Sept. 8, 1936. S. A. SNELL 2,054,025

LIFTING JACK

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Fig. 1.

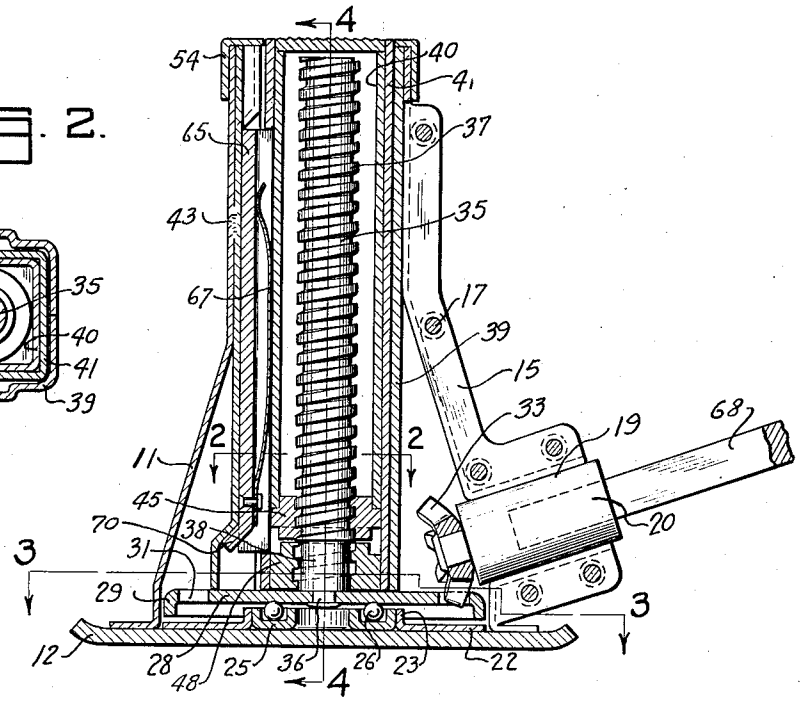


Fig. 2.

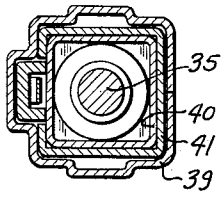
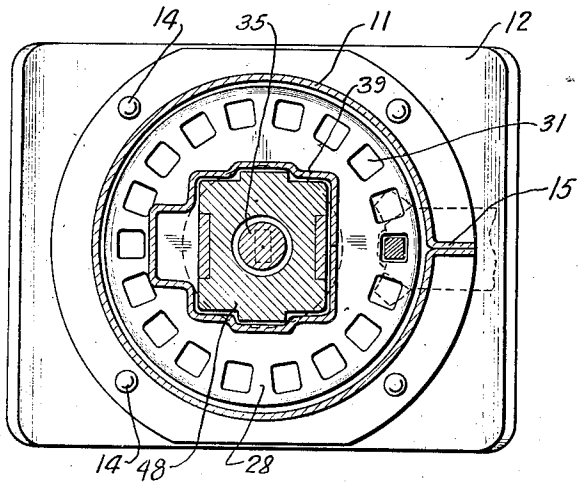


Fig. 3.



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Fig. 4.

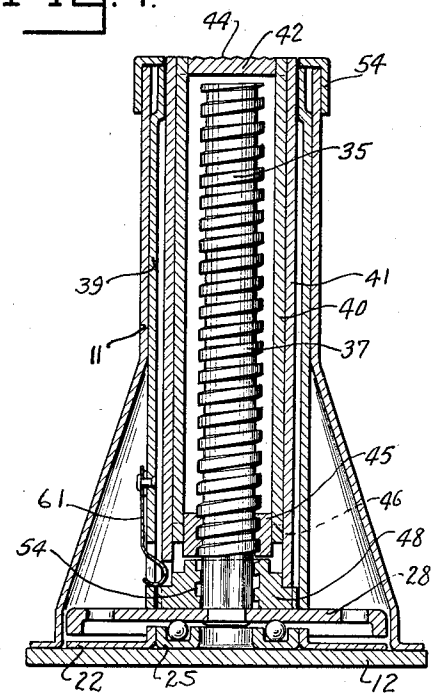


Fig. 5.

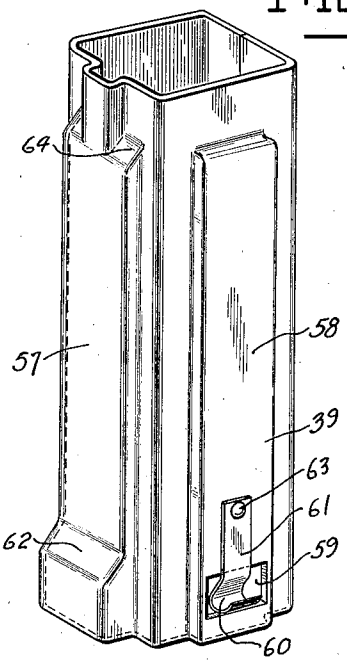


Fig. 6.

