

June 27, 1939.

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2,163,735

ELECTRICALLY DRIVEN VEHICLE JACK

Filed Sept. 10, 1936

2 Sheets-Sheet 1

Fig. 1

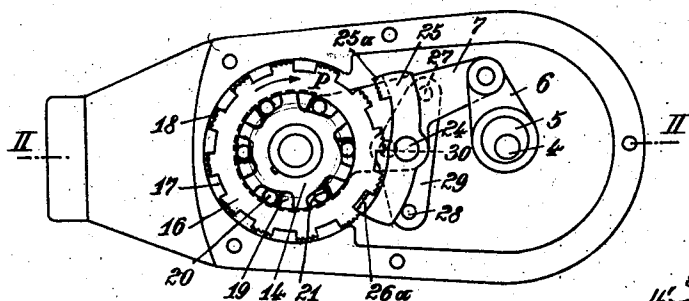


Fig. 1a

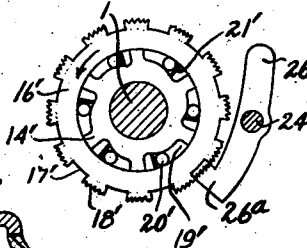


Fig. 2

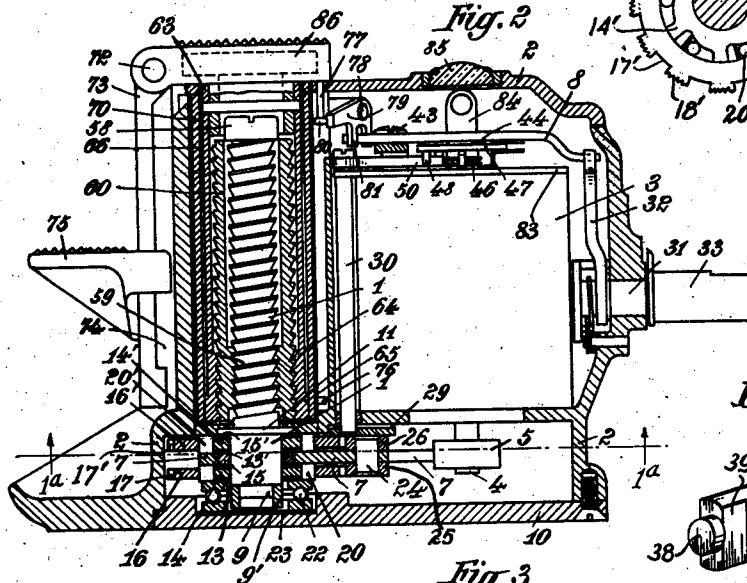


Fig. 6^a

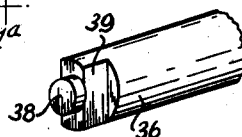
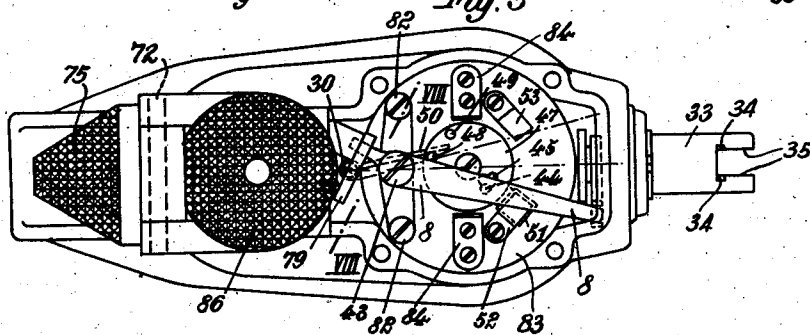


