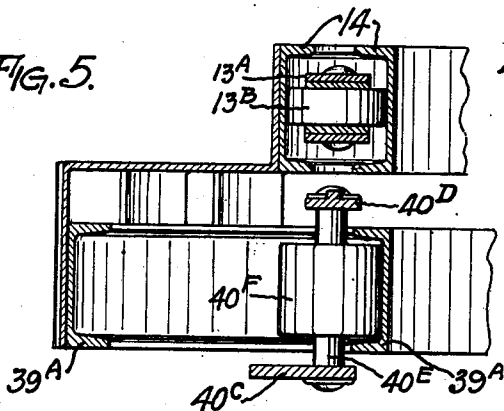


FIG. 6.

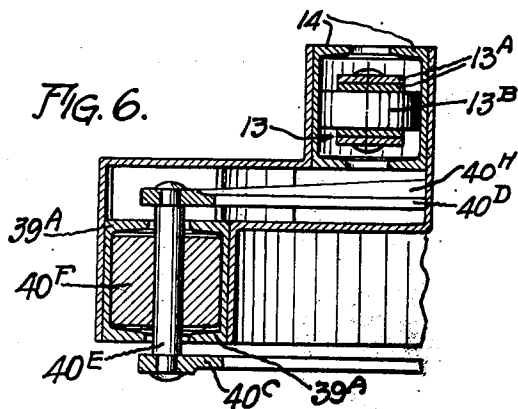


FIG. 7.

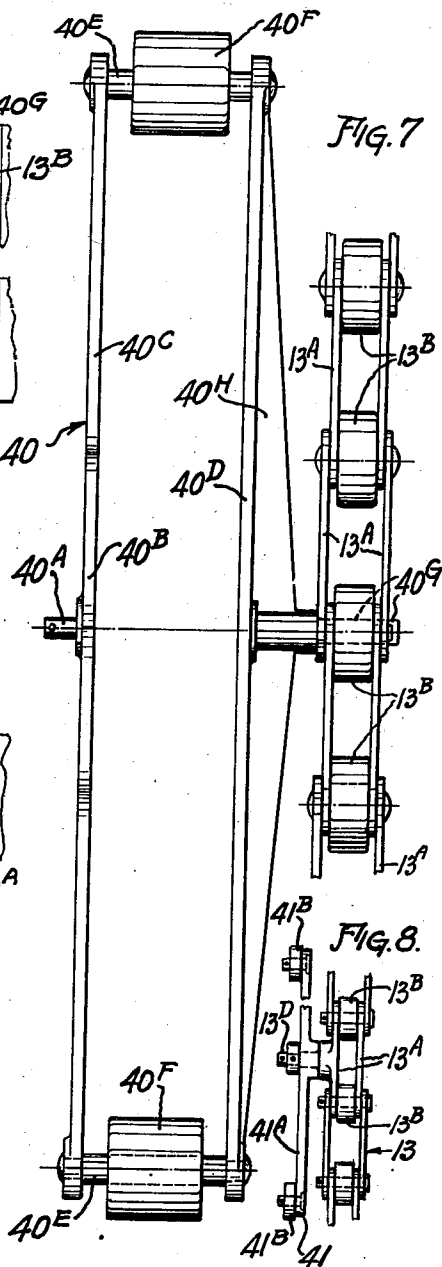
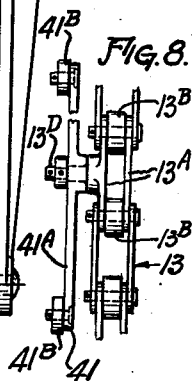


FIG. 8.



Inventor:
JOHN ZRNA

By. *Frank Schwaeder*
Atty.

UNITED STATES PATENT OFFICE

2,089,047

AUTOMOBILE PARKING TOWER

John Zrna, Chicago, Ill.

Application May 4, 1933, Serial No. 669,389

15 Claims. (Cl. 214—16.1)

This invention relates generally to automobile parking towers and has particular reference to new and useful improvements in conveyors and especially elevators having a plurality of movable cages, platforms or supports on which automobiles, or other articles may be stored or conveyed from one point to another.

One of the objects of my invention is to provide an elevator having a plurality of supports or platforms arranged for simultaneous movement in a pair of oppositely movable columns. The movement in said columns being with a predetermined or constant velocity; said platforms being movable from one column to the other with accelerated speed or velocity attained through mechanical instrumentalities.

Another object of my invention is found in the provision of structural or stationary cam means cooperating with movable means associated with the platform-moving means to effect a predetermined acceleration and deceleration of the cages in their movement from one column to the other. Such structural or stationary cam means may be designed to move said platforms from one column to the other with a variable, uniformly, or progressively accelerated and decelerated speed, or the movement of the platforms in such transferring operation may be accelerated to a maximum speed and then maintained at such maximum speed for a period of time and then decelerated to the speed of the platforms in the columns.

