This invention relates to mechanism for lifting a motor vehicle to such an elevation that another vehicle may be parked beneath the raised one. The invention relates more particularly to the type in which the lifting power is supplied by the engine of the vehicle being lifted and involves certain improvements over that shown and claimed in my prior application Ser. No. 781,312, filed Oct. 24, 1947, now abandoned.

In that type of construction there is provided a platform on which the car may be driven, vertical post members at opposite corners and adjacent to opposite ends for coacting with lifting mechanism and for guiding the platform in its raising and lowering movements, and means driven from a rear wheel of an automobile for actuating the mechanism for raising the platform and car vertically along said guides.

As one feature of my improved construction, cables are disposed at the four corners of the platform and are pulled or slackened by a single mechanism so as to prevent any possible tilting of the platform due to any heavier loading at one end or at one side than at the other.

As another feature, the cables each have an end secured to the platform and have a loop which may be extended to thereby shorten effective lengths of the cables and thereby lift the elevator.

As a further feature, the lifting force is supplied by hydraulic means, the liquid pressure being developed by a pump on the platform and driven from the engine of the car being lifted and the pressure may be controlled to vary the speed of the car lift in respect to the car engine speed.

As a further feature, the operating connections between the cables and the hydraulic means are so designed and arranged that a single piston-stroke of the hydraulic power transmitter effects the lifting of the car to the desired elevation even though said stroke is only a fraction of the distance through which the car is lifted.

As a further feature, the raising and lowering are controlled by a valve in the path of the liquid employed in the hydraulic cylinder whereby the raising, lowering and holding of the platform in a desired position are effected by the operation of a single valve.

Various other features of novelty and importance will be pointed out hereinafter in connection with a description of a preferred embodiment illustrated in the accompanying drawings.

In the drawings:

Fig. 1 is a side elevation of the mechanism with a car in place and illustrating in dotted lines the platform and a car in raised position; Fig. 2 is a plan view;

Fig. 3 is a view similar to a portion of Fig. 2 but on a larger scale;

Fig. 4 is a side elevation of certain of the parts shown in Fig. 1 and on a larger scale; and

Fig. 5 is a section on the line 5—5 of Fig. 3.

In the form illustrated, there are provided four vertical guides 10, 10a, 10b and 10c which may be T-beams or channels and which are connected in side pairs by frame members 11 which may, if desired, be parts of the support of an upper deck or an upper floor on to which the car may be moved after being raised. Between the two side pairs of vertical guides is the platform 11 on to which the car may be driven and which is raised to lift the car through a distance at least a little greater than the car height, and, if desired, to the level of an upper floor or deck. The platform includes transverse beams 12 which have their ends vertically slidable along and guided by the vertical guide posts. 10. These transverse members 12 support the body of the platform which carries most of the car lifting mechanism as well as the car to be lifted or lowered. Portions of the platform comprise runways 14 for the car wheels and the ends of these runways may have inclined portions 15 for guiding the car up on to the platform.

The mechanism for effecting the lifting of the platform and the car from power developed on the car itself includes a pump 15 mounted on the platform and forming a portion of the circuit of a substantially non-compressible liquid. For driving the pump from one or both rear wheels of the car, there are provided a pair of rollers 17 and 18 of appropriate length and spaced the proper distance apart for supporting one or both rear wheels. The rollers are preferably connected by a belt 19 for transmitting power from one roller to the other and for providing increased traction for the vehicle tire. The pulley or roller 18 has its shaft 20 connected by a flexible coupling 20a to the pump 15, above referred to.

This pump 15 has a suction or inlet pipe 21 leading from a sump tank 22 and a discharge pipe 23 leads to a surge or pressure tank 24 from which the power transmitting fluid may flow to a cylinder 27 to effect the raising of the platform. Preferably, the pipe 23 has valve 25 connected by a pipe 26 to the sump tank. The valve 26 may be an automatic pressure relief valve to by-pass the liquid when the piston here-
in after referred to has been moved to the limiting extent, and in case the pump is still being operated. The cylinder 27 has a piston 28 therein connected to a piston rod 28' and the cylinder and piston are so proportioned that the piston stroke is about one-half of the range of vertical movement of the platform.

For controlling the flow of the fluid from the surge tank to the cylinder a pipe 29 leads from the surge tank 24 to a three-way valve 30 and from this valve the liquid may be delivered either through a pipe 31 to the cylinder 27 or through a pipe 32 back to the sump tank 22. The valve is preferably positioned at such an elevation above the platform and at such a point along the length of the platform that it is adjacent to the window on the driver's side of the vehicle, as shown in Fig. 1. The valve has an operating handle 33 so that the driver of the car may conveniently shift the valve 30 to deliver liquid from the surge tank to the cylinder 27 instead of to the sump tank 22, and thus affect the raising of the platform and vehicle, as will be hereinafter described.

