

May 10, 1932.

M. S. CLARK

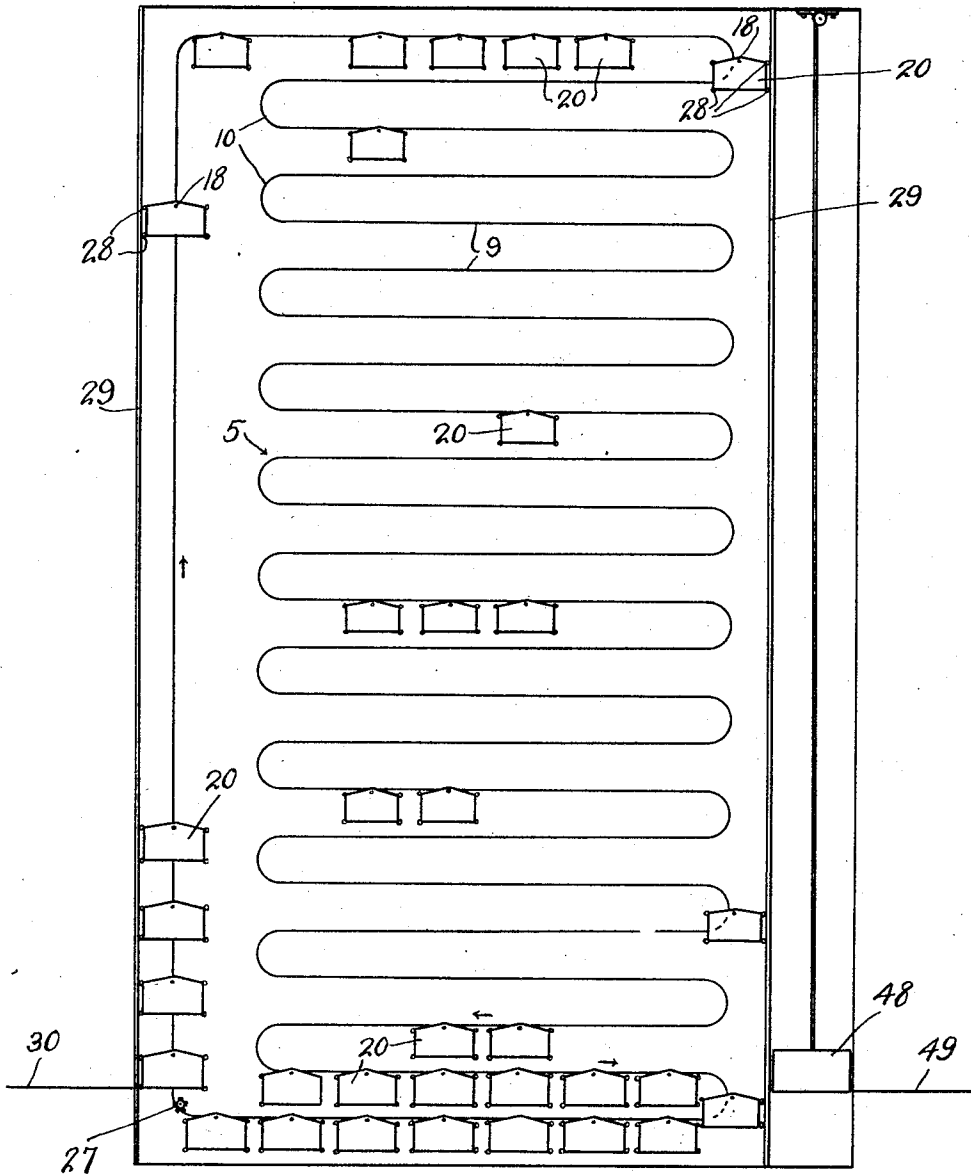
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VEHICLE STORAGE APPARATUS

Filed Nov. 21, 1927

5 Sheets-Sheet 1

Fig. 1.



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Fig. 4.