Fig. 3



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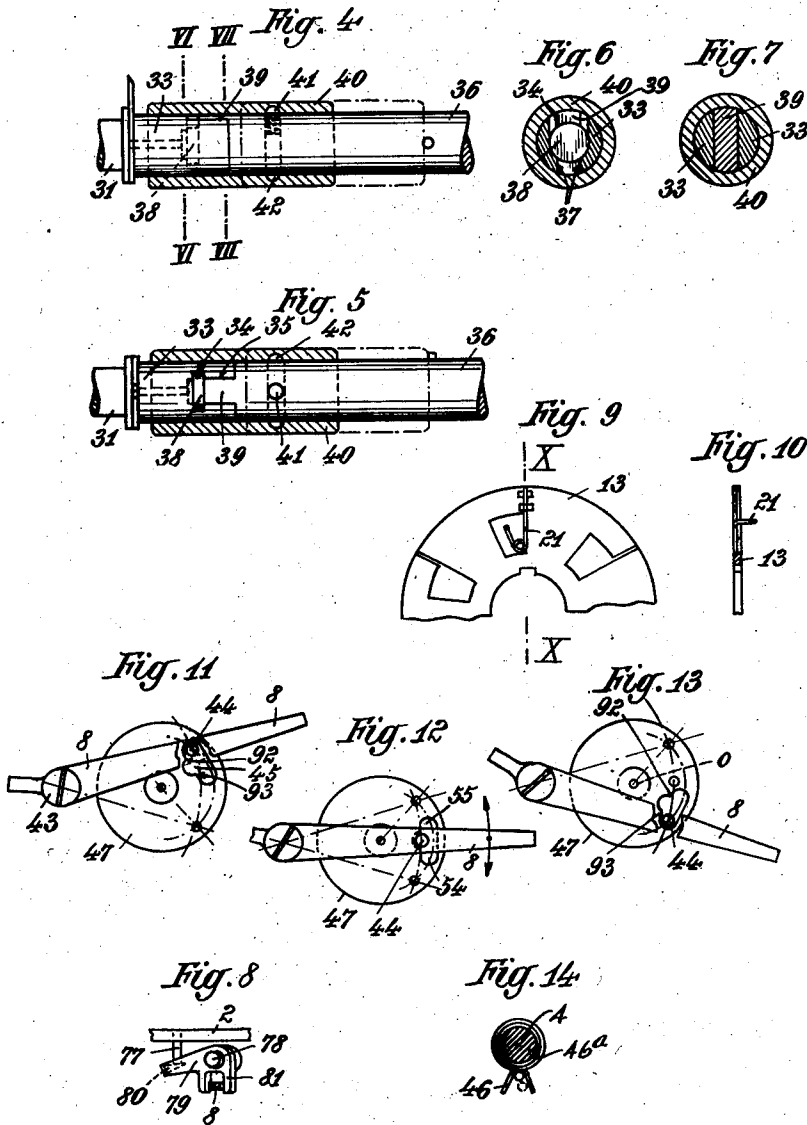
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UNITED STATES PATENT OFFICE

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ELECTRICALLY DRIVEN VEHICLE JACK

Willy Müller, Munich, Germany

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 In Switzerland and Germany September 16,
 1935

9 Claims. (Cl. 254—103)

The invention relates to the construction of an electrically driven jack for vehicles in which, as is old in the art, the jack is driven by a motor which runs without reversing, this being accom-
 5 plished by the provision in the drive for the jack shaft of a mechanism for effecting as desired the raising or lowering of the jack shaft.

It is an object of my invention to provide a mechanism for driving the lifting spindle by
 10 which the jack shaft is raised and lowered at a faster rate.

To this end, I provide a pair of clutch parts each of which, in the jack illustrated by way of example, includes an inner member keyed on the
 15 lifting spindle, and a ring which is free to rotate about the inner member in a given direction but is positively connected to the inner member when the ring is rotated in the opposite direction.

Any suitable kind of one-way clutch can be used for connecting the inner member and the
 20 ring of each clutch part; in the present instance, I have shown, by way of example, the old system of inclined slots and jamming rollers.

For operating the clutch parts, that is, for temporarily driving the ring of one part, and for breaking the drive of the other ring, and vice versa, I provide means to clutch the rings, and mount these means on a movable support which,
 25 in the present instance, is an arm mounted to oscillate about the lifting spindle. This movable support, or arm, is connected to the motor so that it will reciprocate while the motor runs in the same direction, and means are provided
 30 for throwing one of the clutching means into engagement with the corresponding ring by which the lifting spindle is rotated, for instance, to raise the jack shaft and, at the same time, throwing
 35 out the other clutching means by which the spindle would be rotated to lower the jack shaft, and vice versa.