The speed at which the platform is lifted may be controlled by the extent of movement of the valve. When it is desired to lower the platform, the valve may be shifted to connect the pipes 31 and 32, and the weight of the platform and car will gradually force the liquid out of the cylinder 27 and back through the valve to the sump tank. Here again the speed of lowering may be controlled by the proper positioning of the valve handle.

For utilizing the movement of the piston rod 28 for raising the car there are provided four cables 35, 35a, 35b and 35c, anchored at the upper ends to the upper ends of their respective uprights, guides or columns 16, 16a, 16b and 16c. The cables extend down the uprights and around idlers 38, 38a, 38b and 38c, journaled at the four corners of the platform, and then beneath the platform to idlers 37 and 37 mounted beneath the platform and opposite to the end of the piston rod 28. Each idler 37 and 38 may have two grooves so that one idler engages one cable, and the other idler engages the other two cables. The piston rod has a head 39 provided with pulleys 40 and 41 movable toward and from the pulleys 37 and 38.

The cables 35 and 35a at one side of the platform extend down the guides 16 and 16a, around the idlers 36 and 36a to the idler 38c, thence around the pulley 41 to an anchor point 43. Similarly the cables 35b and 35c extend down the uprights or guides 16b and 16c, thence around the idlers 36b and 36c, then around the pulley 41 and around the pulley 39 to an anchor point 44. Obviously, the cables 35 and 35a may be integral at the anchor point 43 and the cables 35b and 35c also integral at the anchor point 44. Thus it will be seen that the pulleys 40 and 41 are in loops in the cable and a movement of the platform which a given distance will raise the platform twice that distance.

In the operation of the lifting mechanism, the driver, by control of the engine, causes the pump 16 to be driven from a rear wheel of the vehicle. With the platform at rest, the liquid will be pumped from the sump tank through the pipes 21 and 22 to the surge tank 24 and from the surge tank through the pipe 29 and valve 30, back through pipe 32 to the sump tank. When it is desired to raise the platform and car, the operator shifts the valve 33 so that the liquid delivered through the pipe 29 goes through the pipe 31 to the cylinder 27 instead of back to the sump tank. This causes the piston to move toward the right, as viewed in Fig. 3, and the head 38 will move the pulleys 40 and 41 toward the right from the position shown in Fig. 3. As the cables are anchored at 43 and 44, this movement of the piston will shorten the effective lengths of the cables by an amount equal to twice the extent of movement of the pulleys 40 and 41 and the piston. By forming an additional loop in the cable the ratio of platform lifting movement and piston movement may be further increased.

When the car has been raised to the desired elevation, the valve 33 is moved to neutral position so that circulation of the fluid is stopped and the engine of the car is stopped. The car may be held in this raised position solely by this fluid pressure, as the check valve prevents return flow of the fluid. There is provided a brake which will prevent the rollers 17 and 18 from rotating, so that the car may be driven onto or off the platform. In the form illustrated, the shaft 20 of the roller 18 has a brake drum 45. The brake band 47 is anchored at one end and has its opposite end connected to a bell crank which is connected by a rod 46 to a control lever 50. This hand lever 50 is preferably positioned closely adjacent to the valve handle 33, as shown in Fig. 1, so that the driver of the car may apply the brake when he stops his engine or operates the valve 33. With this brake applied, the rollers 17 and 18 cannot rotate, and the car may be readily driven off the platform when in lowered position, or onto a second floor if the platform be in raised position.

From a consideration of the embodiment of the invention, it will be noted that each of the idlers is anchored at one end to the upper end of an upright and is anchored at the other end on the platform. The reciprocating member 23, in pulling on loops in the cables, shortens the effective length of the cables and lifts the car. The liquid which is pumped is preferably an oil and the surge tank 24 contains a substantial amount of air or other compressible gas. The pipe connections to the tank are at the bottom so that the air is trapped in the tank. During the lowering of the platform with a car therein the return of the oil to the surge tank compresses the air to between 500 and 750 p. s. i. The brake is applied when the platform is in the lower position and before the car is removed from the platform. Therefore, after removing the car and shifting the valve 33, the brake 47 may be released and the air pressure in the surge tank will be sufficient to force oil from the surge tank to the cylinder 27 and raise the empty platform to the upper position where another car may be run on to the platform from an upper deck and lowered.

