Aug. 27, 1940. A. JACKSON ET AL 2,212,940

AUTOMOTIVE LIFT

Filed March 6, 1939

Fig. 1

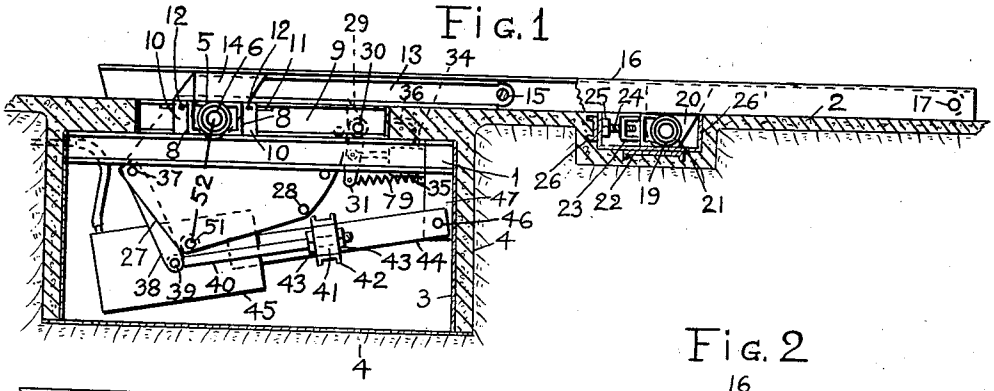


Fig. 2

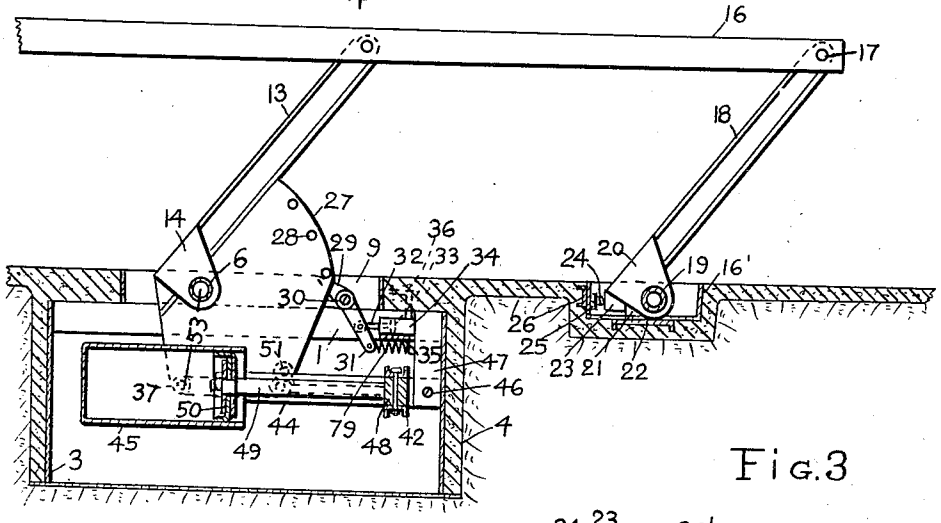


Fig. 3

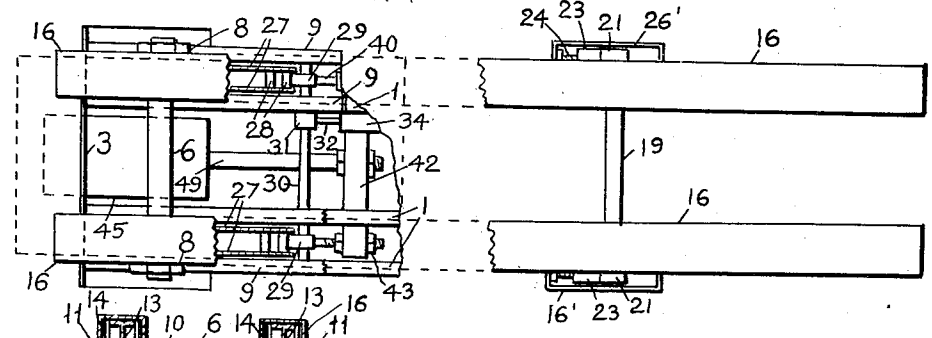
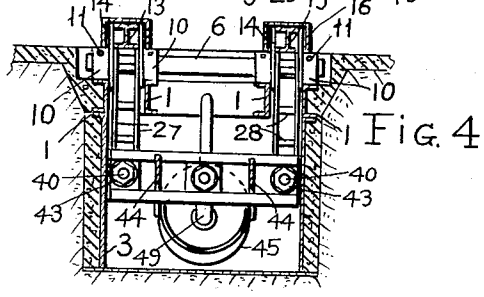