The movable support on which the two clutching means are mounted, moves to and fro at a very rapid rate, being connected to the motor as described, and that clutching means which is in
 40 active position with respect to its ring at the time, imparts successive angular displacements or oscillations to the corresponding ring at a corresponding rate, so that the ring in one direction of movement imparts turning movement to the
 45 spindle. Thus the movement of the jack stem in both directions is much accelerated.

It is another object of my invention to provide convenient means for controlling the clutching members even if the jack is in an awkward position to get at.

To this end, I provide a handle bar of suitable length and a coupling for temporarily connecting
 50 the handle bar to the means for throwing in and out the clutching members.

60 A vehicle jack according to the invention is

shown in a constructional example in the accompanying drawings, in which:

Fig. 1 is a bottom plan view of the vehicle jack with its base plate removed.

Fig. 1a is a section on the line I^a—I^a of Fig. 2.

Fig. 2 is a section on the line II—II of Fig. 1.

Fig. 3 is a plan view of the jack.

Fig. 4 is an elevation, and

Fig. 5 is a plan view of the coupling for temporarily connecting the handle bar with the shaft
 10 on the jack from which the clutching members are controlled.

Fig. 6 is a section on the line VI—VI of Fig. 4.

Fig. 6a is a perspective illustration of the male coupling member at the inner end of the handle
 15 bar.

Fig. 7 is a section on the line VII—VII of Fig. 4.

Fig. 8 is a perspective view of a cam for automatically throwing the lifting spindle out of gear at the end of the stroke, the jack stem performing
 20 in upward and downward direction.

Fig. 9 is a partial plan view of the coupling member in one of the clutches.

Fig. 10 is a section on the line X—X of Fig. 9.

Figs. 11, 12, and 13 show three relative positions of a controlling lever and an actuating plate,
 25 both forming part of the means for drawing in and out the clutching members, and

Fig. 14 shows a return spring of the actuating plate.

The lifting spindle 1 of the vehicle jack shown is driven by the electric motor 2 arranged in the jack casing 2. Keyed to the motor shaft 4 which
 30 always rotates in the same direction, is an eccentric 5. Its rotary movement effects a reciprocatory movement of a connecting rod 6, which, in its turn, oscillates an arm 7 adapted to rock about the lifting spindle 1 a short distance above its
 35 reduced lower end 8.

The arm 7 effects rotation of the lifting spindle 1 in one direction or the other, according to the
 40 adjustment given to a double-armed lever 8, by means of which the mechanism for operating the jack spindle can be thrown out while the motor is running.

The following arrangement is employed for converting the oscillatory movement of the arm
 45 7 into a rotary movement of the lifting spindle 1 in the particular direction required:

As mentioned, the lower end of the lifting spindle is reduced at 8, and mounted in a step bearing
 50 9'. At a short distance above the bearing, the spindle is equipped with a collar 11 for supporting it radially in a horizontal partition of the casing 2.

The two clutches are arranged on the spindle 1 between its collar 11 and its bearing 9', and are separated by the central portion of the rock-
 55 ing arm 7. The lower clutch will first be described, it being understood that the upper clutch
 60

is quite similar to the lower, but designed for rotation of the spindle 1 in a direction opposite to that in which it is rotated by the lower clutch.

Keyed on the spindle 1 just above the step bearing 9' is the coupling member of the lower clutch comprising a disc 13, Figs. 9 and 10.

The inner member 14 of the lower clutch is keyed on the spindle 1 above the coupling member 13, and a washer 15 is inserted between the inner member 14 and the arm 7.

Freely rotatable between the disc 13 and washer 15 is the outer member of the lower clutch composed of a ring 16 provided on its edge with notches 17 and therebetween with a series of lugs 18 provided with teeth 18' which are so positioned that upon operation of the corresponding clutch member, as will be described below, the ring 16 is rotated in the direction of the arrow P, Fig. 1.

