Jan. 6, 1931. E. GEIGER 1,788,155

GARAGE

Filed Feb. 1, 1929 2 Sheets-Sheet 1

Fig. 1.

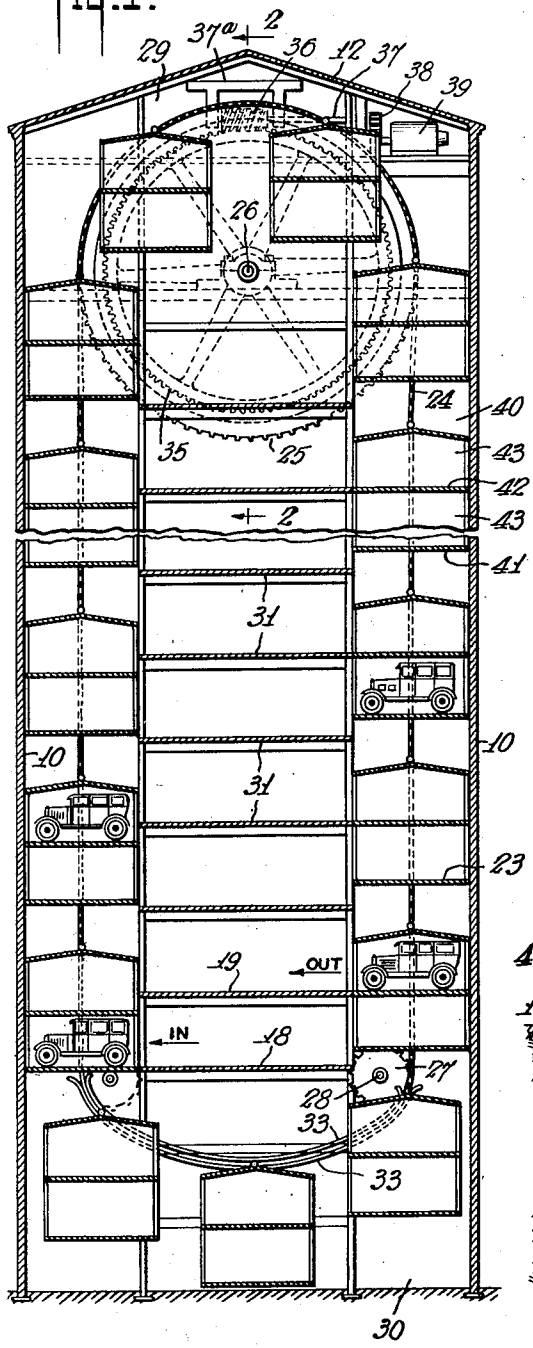


Fig. 2.

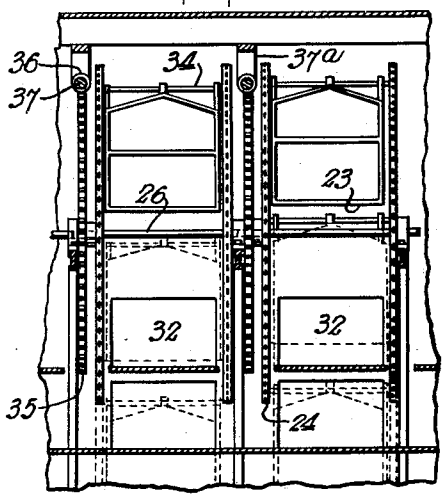
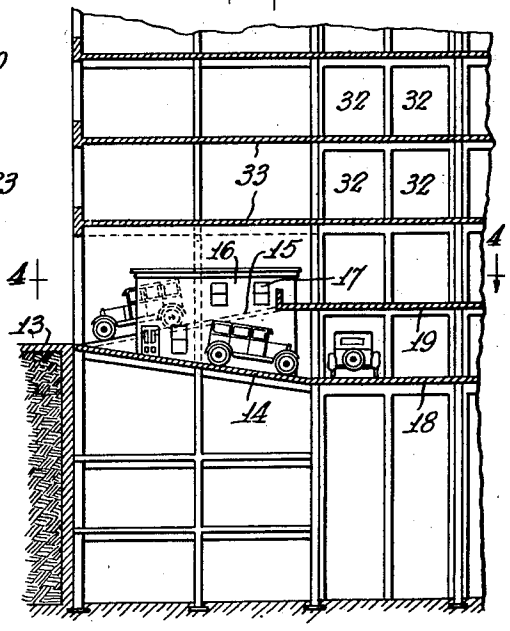


Fig. 3.