Fig. 4



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AUTOMOTIVE LIFT

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Application March 6, 1939, Serial No. 259,954

10 Claims. (Cl. 254—91)

Our invention relates to automotive lifts and has particular reference to lifts for raising automotive vehicles.

In our patent application Serial No. 242,476, filed November 26, 1938, we described an automotive lift in which lifting power was applied to the peripheral portions of the sectors attached to the lower portions of the lifting arms and substantially concentric with the center of rotation of the arms, a constant torque being thereby applied to the arms. A spring buffer was provided for absorbing any shocks that may occur at the end of the lift when the movement is stopped. We have found, however, that considerably better and smoother operation is obtained if the sectors are made with variable radii in order to vary the torque and speed of operation of the lift in accordance with the variations in the resistance caused by the changes in the leverage of the arms with the changes in the lifting angle. Our invention has for its object, therefore, to provide a lift in which the lifting torque varies from its maximum at the beginning of the lift when the resistance of the arms is greatest to the minimum when they are substantially raised and their resistance torque is correspondingly decreased, this resistance varying in proportion to the cosine of the angle of the arm with the base of the lift. We accomplish this object by making the lifting segments eccentric so that the distance of the point of application of the lifting force varies, being the greatest at the start when the resistance is also the greatest, and being reduced at the succeeding points corresponding to the partly and fully raised positions of the arms. With this arrangement it is possible to increase the speed of the lifting operation when the resistance is substantially decreased, another material advantage being also obtained in that no buffer spring is required since there is no appreciable shock at the end of the lifting movement.

Another object of our invention is to provide additional means to reduce the shock of the first application of the lifting torque to the structure, for which purpose we provide a hingedly supported lifting motor with flexible connections to the sectors, the motor being normally allowed to remain in the lowest inoperative position, and being raised when energized by the lifting force to a position in alignment with the direction of the force tangential to the sectors.

Other objects and advantages of our invention will be apparent from the accompanying specification and drawing in which—

Fig. 1 is a sectional elevational view of our lift in the inoperative position.

Fig. 2 is a similar vew of the lift in the raised position.

Fig. 3 is a top plan view of the lift partly in section.

Fig. 4 is a transverse sectional view taken on the line 4—4 of Fig. 1.

Our lift comprises short foundation beams 1 supported under a floor 2 of a shop, resting on the sides of a box-like subframe 3 made of sheet metal and set into an excavation, the subframe being also used as a form for pouring concrete 4 around it, thereby facilitating the installation of the mechanism. The beams support bearings for a tubular shaft 6. The bearings represent bushings 5 to which short pieces of channel iron 8 are attached as by welding, thereby forming boxes placed on the top surfaces of the beams 1 between supplementary beams 9 which abut the bearing boxes as shown in Fig. 1. The ends of the beams 9 have blocks 10 supporting pins 11 held in place by cotter pins 12 and retaining the bearing boxes. This arrangement has an advantage of simplicity since no bolts are required for holding the bearings in place.