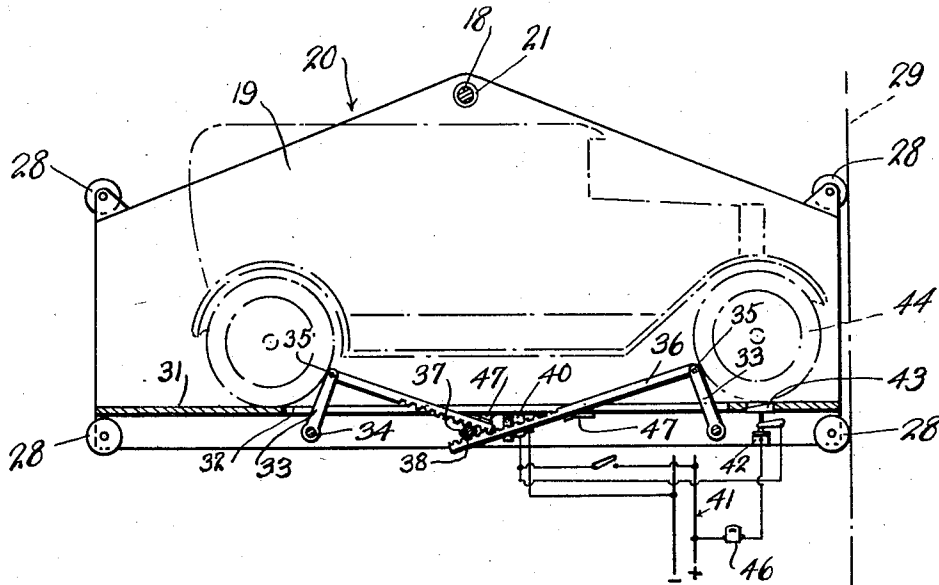
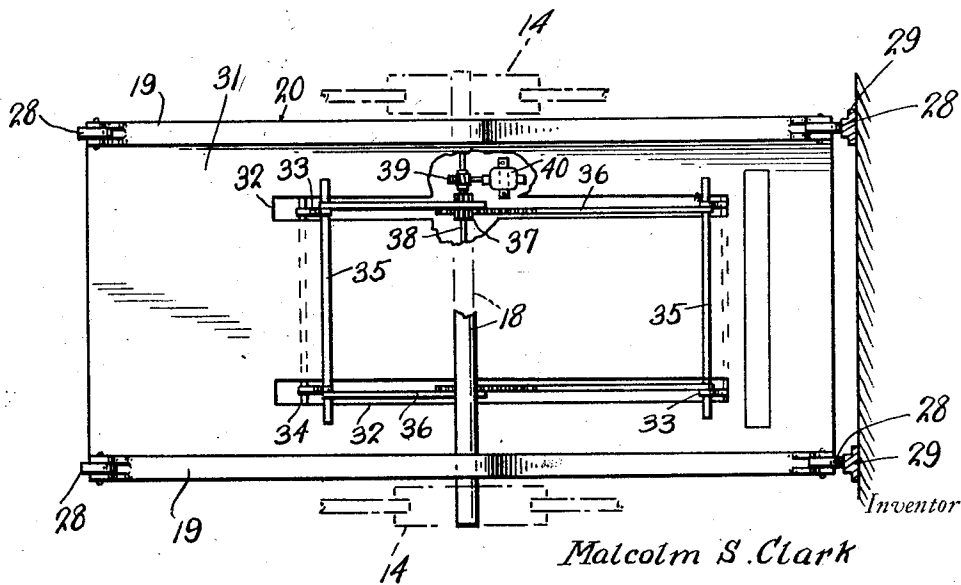


Fig. 5.



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Fig. 8.