The inner member 14 is provided with a number of recesses or wedge-shaped spaces 19, all of which have jamming faces inclined in the same direction, and each of which contains a roller 20, these rollers being forced against the jamming faces of the respective recesses 19 by pressure springs 21 secured to the coupling member or disc 13.

Placed on top of the arm 7 is the upper clutch with its parts 13', 14', 15', 16', 20', corresponding to the elements 13, 14, 15, 16, 20 of the lower clutch, but with oppositely inclined jamming faces in the recesses of the inner clutch member 14' and oppositely directed teeth 18' on the lugs of the ring 16'.

It will be understood that each group of elements makes up one of the clutches referred to.

Below the disc 13 is a ball bearing 22 which bears on a resilient washer 23 set in the base plate 12.

The first mentioned clutch 13, 14 serves to rotate the lifting spindle in one direction and the other clutch 13', 14' serves for rotating it in the other direction.

25, 26 Fig. 1, and 26, Fig. 1a, are the two pawls rigidly mounted in different planes on a pivot 24 of the movable support or arm 7. The pawl member 25 cooperates with the lower clutch and is equipped with a lug 25a at one end for engaging between the lugs of ring 16. The clutching member 26, for cooperation with the upper clutch part, has a similar lug 26a at that end which is opposite the lug 25a, for engaging between the lugs of the ring 16'. Each of the lugs or projections 25a and 26a carries teeth which are opposite to the teeth 18 or 18' on the ring with which it comes in direct engagement. The alternate engagement and disengagement of the ratchet pawls or clutching members 25 and 26 is effected by pins 28 and 27 of a plate 29 at the lower end of a vertical shaft 30 to whose upper end a blade spring 50 is secured. By an operative connection of the double-armed lever 8 whose inner end is fulcrumed at 43, and of the spring 50, as will be described, the plate 29 is oscillated about the axis of a shaft 30 and its pins 27 and 28 throw in one of the clutching members 25 and 26, as required. Since the spring 50 is interposed, the operation is not positive, but resilient, so that damage to the teeth of the rings and clutching members is avoided.

The control of the double-armed lever 8 for raising and lowering the jack shaft is effected by means of the handle bar described below.

31 is a control shaft mounted in one of the end walls of the casing 2, and 33 is a female coupling member on that end of the shaft which

projects from the casing. The outer end of the female member is slotted for the reception of the inner end of the handle bar 36 which is of suitable length to facilitate the operation of the jack. The outer end of the bar which may be equipped with a suitable handle, has not been shown. The diameter of the bar is equal to that of the female member 33. As best seen in Fig. 6a, the bar has a flattened neck 39, of substantially rectangular cross-section, and a collar 38 at its inner end. The diameter of the collar 38 is greater than the width of the rectangular neck 39, as best seen in Fig. 6a, so that the collar projects beyond the flat sides of the neck 39. The neck and the collar make up the male coupling member. The female member has two slots of different configurations. The outer slot has two parallel faces 34 whose distance apart is exactly equal to the width of the rectangular neck 39. The inner slot whose length is equal to the length of the collar 38, is wider than the collar at its upper end and converges toward its lower end where its sides 37, Fig. 6, are as far apart as the width of the neck 39, so that the collar 38 is retained when the two members are connected, and have been exactly aligned.

The male coupling member 38, 39 is inserted in the female member 34, 35 from above, the collar 38 entering the converging slot 35 until it is arrested at its bottom, and the neck 39 entering between the parallel faces 34 of the female member. The collar 38 prevents relative axial displacement of the coupling members, and the rectangular neck 39 transmits the torque exerted by hand upon the free end of the handle bar 36 to the coupling member 33 and hence to the control arm 32.

After the handle bar 36 with its above described coupling member 38, 39 has been inserted radially into the slots 34, 35 of the coupling member 33, the sliding sleeve 40 situated on the handle bar 36 in the position shown in dotted lines in Figs. 4 and 5 is pushed over the joint of the two couplings until a ball 41 in a radial hole of the handle bar 36 enters under the pressure of its spring situated between it and the bottom of the hole, into an internal peripheral groove 42 of the sleeve 40, thereby securing the sleeve against unintentional axial displacement.