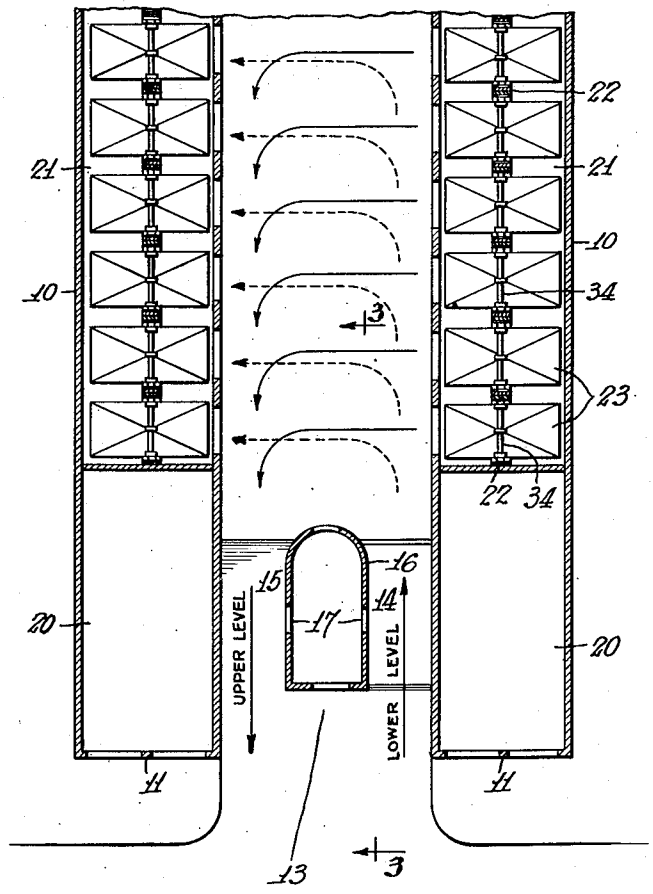
INVENTOR
Ernst Geiger
BY
Franklin J. Foster
ATTORNEY

Jan. 6, 1931. E. GEIGER 1,788,155

GARAGE

Filed Feb. 1, 1929 2 Sheets-Sheet 2

Fig. 4.



INVENTOR
Ernst Geiger
BY
Franklin J. Foster
ATTORNEY

Patented Jan. 6, 1931 1,788,155

UNITED STATES PATENT OFFICE

ERNST GEIGER, OF IRVINGTON, NEW JERSEY

GARAGE

Application filed February 1, 1929. Serial No. 336,792.

An object of the present invention is to provide a garage in which a maximum number of cars may be stored in a minimum amount of space, and a garage in which the cars may be handled with ease and expedition, either when moving the cars into the storage space or driving them out of the garage.

A more specific object of the invention is to provide a garage preferably of relatively restricted cross-sectional area, built up to any desired height. The cars to be stored are conveniently carried to a considerable distance above or below the ground floor. While primarily concerned with the saving of space in a horizontal direction the invention further contemplates the most efficient utilization of the cubic space content of the building.

Preferably I provide any suitable number of endless conveyor elements mounting temporary car storage cabins. The endless conveyors may be conveniently manipulated to rapidly bring any storage cabin into car receiving, or car delivering position.

The endless conveyors and the cabins which they carry preferably travel about a central space of the building which may be used as a permanent storage space, and may be horizontally subdivided into any number of floors.

Preferably the cabins of the endless conveyors are roofed over to effectively prevent a stored car from being soiled by grease drip from superjacent cabins or the well-lubricated conveying and guiding apparatus above it.

In a preferred embodiment of the invention, the cars are forwardly driven in to one side of the storage cabins, rotated partially around the central storage space and forwardly driven out of the other side of the storage cabins. Preferably two road levels are provided, one for driving in the cars, and the other for driving out the cars. The cabins by proper manipulation of the endless conveyor may be moved into alignment with any of the floors of the central storage space, so that cars may be driven from the cabins on to one side of the storage floors, and driven into the cabins off the other side of the storage floors.

It is to be noted, however, that while I refer to the use of permanent storage floors, an important feature of the invention is the storage of vehicles in movable storage compartments, or cabins which may be conveniently shifted to some distance from the point of reception or delivery of the cars, and so constructed that any storage compartment may be expeditiously moved to discharging or delivering position at any time.

The invention may be more fully understood from the following description in connection with the accompanying drawings, wherein:

Figure 1 is a view in vertical section through a garage embodying the present invention.

Figure 2 is a fragmentary vertical sectional view on the line 2—2 of Fig. 1.

Figure 3 is another fragmentary vertical sectional view appoximately on the line 3—3 of Figure 4.