The rollers 17 and 18 are shown as supporting only one rear wheel of the car and the other rear wheel may engage a depression 51 in the platform to give increased resistance to the slipping of this wheel. If desired, the rollers 16 and 17 may be made longer to support both rear wheels. Having thus described my invention, wherein I claim as new and desire to secure by Letters Patent is:

1. A self-lifting car elevator, including corner uprights, a platform adapted to support the car and vertically guided by said uprights, rollers on
said platform for supporting a driving wheel of a car, a pump driven by said rollers, cables suspended from the upper ends of said uprights, a cylinder having a piston connected to said pump, and means operated by said piston for shortening the effective means of said cables to thereby lift said elevator when said pump forces liquid into said cylinder.

2. A self-lifting car elevator, including corner uprights, a platform for supporting the car and vertically guided by said uprights, cables connecting said uprights and said platform for supporting the latter, a cylinder and a piston mounted on said platform, one being connected to said cables, a pump for forcing liquid into said cylinder to move said piston, means driven by a driving wheel of said car for operating said pump, and means connected to said piston for shortening the effective lengths of said cables and thereby lifting said platform.

3. A self-lifting car elevator, including a platform for supporting the car, cables suspended from above the corners of said platform, idlers at the corners of said platform and around which said cables extend, and means driven from a driving wheel of a car on said platform for pulling said cables from said idlers and thereby lifting said platform and the car.

4. A self-lifting car elevator, including a platform for supporting the car, vertical uprights at opposite sides and adjacent to opposite ends of said platform, cables having their upper ends secured to the upper end of said uprights, idlers on said platform and adjacent to said uprights and around which said cables extend, a hydraulic cylinder on said platform, a piston in said cylinder and connected to said cables and a pump for forcing fluid into said cylinder to move said piston, pull said cables from said idlers and thereby lift said platform.

5. A self-lifting car elevator, including a platform for supporting the car to be lifted, cables suspended from above said platform, idlers adjacent to the corners of said platform and around which said cables extend, each of said cables having a loop therein and the other end secured to the platform, a hydraulic cylinder on said platform, a piston having an idler engaging the loops of said cables, a pump for forcing fluid into said cylinder to move said piston and means for driving said pump from a driving wheel of the car.

6. A self-lifting car elevator, including a platform, idlers adjacent to the corners of said elevator, cables suspended from above said elevator and passing around said idlers, a hydraulic cylinder on said platform, a piston in said cylinder and having connected thereto an idler engaging a loop in each of said cables and means driven from a driving wheel of the vehicle for forcing non-compressible fluid into said cylinder, whereby the idler connected to said piston shortens the effective length of said cables and thereby lifts said platform.

7. A self-lifting car elevator, including a platform, cables having their upper ends suspended above said elevator and having their lower ends secured to said elevator, rollers around which said cables pass to form a loop in each, a hydraulic cylinder on said platform, a piston in said cylinder and having an idler engaging the loops in said cables and means driven by a driving wheel of said car for forcing liquid into said cylinder to thereby move said piston, shorten the effective length of said cables and lift said platform.

8. A car elevator including a car supporting platform, stationary uprights adjacent to each corner thereof, cables each having one end secured to the upper end of a corresponding upright and having the other end anchored on said platform, a pulley engaging loops in said cables and means operated from a driving wheel of an automobile on said platform for moving said pulleys to extend loops in said cables and lift said platform.

9. A car elevator including a car supporting platform, uprights adjacent to each corner thereof, a plurality of cables each having one end secured to the upper end of an upright and the other end secured to said platform, a pair of pulleys between which loops in said cables are formed and means operated from the driving wheel of an automobile on said platform for extending said loops and thereby lifting said platform.

10. A car elevator including a car supporting platform, four cables each having one end anchored above said platform and the other end secured to said platform, idlers between which loops of each of said cables extend, a reciprocating member on said platform and connected to all of said loops and means operated from the driving wheel of an automobile on said platform for moving said member to extend said loops and thereby lift said platform.

11. A car elevator including a car supporting platform, four cables each having one end anchored above said platform and the other end secured to said platform, a cylinder and plunger on said platform, one having operative connection to said loops, and means operated by a driving wheel of an automobile on said platform for forcing a fluid into said cylinder to effect relative movement of said cylinder and plunger and the lifting of said platform.

12. A car elevator including a car supporting platform, a pair of rollers on said platform for supporting a driving wheel of the car, a hydraulic cylinder and piston on said platform, means driven by said rollers for pumping liquid into said cylinder, means connected to said piston for raising said platform, a brake for said rollers, and means operable by an occupant of said car for operating said brake and for controlling the flow of said liquid to said cylinder.

13. A car elevator including a vertically movable car supporting platform, a hydraulic cylinder on said platform, a piston therein, cables for lifting said platform and operatively connected to said piston, a sump tank, a surge tank containing a liquid and a gas, a pump for forcing liquid from said sump tank to said surge tank to compress said gas therein, means for operating said pump from a driving wheel of a car on said platform, and a manually operable valve for controlling the flow of liquid from said surge tank to said cylinder.

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