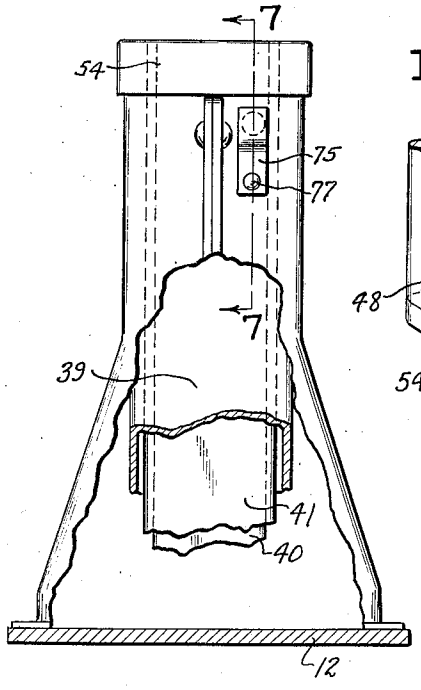


Fig. 8.

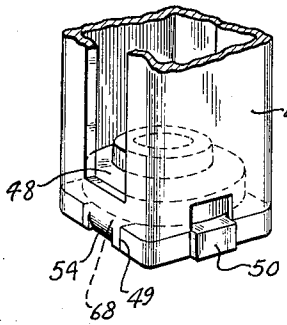
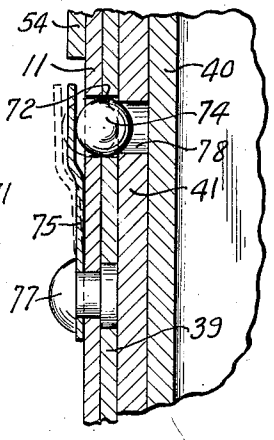


Fig. 7.



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Fig. 9.

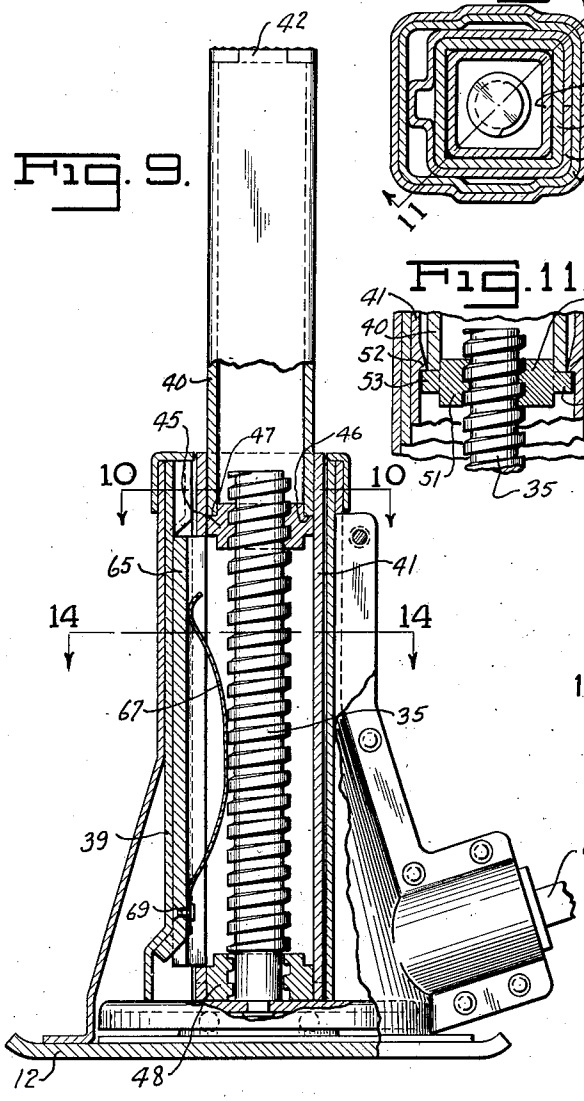


Fig. 10.

Fig. 11.

Fig. 12.

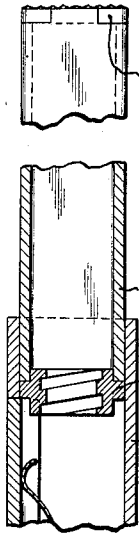


Fig. 13.