Still another object of my invention resides in the provision of intermediate means interposed between the cages and the drive chains or driving means which cooperate with fixed or stationary means so that the path of movement of said intermediate means will be guided and controlled to effect a variation in the speed or velocity of the cages in their transfer movement from one column to another, as for instance, the cages or platforms may be accelerated to a predetermined maximum speed and then decelerated to the speed of the cages in the columns.

A further object of the invention is to provide means intermediate the platforms and their propelling chains which intermediate means are pivotally connected to the propelling chains and disposed for movement in a plane different from the plane of movement of said chains.

A still further object of the invention is found in the novel construction and arrangement of such intermediate means each of which consists of a member pivotally connected to the propelling chain and to the cages; the pivotal connection

to the propelling member being intermediate the free ends of such member and the pivotal connection to the cage being offset to the chain pivotal connection; and the free ends of said member having rollers thereon which are adapted to engage deflecting cams to thereby control the speed or movement of the cages from one path to the other.

With the above and other objects in view, my invention consists in the novel combination, construction and arrangement of the parts and members shown in preferred embodiment in the attached drawings, described in the following specifications and particularly pointed out in the appended claims.

Referring to the attached illustrations:

Figure 1 is a vertical section through a building or structure embodying my invention;

Figure 2 is a vertical section taken on line 2—2 of Figure 3;

Figure 3 is a vertical section taken on line 3—3 of Figure 2;

Figure 4 is a cross-section taken on line 4—4 of Figure 2, showing the connection of the intermediate member to the cage and propelling chain;

Figure 5 is a cross-section taken on line 5—5 of Figure 2;

Figure 6 is a cross-section taken on line 6—6 of Figure 2;

Figure 7 is an enlarged end elevation of the intermediate member; and

Figure 8 is an end view in reduced scale of a modified construction of the intermediate member.

Referring now to the drawings, 10 indicates a structure which includes my improved elevator or conveyor which is generally indicated by numeral 12.

In the illustrations, the invention is applied to an elevator which is disposed vertically and consists of a pair or two sets of continuous link chains, a plurality of cages or platforms adapted to support automobiles and intermediate means for operatively connecting the cages or platforms to the propelling chains.

The cages move in a circuitous path which, in the present instance, may be considered as a pair of vertical columns interconnected at their upper and lower ends to permit the movement or transfer of the cages or platforms at such ends from one column to the other, and the movement of the cages is reversible so that a selected cage may be caused to move to a loading or unloading station through the shortest route.

Various types of control for the operating mechanism may be provided for automatically, semi-automatically or manually controlling the movement of the cages, but since such controls are not a part of the present invention, they are not illustrated in the drawings.

The cage-propelling link chains 13 consist preferably of pivotally-interconnected links 13^A and rollers 13^B to facilitate the movement of such chains in the channel chain guides 14. Each set of such chains 13 is continuously embraced or guided in the vertical column movements and in the transfer movements at the ends by a pair of continuous channel members 14.

It will be observed in Figures 1, 2 and 3, that the upper and lower ends of such chain guides 14 are curved, and that the curved ends and the two propelling chains are offset one to the other in the vertical plane.

The propelling flexible means or chains 13 are, in the present instance, provided with a driving mechanism which is operatively connected to such chains at their lower portions, and consists of a motor 15, the shaft of which is coupled with a speed reducer 16 having a drive pinion 17 in mesh with a gear 18 which is fixed to shaft 19.

The shaft 19 is supported in suitable bearings 20 and at each end carries a bevel gear 21 which is fixed thereto.

The lowermost chain 13 is driven by a sprocket 22 which is fixed to shaft 23 supported in suitable bearings, as for instance, 24 and at one end of shaft 23 is a bevel gear 25 which is fixed thereto.

The gears 21 and 25 are operatively interconnected by a shaft 26 supported in bearings 27 and having fixed thereto a bevel gear 28 which meshes with gear 25, and a gear 29 which meshes with gear 21.

The other chain 13 is driven by a sprocket 30 which is fixed to shaft 31 supported in suitable bearings, as for instance, 32 and at one end of shaft 31 is a bevel gear 33 which is fixed thereto.

The bevel gear 33 and the bevel gear 21 are operatively interconnected by a shaft 34 supported in suitable bearings 35 and having fixed thereto a bevel gear 36 which meshes with bevel gear 33, and a bevel gear 37 which meshes with bevel gear 21.

It will now be readily apparent that the operation of the motor 15 will, through its interconnected transmission mechanism hereinabove described, cause a rotation of the drive sprockets 22 and 30 to thereby propel the chains 13. Obviously, a reversible electric motor 15 may be provided for selectively reversing the movement of chains 13 in their travel within the guides 14.