Figure 4 is a sectional plan view on the line 4—4 of Figure 3.

It is to be understood that the drawings which form part of this application are illustrative of only one embodiment of the invention, and are by no means to be interpreted in a limiting sense.

In the drawings I have shown a building including side walls 10, a front wall 11 and a roof 12. A driveway 13 enters the front of the building at the ground floor thereof and communicates with a downwardly inclined runway 14 for arriving cars, and an upwardly inclined runway 15 for departing cars. The roadway space between the two runways may be conveniently occupied by a building structure such as control house 16 housing all of the controls for the motor mechanism to be later described, and provided with windows 17 through which business may be transacted with the drivers of the cars as they pass down the runway 14 on to the receiving floor 18, or as they pass from the superjacent delivery floor 19 down the runway 15.

The building space indicated by the reference character 20 at opposite sides of the

entering drive 13 and above the drive, may be conveniently used for office space or as a permanent storage space for cars, as will be later understood.

At each side of the building there is provided a vertical shaftway 21, and in these shaftways are mounted pairs of vertical guideways 22 for guiding the movement of storage cabins 23 carried on spaced endless conveyors 24.

The conveyors 24 run over pairs of relatively large spaced sprocket wheels 25 mounted on common horizontal bearing shafts or axles 26 journalled or keyed near the top of the building. The chains also run over idler sprockets 27 journalled on shafts 28 immediately below the receiving floor 18. Suitable space is provided at 29 in the top of the building and at 30 below the street level in the bottom of the building for the passage of the storage cabins from one shaftway 21 to the other.

The cabins in their travel thus pass completely around a central space which is preferably vertically divided into a number of floors 31 upon which cars may be stored for relatively long periods of time. As best seen in Fig. 3, the receiving and delivery floors 18 and 19, and also all of the storage floors 31 above them communicate by doorways 32 with the shaftways 21 so that by horizontally aligning the cabins 23 with any floor, a car may be driven from the cabin on to the floor at one side of the building or from the floor on to the cabin at the other side of the building.

Obviously, some means must be provided for guiding the movement of the endless conveyors and the cabins which they carry from one shaftway to the other. In the upper space the large sprocket wheels 25 are of sufficient size to effect the transfer from one shaftway to the other, their diameters equalling the distance between the center of one shaftway and the center of the other shaftway.

In passing through the lower space at 30, the sprocket chains travel between pairs of arcuate guide rails 33. Preferably each endless conveyor assembly includes two conveyor chains 24 and cross rods 34 which connect the chains, and from which the cabins are hung for free swinging movement. The weight of the cabins will tend to retain them in horizontal position as they are transferred from one shaftway to the other, either between sprocket wheels 25 or under the guides 33.

Numerous expedients might be resorted to for properly driving the sprocket wheels 25. I prefer to employ driving gears 35 keyed to turn with the sprocket wheels and driven by worms 36 carried by shafts 37 which are journalled in suitable bearing hangers 37*a*. Shaft 37 may be driven through any suitable gear train indicated at 38 by motor 39.

As seen by the fragmentary plan view, Fig. 4, there may be any suitable number of endless conveyor units and associated series of cabins. As for the construction of the cabins themselves, I prefer to use cabins of duplex type, that is to say, cabins which embody a ceiling 40, floor 41, and a central horizontal partition 42 which divides the cabins into upper and lower storage compartments 43. I am thus able to effect considerable space economy as will be later explained without rendering the cabins too large for convenient manipulation by the conveyors.

Prime considerations in this type of structure are the efficient, expeditious handling of cars and the economy of space, primarily space in a horizontal direction, but more generally the most efficient utilization of the cubic contents of the building.

The factors which determine efficient space utilization for any given height of building of the general character described above are (1) the width of the car receiving and delivery floors, (2) the spacing of the car handling cabins on the endless chain, (3) the number of cars carried by a cabin, and (4) the mounting of the sprocket wheels which transfer the cabins from one shaftway to the other.

Considering first the width of the car receiving floors, these floors must be sufficiently wide so that a car driven in from one end of the garage may be turned and driven ahead into a waiting storage cabin without any backing or maneuvering which would delay car handling. Similarly a car should be driven out onto the delivery floor and swung around toward the exit without any jockeying or gear-shifting. With this in mind the width of the floors must be at least once and a half as long as the standard or average length of the cars to be handled and bearing in mind the unskillfulness of some drivers, the floors should be twice as wide as the length of a car to assure efficient and expeditious driving of a car into its receiving cabin. Inasmuch as the cabin depth is just sufficient to accommodate a standard-sized car, the floor width may be considered in terms of cabin depths rather than car lengths and is equal to from once and a half to twice such depth, in accordance with a preferred embodiment of the invention.