The handle bar enables the driver first to bring the vehicle jack under the vehicle into position in a most convenient manner, the driver being able by means of the long handle bar connected to the jack to move the jack to and fro and adjust it also laterally, until the jack has been brought into the suitable position.

A control arm 32 is secured on the inner end of the control shaft 31 between the end wall of the casing 2, and the motor 3. The upper end of the control arm is forked and engages the free end of the double-armed lever 8.

By rotating this handle bar in one direction or the other, the control arm 32 is caused to bring the double-armed lever 8 to its central position or into either of its end positions.

The double-armed lever 8 which, as mentioned, is fulcrumed at 43, engages by means of a stud 44 a suitably shaped slot 45 of a disc 47 which is adapted to turn about the extended axis of the electric motor 3 in both directions of rotation against the resistance of a spring 46 extending about a collar 46a supported by the upper end of the motor shaft 4, Fig. 14; and carries two pins 48 and 49 which, in the central position of the double-armed lever 8,

and hence also of the disc 47, are situated at equal distances on opposite sides of the leaf spring 50, which is therefore not under tension, and the shaft 30 is not operative. A contact blade 51 mounted on the disc 47 is then in the center between two fixed contacts 52 and 53.

In the central position of the double-armed lever 8, the current is switched off and also the two pawls 25, 26 are disengaged from their corresponding rings 16, 16'. In passing into either of its end positions, the double-armed lever 8, by means of pin 44 and disc 47, moves the contact blade 51 into engagement with one of the contacts 52 or 53 thereby closing the circuit, and, by means of the pin 44, disc 47, and one of the pins 48 and 49, forcing the leaf spring 50 to one side or the other, thereby throwing one of the clutching members or pawls 25, 26 into engagement with the corresponding ring 16, 16' of one of the clutches by means of the shaft 30, plate 29, and pins 27, 28.

If the toothed lug or projection 25a or 26a of the pawl 25 or 26, which has been operated, does not immediately enter a gap or notch 17 or 17' of the corresponding ring or clutch element 16 or 16', but if, for example, the lug or projection 25a of the clutch member or pawl 25 strikes the teeth 18 of a lug, the spring 50 will yield, and the lug 25a first passes over the backs of the teeth 18 without driving the ring 16. On the return stroke, however, the pawl projection 25a drives the ring 16 in the direction indicated by arrow P in Fig. 1 and imparts movement from ring 16 through the roller 20 to the inner clutch member 14. On the next stroke, this operation is repeated again until the projection 25a engages one of the notches 17 which has been moved up in this manner, and now on the stroke in the direction of the arrow P drives the ring 16 and thereby the inner clutch member 14. Since the ratchet disc 14, and also the parts 22, 13, 15, 7, 13', 14', 15', because of the pressure exerted by the spring washer 23 on all these parts, forcing them against the collar 11, first of all offers resistance to rotation by the rollers 20 forced by the ring 16 by friction against the inclined jamming faces of the recesses 19 and hence does not move, the rollers 20 are forced by the ring 16 against the jamming faces of the recesses 19 of the still stationary inner clutching member and then couples this member 14 with the ring 16 which now drives the disc 14 in the direction of the arrow P, whereby the lifting spindle 1 is rotated through this angular amount and hence the lifting head 86 of the jack shaft is raised.

Thus, the consequence of throwing over the double-armed lever 8 into the position shown in Fig. 3 is that when the motor 3 is started, the pawl 25, by means of its projection 25a, rotates the ring 16 back and forth, which drives the inner clutching member 14 and hence the lifting spindle 1 only in the direction shown by the arrow P, thereby raising the lifting head 86.