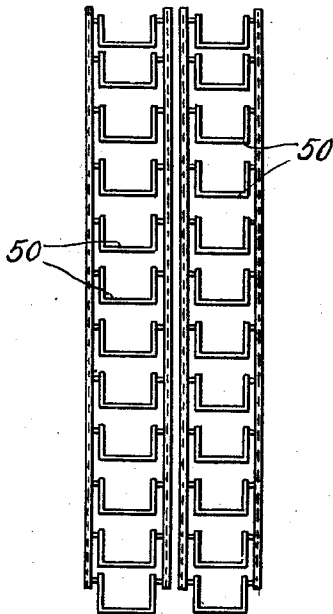


Fig. 9.

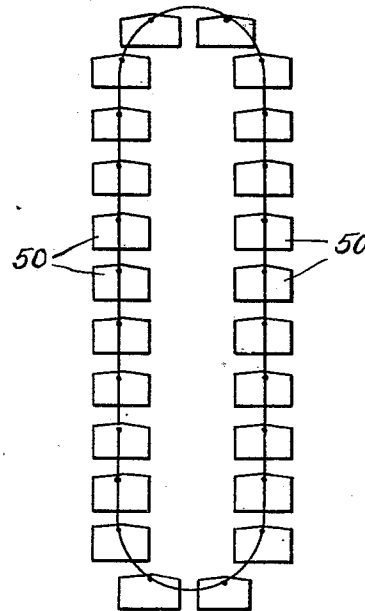
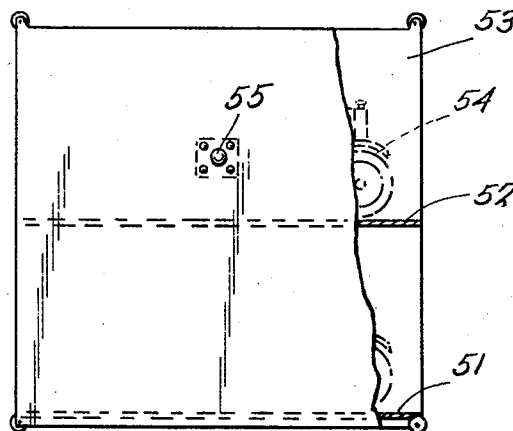


Fig. 10.



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UNITED STATES PATENT OFFICE

MALCOLM S. CLARK, OF FERNDALE, MICHIGAN, ASSIGNOR OF ONE-FIFTH TO STARRETT BUILDING COMPANY, A CORPORATION OF ILLINOIS, ONE-FIFTH TO HARNISCHFEGGER CORPORATION, A CORPORATION OF WISCONSIN, ONE-FIFTH TO WALTER W. AHSCHLAGER, INC., A CORPORATION OF ILLINOIS, ONE-FIFTH TO ALBERT B. FRIDAKER, OF CHICAGO, ILLINOIS, AND ONE-TENTH TO BERT B. BALKEMA, OF DETROIT, MICHIGAN

VEHICLE STORAGE APPARATUS

Application filed November 21, 1927. Serial No. 234,847.

The present invention relates to an apparatus for storing vehicles in a building and has for its principal object to provide means for hoisting the vehicle and distributing the same at various elevated positions in the building so as to compactly arrange the same and utilize all available spaces in the building for the storage of the cars.

A further object is to provide an endless conveyor operating about a track arranged within the building and upon which track is also movably carried a number of cars adapted for movement about the track through the operation of the conveyor, said track being arranged in a continuous circuit in section and various elevated positions in the building, each section being spaced so as to traverse the entire area of the building and at the same time permit the free movement of the cars thereupon and arranging an elevator within the building adapted to receive the vehicle from the car disposed at any of the elevated track sections.

A still further object is to provide a car adapted to travel about the track in a suspended position therefrom and suitable for supporting a vehicle thereon for movement about the track by the car, each of said cars being equipped with an automatically operated chock for engaging the wheels of the vehicle after the same has been placed in a predetermined position upon the car for securing the same in position on the car.

Another object is to provide an apparatus of this character of simple and practical construction which is efficient and reliable in performance, which provides an extremely economical means in utilizing practically the entire face of a building for vehicle storage purposes without sacrificing a part of the building for constructing extended runways for the purpose of moving the vehicles from one floor to another of the building, which is relatively inexpensive to manufacture, install and maintain in operation and otherwise well adapted for the purpose for which the same is intended.