The cages 38 in the design shown embody a platform 38^A having channeled runways 38^B to guide a motor-vehicle thereon. The platform 38^A is provided at one end with a channel iron frame 38^C and at the other end with a reinforcing cross-channel 38^D. Suitable gusset plates 38^E are provided at the connection of the frame 38^B to the platform 38^A. Likewise brace members 38^F are provided between the platform 38^A and a pair of depending angularly disposed supports 38^G. A similar pair of angularly disposed supports 38^H is arranged to extend upwardly from the frame 38^C.

The cages 38 are pivotally connected and supported at both ends thereof through intermediate means, generally indicated by numeral 40, to the driving or propelling chains 13.

The angularly disposed depending supports

38^G, and the upwardly extending angularly disposed supports 38^H, are each arranged for common pivotal connection with a pin 40^A which is securely held in an extended portion 40^B of a pivotal member 40^C. The intermediate member 40 also includes a companion pivotal member 40^D of equal length.

The pivotal members 40^C and 40^D are interconnected at their ends with pins 40^E, each having a roller 40^F mounted thereon.

The pivotal member 40^D is provided with an extended pin 40^G reinforced with a pair of longitudinally extending rib portions 40^H.

The pin 40^G forms a pivotal support for one of the rollers 13^B of the propelling chain 13, so that the intermediate member 40 is pivotally connected relatively to and with the propelling chain 13.

The pivotal pins 40^A and 40^G are centrally disposed relatively to the members 40^C and 40^D and are offset and not aligned with one another longitudinally of the members 40^C and 40^D.

In the design of elevators of the type shown herein, it is very desirable to mount the cages or platforms 38 as close together as possible and yet permit the transfer movement of the cages or platforms from one vertical column to the other without interference of the cage being transferred with either of the adjacent cages and therefore one of the important objects or features of this invention is found in the provision of the intermediate means 40 which are interposed between the cages or platforms 38 and the chains 13 which impart movement to the cages, and which intermediate means 40 cooperating with cams 39 permit such close mounting of the cages.

The rollers 40^F of the intermediate means 40 are supported and guided within the pair of channel members 39 which extend in the vertical runs substantially parallelly with the chain guides 14.

In order to vary the speed and control the movement of the cages 38 in and during their transfer from one vertical column to the other, simultaneously with the movement of the cages in such vertical columns, the upper and lower portions 39^A of the channels 39 are designed to function as cams for the intermediate means rollers 40^F to thereby cause pivotal movement of such intermediate means about the pins 40^G whereby the speed and movement of the cages or platforms 38 will be varied and controlled.

Such load supporting cams 39^A may, obviously, be so designed or arranged or spaced to extend into suitable planes to so guide the rollers 40^F to produce various predetermined speeds or movements of the cages during their transfer, and I, therefore, do not wish to be understood as limiting myself to the particular form or arrangement of such cams 39^A shown for purposes of illustration in the attached drawings.

In the modification shown in Figure 8, the intermediate means or member 41 consists of a single elongated member 41^A provided with a guide roller 41^B at each end thereof and centrally pivotally mounted on a pin 13^D which is fixed centrally longitudinally of one of the links 13^A of the chain 13, so that the load on the chain 13 is divided between two of the rollers 13^B. Obviously, the member 41 would be extended similarly as at 40^B to accommodate an offset pivotal support for the cage.

I claim:—

1, A conveyor comprising a plurality of plat-

forms simultaneously movable in opposite directions in two interconnected paths, means for moving said platforms, intermediate means interposed between said platforms and said platform-moving means, said intermediate means being movable independently of said platform-moving means and being disposed for movement in a plane different from the plane of movement of said platform-moving means, and means for controlling the movement of said intermediate means whereby said platforms will be moved from one path to the other path with a variable speed.

2. A conveyor comprising a plurality of platforms simultaneously movable in opposite directions in two interconnected paths, means for moving said platforms, intermediate means interposed between said platforms and said platform-moving means, said intermediate means being movable independently of said platform-moving means and being disposed for movement in a plane different from the plane of movement of said platform-moving means, and means for controlling the movement of said intermediate means whereby said platforms will be moved from one path to the other path with an accelerated and then decelerated velocity.

3. A conveyor comprising a plurality of platforms simultaneously movable in opposite directions in two interconnected paths, means for moving said platforms, intermediate means interposed between said platforms and said platform-moving means, said intermediate means being movable independently of said platform-moving means and being disposed for movement in a plane different from the plane of movement of said platform-moving means, and cam-like guiding means for controlling the movement of said intermediate means whereby said platforms will be moved from one path to the other path with a velocity accelerated to a predetermined speed which is maintained for a period of time and then decelerated to the speed of the platforms in said paths.