If the double-armed lever 8 is moved into its central position shown in dot and dash lines in Fig. 3, the two pawls 25, 26 are out of engagement with the rings 16 and 16' so that no movement of the lifting spindles or of the lifting head 86 takes place. If the double-armed lever 8 occupies the position shown in Fig. 3 of the drawings, the pawl or clutching member 26, by means of its projection 26a, rotates the ring 16' and hence the inner clutching member 14' and the lifting spindle 1 are rotated in the reverse

direction, that is to say, in a direction opposite that of the arrow P, which results in the lowering of the lifting head 86.

In order that the double-armed lever 8 will only be thrown into the three positions: central position, right and left-hand end positions, and not remain in any intermediate positions, the following construction is provided for the recess 45 of the disc 47 already referred to, in addition to the above-mentioned spring 46, Fig. 14, engaging the disc 47. Since the axis of rotation of the disc 47 is at a certain distance from the axis of rotation of the double-armed lever 8, the recess 45 for guiding the pin 44 of the double-armed lever 8 in the disc 47 must have a part in the form of a radial slot, the length of which is determined by the difference between the considerable distance of the pin 44 from the axis of rotation of the disc 47 in both end positions of the double-armed lever 8 on the one hand and the short distance of the pin 44 from the said axis of rotation in the central position of the double-armed lever 8. According to the invention, this slot at each end remote from the said axis of rotation is widened towards both sides by substantially the thickness of the pin 44. The effect of this is that on throwing over the double-armed lever 8 from its central position into an end position, the pin 44 has to be pressed away with a certain expenditure of force over the corner 92 or 93 which projects a little in its path, the consequence of which is that it then springs into the end portions 54 or 55 and cannot again leave its end position thus assumed without external application of force. Nor can it leave its central position on its own account. Furthermore, it thus does not remain in any intermediate position between the central and end positions.

That portion of the lifting spindle 1 which is above its collar 11, has a male thread, and, upon being driven in the appropriate direction of rotation, screws upwardly the hollow spindle 60 provided with the internal screw-thread 59, until the latter abuts with its internal screw-thread against the head 58 of the spindle 1.

Upon further rotation of the spindle 1, the hollow spindle 60 which is now coupled to it, screws upwardly the hollow jack shaft 63 mounted with its internal screw-thread 64 on the external screw-thread 61 of 60.

At the end of the first telescopic movement, the hollow spindle 63 had arrived with its lower annular projection 65 as far as the upper annular projection 66 of the hollow cylinder 70 and had since carried with it the hollow cylinder 70. The latter is guided by its guide ledge 74 on the jack casing 2.

Guided on the guide ledge 74 is the guide bar 73 which engages 74 and has its other end pivoted at 72 to the jack head 86.

Vertically adjustable on the guide bar 73 is a bracket 75.

For switching off its motor 3 on attaining the uppermost and lowermost end of its stroke of the telescoping jack stem, a pin 76 is provided in the lower part of the hollow cylinder 70 and a pin 77 on the jack head 86.

When the telescoping jack stem has reached the upper end of its stroke, the pin 76 abuts against the longer arm 80 of a bell crank lever 79 pivoted at 78 to the jack casing 2, so that the said bell crank lever by means of its fork 81 moves the double-armed lever 8 into the central position, whereby the motor is switched off and

the two clutching members 25 and 26 are brought into their inoperative position.

When the telescoping jack stem has reached the lower end of its stroke, the pin 77 abuts against the longer arm of the bell crank lever 79, whereby the double-armed lever 8 is likewise brought into its central position, that is to say it is rocked into the position for switching off.

In addition to the above-mentioned contacts 52, 53 there are mounted on the plate 83, which is secured to the casing 2 by the two head-screws 82, two brackets 84 which accommodate between them a tubular incandescent lamp, (not shown), the light of which, on switching on the motor, passes upwardly through a glass lens 85 mounted in the casing 2.

I claim:

1. In a jack comprising an electric motor and a jack shaft, a rotatable member operative upon rotation in opposite directions to raise and lower said jack shaft, and means connecting said motor to said rotatable member to drive the same, said connecting means comprising a shaft connected to said motor and driven thereby, two one-way clutches operable in opposite directions and each comprising a clutch element secured to said rotatable member and a second clutch element cooperating therewith to drive the first clutch element upon movement in one direction only, an eccentric on said motor shaft, an oscillatable lever, means connecting said eccentric and lever whereby rotation of said motor shaft imparts oscillations to said lever, and means for selectively connecting said second clutch elements to said lever.