The mounting of the sprocket wheels is of importance from the standpoint of space economy, in that any attempt to mount these wheels on stub shafts would involve loss of space between adjacent shaftways, since the stub shafts would have to run well back and even then would take the tremendous strain on the wheels very inefficiently. A preferred method of overcoming this is to connect the wheels by a common bearing shaft or axle which requires relatively shallow bearings

in the shaftway walls. This axle, however, immediately creates a necessity for using cabins of a height which is less than the radius of the wheels if the cabins are hung from their tops on the chains, since otherwise the cabins would strike the axle as they were transferred.

The shortest distance between the adjacent cabins on a chain is proportional to the diameter of the sprocket wheel. These cabins might be spaced quite closely together on a very large wheel and would have to be spaced very far apart if a relatively small wheel were used for transfer purposes due to interference between the cabins in making the sharp turn around the wheel.

Efficient utilization of the space on the chain requires cabins horizontally subdivided into the greatest number of car compartments possible. Bearing these size-controlling factors in mind, it may be seen that the present arrangement affords substantially 100% efficient space utilization.

Duplex cabins are used of a horizontal cross-section closely approximating the length and width of a standard-sized car, only sufficient excess width being present to permit the egress and ingress of a driver. The height of each cabin compartment is approximately that of a standard-sized car. The space between shaftways is equal to approximately twice the length of a standard-sized car whereby convenient emplacement and removal of the cars is permitted and the radius of the sprocket wheel is somewhat greater than the height of a two-compartment cabin, but insufficient to permit the use of pendent three-compartment cabins.

An attempt to vary these proportions immediately results in either wasting space or making it extremely difficult to maneuver the cars.

For example, if the width of the receiving and delivery floors were decreased, car maneuvering would become more difficult and the decreased size of the sprocket wheel would necessitate a greater spacing between the cabins of the chain and a consequent reduction in the number of cars which could be carried by a single length of chain. If these floors were narrower sufficiently, pendent duplex cabins could not be used at all and further reduction in the car carrying capacity of the chain would result.

By increasing the size of the sprocket wheel in order to shorten the necessary distance between the cabins of the chain, the width of the car receiving and delivery floors would be increased and the increased space would be essentially waste. More roadway would be provided than is required for convenient maneuvering. The increase in the storage floor area would be a negligible factor in most installations since these storage floors take care of only emergency congestion or permanently stored cars and the illustrated arrangement gives considerably more dead storage space than is usually required.

If the cabins were cut in half horizontally to provide single instead of duplex carriers it will be perfectly obvious that the total car carrying capacity of the chain would be decreased.

Increasing the height of pendent cabins by making them of the triplex type would necessitate a material increase in the diameter of the sprocket wheels so that such cabins could clear the sprocket wheel axles. Here again there would be a corresponding needless increase in the width of the space between shaftways.

From the foregoing discussion it will be evident that in a garage of this character most efficient space utilization is accomplished by spacing the two shaftways apart a distance equal to from one and one-half to twice the depth of a cabin, by using pendent duplex cabins of a height approximately equal to twice the height of a car and by using sprocket wheels mounted on a common connective shaft the diameter of which wheels is equal to the distance between the center of opposite shaftways and the radius of which is somewhat greater than the height of the suspended duplex cabins to be handled. It is understood of course that the cabins are arranged as closely to each other as possible on the chain, the controlling factor here being the clearance necessary between cabins when they pass around the sprocket wheel.

Any attempt to depart from the relative proportions above specified results in either waste of space at the car handling floors or the impedance of convenient car manipulation.

The vital importance of expeditious car parking and expeditious car delivery may be clearly demonstrated by considering the actual operating conditions in a 600 car garage. With such garages located in an office district they will ordinarily be completely filled within the space of a couple of hours in the morning, which means that cars must be received at the rate of one every ten to thirty seconds. The congestion which would be caused by narrow receiving floors will be apparent. On the other hand, the delivery of cars must be correspondingly rapid during the evening rush hour. From which it will be immediately obvious that the amount of so-called live or cabin storage space is of far more importance than the dead or floor storage space.

As suggested above, there is preferably a set of suitable control mechanisms not illustrated, housed within the building structure 16, and with such control mechanism any one of the sets of endless conveyors may be manipulated to align either compartment of any cabin with either side of any floor. The

cabins are open at both sides, and as best seen in Fig. 1, the cars are driven into the cabins at one side and driven out of the cabins at the other side after the cabins have been shifted from one shaftway to the other.