Other objects and advantages reside in the special construction and combination of the various elements comprising the invention,

reference being had to the accompanying drawings forming a part hereof, wherein:

Figure 1 is a diagrammatic elevational view showing the manner of arranging the track circuit for supporting the cars and moving the same throughout the building,

Figure 2 is an elevational view of one end of a track section showing the bars in position extended therefrom together with the endless chain provided for the movement of the cars about the track,

Figure 3 is a fragmentary sectional view through one of the rails of the track illustrating the manner of supporting the cars thereon,

Figure 4 is a side elevational view of one of the cars with a vehicle shown in transporting position thereon and illustrating the manner of securing the vehicle in position upon the car,

Figure 5 is a top plan view of one of the cars with parts broken away illustrating the wheel chock operating mechanism,

Figure 6 is a transverse sectional view through a floor of the building illustrating the manner of arranging the track and supporting the cars therefrom,

Figure 7 is a transverse sectional view through a section of the train taken substantially along a line 7-7 of Figure 2,

Figure 8 is an end elevational view of a modified arrangement of the apparatus,

Figure 9 is a diagrammatic side elevational view of the simplified arrangement shown in Figure 8 and

Figure 10 is a side elevational view of a modified car construction,

Referring now to the drawings in detail, my invention consists of a vehicle storage apparatus comprising a continuously formed track 5 formed of a pair of spaced parallel rails 6, of an I beam formation in cross section having upper and lower flanges 7 and 8 respectively. As shown in Figure 1 of the drawings, the track extends vertically adjacent one side of the building, from the bottom to the top thereof and transversely across the upper portion of the building and continues in a series of horizontal sections at different elevated positions throughout the height of

the building. Each adjacent horizontal track section indicated at 9 is connected at one end by a vertically extending curved section 10. The lowermost horizontal section is in turn connected with the vertical section throughout the height of the building.

The building may be provided with the usual floors 11 and supporting column 12, the columns 12 at each alternate floor level extending from the floor to the ceiling of such floor level whereas the remaining column terminates short of the ceiling and have their upper ends provided with heads 13 extending transversely of the column and upon which the rails 6 may be supported. Any suitable number of track circuits may be arranged throughout the building, Figure 6 of the drawings representing a fragmentary section of one of the floor levels illustrating the manner of supporting a double track section.

Upon each rail of the track is arranged a carrier 14 having a pair of rollers 15 rotatably mounted at each end thereof and engageable with the horizontal surface of the track, each side of the carrier being provided with ejections 16 extending in a direction toward the opposite end of the track and forming a mounting for a pair of rollers 17 engaging the surface of the flange of the track in opposed relation with respect to the rollers 15. As clearly illustrated in Figure 3 of the drawings, the arrangement of the rollers constitutes a guide for the flange of the track whereby to prevent the derailment of the carrier therefrom. An axle 18 is rotatably carried by a pair of the carriers 14 disposed on the corresponding rails of the track, said axle forming a support for the upper edge of the sides 19 of a car 20 arranged in suspended relation from the axle between the rails of the track. The ends of the axle 18 extend through bushings 21 arranged in the sides 19 of the bar to provide for the free swinging movement of the car with respect to the axle.

An endless chain indicated generally at 22 is arranged upon the track, said chain being disposed in sections of suitable length with one end of each section attached to the rear of one of the carriers 14 with the opposite end of each section attached to the forward end of the adjacent carrier.