2. In a jack comprising an electric motor and a jack shaft, a rotatable member operative upon rotation in opposite directions to raise and lower said jack shaft, and means connecting said motor to said rotatable member to drive the same, said connecting means comprising a shaft connected to said motor and driven thereby, two one-way clutches operative in opposite directions and each comprising a ring secured to said rotatable member, and a second ring surrounding said first ring, one of said rings having wedge shaped spaces therein, and rollers in said spaces engaging both said rings, said spaces tapering in opposite directions whereby said clutches drive said member in opposite directions only, an eccentric on said motor shaft, an oscillatable lever, means connecting said eccentric and lever whereby rotation of said motor shaft imparts oscillations to said lever, and means for selectively connecting said rings to said lever.

3. In a jack comprising an electric motor and a jack shaft, a rotatable member operative upon rotation in opposite directions to raise and lower said jack shaft, and means connecting said motor to said rotatable member to drive the same, said connecting means comprising a shaft connected to said motor and driven thereby, two one-way clutches operative in opposite directions and each comprising a clutch element secured to said rotatable member, and a second clutch element cooperating therewith to drive said member in one direction only, an eccentric on said motor shaft, an oscillatable lever, means connecting said eccentric and lever whereby rotation of said motor shaft imparts oscillation to said lever, a pawl member pivoted on said lever, said pawl

member having engaging portions each located in the plane of one of said second clutch elements, said second clutch elements having notches therein engageable by said engaging portions, and means for shifting said pawl member to engage selectively the notches in one or the other of said second clutch elements and thereby to connect said lever selectively thereto.

4. In a jack comprising an electric motor and a jack shaft, a rotatable member operative upon rotation in opposite directions to raise and lower said jack shaft, and means connecting said motor to said rotatable member to drive the same, said connecting means comprising a shaft connected to said motor and driven thereby, two one-way clutches operative in opposite directions and each comprising a ring secured to said rotatable member, and a second ring surrounding said first ring, one of said rings having wedge shaped spaces therein, and rollers in said spaces engaging both said rings, said spaces tapering in opposite directions whereby said clutches drive said member in opposite directions only, an eccentric on said motor shaft, an oscillatable lever, means connecting said eccentric and lever whereby rotation of said motor shaft imparts oscillation to said lever, a pawl member pivoted on said lever, said pawl member having engaging portions each located in the plane of one of said second rings, said second rings having notches therein engageable by said engaging portions, and means for shifting said pawl member to engage selectively the notches in one or the other of said second rings and thereby to connect said lever selectively thereto.

5. In a device as claimed in claim 2, the peripheries of said second rings having notches therein adapted to receive said engaging portions and between said notches having teeth thereon, and said engaging portions of said pawl having cooperating teeth thereon.

6. In a device as claimed in claim 3, a snap action mechanism for holding said pawl member in engagement with either of said second rings.

7. In a device as claimed in claim 2, springs urging said rollers into the narrower ends of said spaces.

8. In a device as claimed in claim 3, said means for shifting said pawl member comprising a second lever fulcrumed on the jack, a disc mounted to rotate about an axis spaced from the axis of said second lever, said disc having a slot therein having a portion transverse to a radius of the disc, and a circular extension from the center of said transverse portion, a pin on said second lever engaging in said slot, means for oscillating said second lever, and means operatively connecting said disc and said pawl member.

9. In a device as claimed in claim 3, said means for shifting said pawl member comprising a second lever fulcrumed on the jack, a disc mounted to rotate about an axis spaced from the axis of said second lever, said disc having a slot therein having a portion transverse to a radius of the disc, and a circular extension from the center of said transverse portion, a pin on said second lever engaging in said slot, means for oscillating said second lever, and means operatively connecting said disc and said pawl member, said connecting means including a resilient member.

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