A great many cars may be expeditiously handled by the use of the separate receiving and delivery levels. The cabins will of course be numbered. The owner when calling for his car will present a ticket indicating the particular cabin number within which his car is stored, and the operator may shift one of the sets of endless conveyors in their direction to bring this cabin most expeditiously into alignment with the delivery floor 19.

Whether the space between the shaftways is used as an airshaft or for the accommodation of stored cars, or for any other purpose, is of course a matter to be decided in the case of each garage structure, and will depend upon the requirements of the trade.

The device of the present invention may be built as an addition to apartment houses and may be constructed in numerous ways other than that shown. In some instances the cabins serve as elevators rather than as storage compartments, but in a preferred embodiment of the invention the cabins are used for storing and not merely for transporting the vehicles.

Various changes and alterations might be made in the general form and arrangement of parts described without departing from the invention. Hence I do not wish to limit myself to the details set forth, but shall consider myself at liberty to make such changes and alterations as fairly fall within the spirit and scope of the appended claims.

What I claim is:

1. In a garage structure pairs of spaced vertical shaftways, spaced upper and lower crossways connecting them, pairs of spaced wheels in the upper crossway of a diameter substantially equal to the distance between centers of the opposite shaftways, an axle connecting them, pairs of spaced endless flexible devices running through the shaftways and crossways and over the wheels, car storage cabins hung between the flexible devices and carried thereby, each cabin being horizontally sub-divided to provide a plurality of car compartments of a width and depth to conveniently accommodate an average sized car, the radius of the wheels exceeding the combined height of the number of compartments used but being less than the combined height of a greater number of compartments of similar size, and a car handling floor between the shaftways.

2. In a garage structure pairs of vertical shaftways, spaced upper and lower crossways connecting them, pairs of spaced guide wheels in the upper cross-way of a diameter substantially equal to the distance between centers of the opposite shaftways, pairs of spaced endless flexible devices running through the shaftways and crossways and over the wheels, car storage elements hung between the flexible devices and carried thereby, each element including spaced, superimposed rigidly connected car receiving platforms of a width and depth to conveniently accommodate an average sized car, and superimposed landing and loading floors associated with a shaftway.

3. In a garage structure, pairs of spaced vertical shaftways, spaced upper and lower crossways connecting them, pairs of spaced sprocket wheels in the upper crossway of a diameter substantially equal to the distance between centers of the opposite shaftways, pairs of spaced endless chains running through the shaftways and crossways and over the sprocket wheels, car storage cabins hung between the chains and carried thereby, each cabin being horizontally sub-divided to provide a plurality of car compartments of a width and depth to conveniently accommodate an average sized car, the radius of the sprocket wheels exceeding the combined height of the compartments, a car handling floor extending approximately from shaftway to shaftway and being of a width from approximately one and one-half to two times the depth of a cabin.

4. In a garage structure pairs of spaced, vertical shaftways, spaced upper and lower crossways connecting them, pairs of spaced sprocket wheels in the upper crossway of a diameter substantially equal to the distance between centers of the opposite shaftways, pairs of spaced endless chains running through the shaftways and crossways and over the sprocket wheels, car storage cabins hung between the chains and carried thereby, each cabin being horizontally sub-divided to provide a pair of car compartments of a width and depth to coveniently accommodate an average sized car, the radius of the sprocket the wheels exceeding the combined height of two compartments, a car handling floor extending approximately from shaftway to shaftway and being of a width from approximately one and one-half to two times the depth of a cabin, said car handling floor communicating at one end with the exterior of the structure.

5. In a garage structure pairs of spaced vertical shaftsways, spaced upper and lower crossways connecting them, pairs of spaced sprocket wheels in the upper crossway of a diameter substantially equal to the distance between centers of the opposite shaftways, pairs of spaced endless chains running through the shaftways and crossways and over the sprocket wheels, car storage cabins hung between the chains and carried thereby, each cabin being horizontally sub-divided to provide a pair of car compartments of a width

and depth to conveniently accommodate an average sized car, the radius of the sprocket wheels exceeding the combined height of two compartments, superimposed car delivery and receiving floors arranged between the shaftways and communicating with the exterior of the building through one end of the latter, said storage compartments being open at both ends whereby a car may be driven ahead into a compartment at the receiving floor and driven ahead out of the compartment at the delivery floor after the compartment has been carried in a partially orbital path from one shaftway to the other.

Signed at New York, in the county of New York and State of New York this 28th day of January A. D. 1929.

ERNST GEIGER