Each chain section is composed of a plurality of links arranged in end to end relation as illustrated in Figure 2 of the drawings, each link comprising a longitudinally extending rod section 23 with flanges 24 arranged at each side thereof and adapted to extend over the side of the flange of the rail. Each of the links 22 are provided with opposed rollers engageable with the opposite surfaces of the flange of the rail, and comprising rollers 25 rotatably mounted upon the rod section 23 of the link and rollers 26 disposed inwardly with respect to the flanges 24 and rotatably engaging the oppo-

site surface of the flange, said rollers 25 and 26 thereby forming guides for receiving the flange of the rail. By connecting the carriers of each of the cars in this manner it will be apparent that the entire group of cars may be moved along the rails as a unit. A suitable drive means indicated at 27 is provided for engaging the links of the chain whereby to move the same along the rails, said drive means being of any suitable construction, such as for instance the sprocket wheel operatively connected with a collar flange and engaging the chain for the operation thereof in a manner well known in the art.

With the parts of the apparatus assembled in the manner heretofore explained it will be apparent that the cars 20 may be moved along the track, and as illustrated in Figure 2 of the drawings the carrier 14 will travel along the upper flange 7 of the rail while traversing one horizontal section of the track and upon passing around the curved section of the track will be suspended from the lower flange 8 thereof while traversing the next succeeding horizontal section thereof. The manner of swingingly mounting the cars upon the axle 18 readily permits of such traversing of the carriers 14 with respect to the rails so as to maintain the cars constantly in a suspended position.

Rollers 28 are mounted at each end of the cars adapted for engagement with vertically disposed rails 29 arranged adjacent the curved portion of the track whereby to prevent tilting movement of the cars while passing around the curved section thereof.

Through the engagement between the rollers and the rails 29, the tilting of the car is also prevented during the loading and unloading of the vehicle therefrom.

By mounting the rails at one floor level upon the upper edge of the T-head supports 13 and suspending the rails from the ceiling of the adjacent floor level in a manner as illustrated in Figure 6 of the drawings provides a practical method of permitting the carriers 14 to travel upon the opposite flanges 7 and 8 of the rails.

At the side of the building adjacent the vertically disposed section of the track is arranged an entrance way from the street level indicated at 30 providing means for driving the vehicle on to the cars 20 as the same are moved into position opposite the entrance way. Each of the cars 20 are open at each end and have a floor 31 connected with the lower edge of the sides 19, said floor having a pair of longitudinally extending slotted openings 32 formed therein to each end of which a lever 33 extends, the lower end of the lever at the adjacent end of the slot being mounted on a rock shaft 34 with the upper end thereof protruding above the

surface of the floor connected by a transversely disposed rod 35.

The rod 35 disposed at the respective end of the slotted openings 32 form a connection for one end of a pair of rack bars 36 extending toward the center of the car, the rack formed on the bars at each side of the car being opposed with respect to each other as clearly illustrated in Figure 4 of the drawings and engageable with the opposite side of a side pinion 37 mounted on a transversely disposed end 38 and which shaft also carries a worm drive 39 connected with a motor 40 forming the drive means for the pinion.

The motor 40 is connected in a circuit 41 with a suitable source of current and in which is also interposed a switch 42 operated through a movable platform 43 disposed slightly above the surface of the floor 31, which upon being depressed will operate to close the circuit. Normally the rods 35 and rack bars 36 connected therewith are disposed below the surface of the floor and upon the driving of a vehicle as indicated by the dotted line in Figure 4 of the drawings, the front wheels 44 of the vehicle coming into contact with the platform 43 will thereby operate to close the switch and through the operation of the motor 41 to raise the rods 35 so as to engage the opposite sides of the front and rear wheels of the vehicle and thus prevent further movement of the vehicle across the floor of the car. An overload circuit breaker 46 of any suitable type is interposed in the circuit 41 and adapted to break the circuit upon the overloading of the motor 40 after the limit of the movement of the rod 35 against the respective wheels of the vehicle.

Suitable guides in the form of leaf springs 47 may be employed for maintaining a positive engagement of the rack bars 36 with the drive pinion 37.

At the side of the building opposite from the entrance way may be installed an elevator indicated at 48 adapted to be moved adjacent any of the floor levels of the building and to receive the vehicle from the car at any of the floor levels so as to enable the removal of any of the vehicles at any time from the building regardless of the order of the entrance thereof into the building. The elevator is adapted to discharge the vehicle at an exit from the building disposed adjacent the street level as shown at 49.