The shaft 6 is rigidly connected with arms 13 by means of plates 14 welded to the shaft. The upper ends of the arms are pivotally connected at 15 to rails 16 of a channel shape so that the ends of the arms are concealed under the rails. The plates 14 are offset so that the arms lie horizontally inside the rails when they are lowered as shown in Fig. 1. This arrangement facilitates turning the arms from their lowermost position, the axis of rotation being substantially below the axis of the pivots 15. The pivot 15 is placed near the middle point of the rails 16, the front ends of the rails being pivotally connected at 17 to the upper ends of front arms 18 mounted on a tubular shaft 19 by means of offset plates 20. The shaft 19 is journaled in bearings 21 slidably supported on a cross beam 22. The bearings 21 have tubular extensions 23 in the rear for bolts 24 with nuts 25, the heads of the bolts resting against beams 26 imbedded in concrete in boxes 26'. The bearings may be shifted on the beam 22 by turning the nuts 25. With the arrangement of the pivoting points as shown, the vehicle is always so placed on the rails that its weight is almost wholly supported by the rear arms thereby relieving the front arms from any considerable portion of the strain. It is possible therefore to apply the lifting power to the rear arms only thereby also reducing the maximum torque required for the mo-

tor in order to lift the front arms under the worst operating conditions when the arms lie flat. The sectors abut the arms, supporting their lower portions.

The rear arms are provided with lifting sectors 27 with ratchet teeth 28 on the periphery engaged by dogs or pawls 29 mounted on a shaft 30. An arm 31 is rigidly mounted on the shaft 30 and is engaged by a rod 32 connected with a piston 33 in an auxiliary cylinder 34 mounted on a cross bar 35 attached to the beams 1. Compressed air is admitted to the cylinder through a pipe 36. Spring 79 turns the pawls against the ratchet teeth 28.

The sectors have pins 37 at the ends pivotally supporting the ends of links 38 whose other ends are pivotally connected at 39 to the ends of rods 40. These rods are threaded at the other ends and are slidably fitted in blocks 41 in a cross-beam 42, nuts 43 adjustably retaining the threaded portion of the rods in the blocks 41. The cross-beam 42 is slidably supported on bars 44 rigidly attached to the sides of a power cylinder 45, the other ends of the bars 44 being pivotally supported on a shaft 46 fitted in brackets 47 extending from the base 1. A block 48 is fitted in the middle of the cross-beam for the end of a piston rod 49 extending from a piston 50 sliding in the cylinder. A pin 51 is fitted in each sector 27, forming a rest for the links 38. The length of the links 38 is such that they bear against the pins 51 at the ends or at the points of joint with the ends of the rods 40. This arrangement brings the pins 39 farther away from the axis of rotation of the sectors. Moreover, the pins 37 are substantially nearer the axis of rotation than the pins 51 so that a considerably longer arm 52 of the turning moment is provided at the start of the lifting operation than during the next operating stage when the pull is transmitted through the pins 37, the arms of the turning moment being reduced to 53 (Fig. 2), the cylinder being raised by the force exerted on the sector to a position shown in Fig. 2, the links 38 being then aligned with the rods 40.

Compressed air is admitted into the cylinder through a flexible hose 54 extending from a point of control (not shown).

It is understood that our lift may be further modified without departing from the spirit of our invention as set forth in the appended claims.

We claim as our invention:

1. An automotive lift comprising a base, arms rotatively supported on the base at their lower ends, means to support a vehicle at the upper ends of the arms, a motor in the base, extensions on the lower portions of the arms, and operative connections between the extensions and the motor, and means to vary the radial distances of the points of application of the lifting force to the extensions varying for different positions of the lifting arms so as to increase the turning moment at the start of the lifting operation.

2. An automotive lift comprising a base, arms rotatively supported on the base at their lower ends, means to support a vehicle at the upper ends of the arms, a motor in the base, sector-like extensions on the lower portions of the arms, and operative connections between the motor and the peripheral portions of the sectors, the radial distances of the points of application of the lifting force to the sectors varying for different positions of the lifting arms so as to increase the turning moment at the start of the lifting operation.

3. An automotive lift comprising a base, arms rotatively supported on the base at their lower ends, means to support a vehicle at the upper ends of the arms, a motor in the base, sector-like extensions on the lower portions of the arms, and operative connections between the motor and the peripheral portions of the sectors, the sectors being so shaped as to provide the greatest turning moment at the start of the lifting operation.

4. An automotive lift comprising a base, arms rotatively supported on the base at their lower ends, means to support a vehicle at the upper ends of the arms, a motor in the base, sector-like extensions on the lower portions of the arms, and flexible connections between the peripheral portions of the extensions and the motor, the extensions being so shaped as to provide for a relatively large turning moment at the start and a reduced turning moment at the end of the lifting operation.