4. A conveyor comprising a plurality of supports simultaneously movable in opposite directions in a pair of vertically disposed columns, flexible means for moving said supports, power-driven means for propelling said flexible means, intermediate means interposed between said supports and said flexible means and pivotally connected to said supports and to said flexible means, and means cooperating with said intermediate means for causing said supports to move with an accelerated and decelerated velocity during their transfer movement from one column to the other column, said intermediate means being movable in a plane different from the plane of movement of said flexible means.

5. A conveyor as embodied in claim 4, wherein said means cooperating with said intermediate means comprises stationary means adapted to cause a movement of said intermediate means relatively to said supports during the transfer of said supports from one column to the other.

6. A conveyor comprising a plurality of supports arranged for simultaneous movement in a circuitous path, means for moving said supports, means including power-driven means for propelling said support-moving means, intermediate means having a single pivotal connection with said supports and with said support-moving means, and means adapted to be engaged by said intermediate means at a predetermined location in a circuitous path whereby the velocity of said supports will be increased and decreased during

the movement of said supports in a predetermined location in the path of movement of said supports.

7. A conveyor as embodied in claim 6, wherein said pivotal connections of said intermediate means are offset transversely to the longitudinal axis of said intermediate means.

8. A motor-vehicle parking tower comprising a pair of endless chains, motor-driven means for propelling said chains, guiding means for said chains, a plurality of cages each adapted to support a motor-vehicle, said cages being movable in opposite directions in a pair of columns and from one column to the other, a plurality of movable instrumentalities, each of said instrumentalities having a pivotal connection with one of said chains and a separate pivotal connection with one of said cages, and guiding means for said instrumentalities independent of said chain-guiding means, said guiding means for said instrumentalities being arranged to cause a movement of said cages from one column to the other with a velocity different from the velocity of the cages in said columns by controlling and changing the path movement of said instrumentalities.

9. A conveyor comprising a plurality of supports arranged for movement in a circuitous elongated path, means for moving said supports, intermediate means having a single pivotal connection with said supports and with said support-moving means, guiding means for said support-moving means, and separate cam-like guiding means for said intermediate means for controlling the movement of said intermediate means whereby the speed of said supports is increased and decreased in their movement between their positions in the extreme ends of the elongated circuitous path.

10. A conveyor as embodied in claim 9, and including said separate guiding means for said intermediate means comprising stationary extended cam-like structures engaged by said intermediate means and adapted to gradually tilt said intermediate relatively to said support-moving means to thereby cause the variations in the speeds of said supports.

11. A conveyor as embodied in claim 9, and including said separate guiding means for said intermediate means comprising stationary extended cam-like structures engaged by said intermediate means and adapted to gradually tilt said intermediate relatively to said support-moving means to thereby cause the variations in the speeds of said supports, said stationary cam-like structures being so arranged that in each half of said circuitous elongated path, the distance of said structures from said platform-moving means will be gradually increased to a maximum and then gradually decreased to the minimum.

12. A conveyor comprising a plurality of supports movable in a circuitous path, means for moving said supports comprising a pair of spaced endless chains having opposite portions moving in opposite directions in fixed parallel paths, means for guiding said support-moving means in a fixed path, intermediate means comprising members pivotally mounted to said support-moving means, rollers at the ends of said members, extensions from said members disposed intermediate the ends of said members, each of said extensions being pivotally connected to one of said supports, said intermediate means being movable relatively to said supports and to said support-moving means, and means cooperating with said intermediate means for causing the relative

movement of said intermediate means in predetermined portions of said path including guides for guiding said rollers.

13. In a conveyor including a plurality of supports movable in a circuitous path, means for moving said supports, and guiding means for said support-moving means, the combination with said supports and said platform-moving means of intermediate means connected to said platform-moving means and said platforms at spaced points, and separate guiding means for said intermediate means, said intermediate means having a pair of extensions the ends of which extensions are arranged to be guided by said separate guiding means to thereby guide and control the movement of said platforms relatively to the movement of said platform-moving means.

14. The combination in a conveyor as embodied in claim 13, and including rollers on the ends of said extensions which rollers engage said separate guiding means, and wherein said rollers are disposed on a straight line intersecting the connection of said intermediate means with said platform-moving means, and wherein the con-

nections for said intermediate means with said platforms are offset relatively to said connections for said intermediate means with said platform-moving means.

15. A conveyor comprising a plurality of supports movable in a circuitous path, means for moving said supports including a pair of spaced endless chains having opposite portions moving in opposite directions in fixed parallel paths, means for guiding said chains in a fixed path, intermediate means comprising members pivotally mounted to said chains, rollers at the ends of said members, extensions from said members disposed intermediate the ends of said members, each of said extensions being pivotally connected to one of said supports, said intermediate means being movable relatively to said supports and to said chains, and stationary means cooperating with said intermediate means for causing the relative movement of said intermediate means in predetermined portions of said path comprising continuous guides for guiding said rollers.

JOHN ZRNA.