For selecting the proper stopping position for unloading a desired vehicle from the car, transporting the same, a suitable mechanical chart may be arranged in an operator's quarters, said chart constituting a miniature of the storing apparatus which will move in comparison to the operation thereof, each car of the miniature being identified with a corresponding car of the main apparatus. The operation of the apparatus will be under

constant control by the operator and accordingly as one of the cars approaches a predetermined floor level, the operator will thus be enabled to interrupt the operation of the apparatus to permit the discharge of the desired vehicle from the car onto the elevator 48 and discharging the same from the building at the street level.

In Figures 8 and 9 of the drawings I have illustrated a construction in which the apparatus is reduced to its very simplest form, Figure 8 representing a double track construction about which the cars 50 are adapted to travel, the track being arranged in the form of a vertically disposed loop, as shown in Figure 9, without any horizontal sections at the various floor levels as provided in the form of the invention heretofore described. This form of the invention is adapted particularly for use in connection with relatively narrow buildings.

In Figure 10 of the drawings I have also illustrated a modified construction for the car utilizing the double deck principal by providing a lower floor 51 and an intermediate floor 52 connected by side walls 53, either of said floors being adapted to support a vehicle as indicated at 54. In such modified construction, the transversely extending axle 18 is dispensed with and in place thereof I provide a pair of stub axles 55 extending outwardly from the outer surface of each of the walls 53 and mounted upon the carriers 14 in the usual manner, the stub axles 55 being disposed a position distant above the center line of the car in order to maintain the same in a suspended position.

From the foregoing explanation it will be apparent that an exceedingly economical method is provided for conveniently and rapidly storing a large number of vehicles within the building.

It is obvious that the invention is susceptible of various changes and modifications, without departing from the spirit or scope of the invention or sacrificing any of its advantages, and I accordingly claim all such forms of the device to which I am entitled.

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

1. In an apparatus of the class described, an endless track including a plurality of vertically spaced horizontal runs and runs connecting alternate ends of said horizontal runs, storage cages supported for movement along said track means for moving said storage units, and an elevator operating adjacent said endless track for unloading storage cages of any horizontal run of said track.

2. In an apparatus of the class described, an endless track including a plurality of vertically spaced horizontal runs and runs connecting alternate ends of said horizontal runs, storage cages supported for movement along said track, means for moving said storage

units, an elevator operating adjacent said endless track for unloading storage cages of any horizontal run of said track, vertical guide means adjacent said elevator and co-
5 operating with the cages as they travel along the vertical runs at one side of the track.

3. In an apparatus of the class described, a plurality of storage cages, means for supporting said cages for movement along an
10 endless path having spaced horizontal runs and a single unloading device associated with said means and adapted to be alined with cages at any level.

4. In an apparatus of the class described,
15 a continuously formed rigid track structure including a plurality of superimposed interconnected horizontal track sections and a vertical section, said track being constructed in the form of an I beam in cross section, car-
20 riers mounted for movement about the track, rollers mounted on the carrier adapted for engagement with the opposite surfaces of the flanges of the track, said carriers being adapted for movement upon the upper flange of
25 the track at one horizontal section and upon the lower flange of the track of the adjacent horizontal section, an axle extending between the carriers of the opposite rails of the track, a car swingingly suspended from said axle
30 and a chain section mounted for movement about the flanges of the track and forming a connection between the adjacent carriers whereby to enable the movement of the cars about the track as a unit, each of said cars
35 adapted to support a vehicle thereon.

5. In an apparatus of the class described, the combination of an endless rigid track structure arranged in vertical and horizontal
40 sections, car suspension means movable about the track, and flexible connectors for the suspension means whereby to connect a predetermined number thereof for movement as a unit about the track.

In testimony whereof I affix my signature.
45 MALCOLM S. CLARK.

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