5. An automotive lift comprising a base, arms rotatively supported on the base at their lower ends, means to support a vehicle at the upper ends of the arms, a motor in the base, sector-like extensions on the lower portions of the arms, and flexible members extending from the outer portions of the extensions to the motor and bearing against the intermediate portions of the extensions, the outer portions having shorter radii than the intermediate portions, said portions being so positioned that the turning moment is the greatest at the start when the torque is transmitted through the intermediate portions.

6. An automotive lift comprising a base, arms rotatively supported on the base at their lower ends, means to support a vehicle at the upper ends of the arms, a motor in the base, sector-like extensions on the lower portions of the arms, flexible members extending from the outer portions of the sector-like extensions, and operative connections between the motor and the ends of the flexible members adapted to pull the flexible members tangentially to the extensions for turning the arms, the extensions being so shaped as to provide for the greatest turning moment at the start of the lifting operation.

7. An automotive lift comprising a base, arms rotatively supported on the base at their lower ends, means to support a vehicle at the upper ends of the arms, a motor in the base comprising a cylinder and a piston mounted for a movement in relation to each other, means to admit compressed fluid into the cylinder, sector-like extensions on the lower portions of the arms, flexible members attached to the outer end portions and passing over the middle portions of the extensions, and means to move the flexible members by the relative movement between the piston and the cylinder, thereby turning the arms, the torque at the start of the lifting operation being transmitted through the intermediate portions of the extensions and at the end through the end portions, the end portions being nearer the axis of rotation than the intermediate portions, the turning moment being therefore greater at the start than at the end of the lifting operation.

8. An automotive lift comprising a pair of front arms, a pair of rear arms, means to rotatively support the arms, a pair of rails pivotally supported at the upper ends of the arms, and adapted to support an automobile, the rails and the arms with their supporting means forming two hinged parallelograms thereby maintaining

the rails in a horizontal alignment, sectors mounted on the rear arms, the rear ends of the sectors being spaced at shorter distances from the axis of rotation of the arms than the intermediate portions, flexible members extending from the rear portions of the sectors, an air motor, means to pull the flexible members by the motor thereby turning the sectors with the arms, pins on the intermediate portions of the sectors forming fulcrums for the flexible members at the start of the lifting operation, the starting pull being thereby transmitted through greater radii.

9. An automotive lift comprising a pair of front arms, a pair of rear arms, means to rotatively support the arms, a pair of rails pivotally supported at the upper ends of the arms, and adapted to support an automobile, the rails and the arms with their supporting means forming two hinged parallelograms thereby maintaining the rails in a horizontal alignment, sectors mounted on the rear arms, the rear ends of the sectors being spaced at shorter distances from the axis of rotation of the arms than the intermediate portions, flexible members extending from the rear portions of the sectors, an air motor comprising a piston and a cylinder mounted for a relative sliding movement therebetween, means to pull the flexible members by the motor thereby turning the sectors with the arms, pins on the intermediate portions of the sectors forming fulcrums for the flexible members at the start of the lifting operation, the starting pull being thereby transmitted through greater radii.

10. An automotive lift comprising a pair of front arms, a pair of rear arms, means to rotatively support the arms, a pair of rails pivotally supported at the upper ends of the arms, and adapted to support an automobile, the rails and the arms with their supporting means forming two hinged parallelograms thereby maintaining the rails in a horizontal alignment, sectors mounted on the rear arms, the rear ends of the sectors being spaced at shorter distances from the axis of rotation of the arms than the intermediate portions. flexible members extending from the rear portions of the sectors, an air cylinder, bars extending from the open end of the cylinder, means to rotatively support the free ends of the bars thereby rotatively supporting the cylinder, a member slidably mounted on the bars, a piston slidably fitted in the cylinder, means to connect the piston with the sliding member, the flexible members being connected at their front ends to the member, and means to admit compressed air into the cylinder for moving the piston, the piston being adapted to rotate the sectors with the arms at a slower speed and with greater torque at the start of the lift when the flexible members rest on the front portions of the sectors, the cylinder being adapted to be raised by the pull on the flexible members.

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