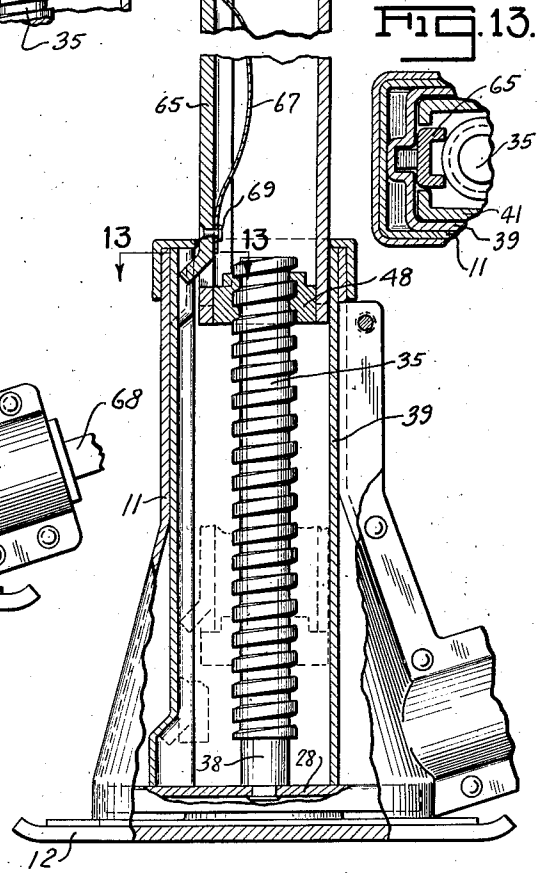
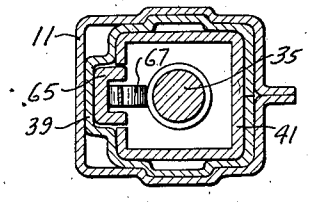


Fig. 14.



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UNITED STATES PATENT OFFICE

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LIFTING JACK

Samuel A. Snell, Toledo, Ohio, assignor to The Bingham Stamping & Tool Company, Toledo, Ohio, a corporation of Ohio

Application October 9, 1934, Serial No. 747,570

5 Claims. (Cl. 254—102)

This invention relates in general to lifting devices and more particularly to lifting jacks for use with automotive vehicles.

An object of the present invention resides in the provision of a lifting jack having a single screw cooperating with means capable of extending the effective height of the jack several times the enclosed height of the jack.

The invention embraces the provision of a lifting jack incorporating a single screw having telescoping lifting elements cooperating therewith whereby the effective extended height of the jack is several times the length of the single lifting screw.

The invention embraces the provision of improved means for lifting and supporting the lifting elements of the structure.

The invention contemplates a jack of this character provided with a plurality of telescoping lifting devices or elements coacting with a single screw and having means for supporting the elements in extended position and being capable of being automatically moved to extended position and withdrawn by a simple operation of the screw.

A further object of the invention is to provide a simplified jack of this character wherein the number of working parts is reduced to a minimum and protected from dirt or foreign matter, the mechanism fully enclosed and the housing structure and certain elements of the operating mechanism being made of comparatively thin sheet metal or other suitable material.

Further objects and advantages are within the scope of this invention such as relate to the arrangement, operation and function of the related elements of the structure, to various details of construction and to combinations of parts, elements per se, and to economies of manufacture and numerous other features as will be apparent from a consideration of the specification and drawings of certain forms of the invention, which may be preferred, in which:

Figure 1 is a vertical sectional view of a lifting jack forming one embodiment of the invention;

Figure 2 is a transverse sectional view taken substantially on a line 2—2 of Figure 1;

Figure 3 is a sectional view taken substantially on a line 3—3 of Figure 1;

Figure 4 is a vertical sectional view taken substantially on a line 4—4 of Figure 1;

Figure 5 is an isometric view of one of the elements of the invention showing a lifting element retaining means;

Figure 6 is a front elevation of the jack with portions broken away to show interior portions thereof;

Figure 7 is an enlarged detail sectional view taken substantially on a line 7—7 of Figure 6;

Figure 8 is a fragmentary isometric view of a portion of one of the lifting elements showing a form of threaded element associated therewith;

Figure 9 is a view similar to Figure 1, with one of the lifting elements in extended position;

Figure 10 is a sectional view taken substantially on a line 10—10 of Figure 9;

Figure 11 is a detail sectional view taken substantially on a line 11—11 of Figure 10;

Figure 12 is a view similar to Figure 1 with the lifting elements in extended position;

Figure 13 is a detail sectional view taken substantially on a line 13—13 of Figure 12;

Figure 14 is a sectional view taken substantially on a line 14—14 of Figure 9.

The jack illustrated as embodying a form of the invention is particularly adapted for use with automotive vehicles, but it is to be understood that its use is not so limited.

Referring to the drawings in detail the structure is shown as inclusive of a casing or housing 11 preferably formed of sheet metal or other suitable material riveted or otherwise secured as at 14 to a base member 12 which may also be formed of sheet material. The casing 11 is illustrated as being formed of a single piece of sheet metal shaped to form an enclosure for the working parts of the structure and provided with flange portions 15 which may be riveted or otherwise secured together as at 17 but it is to be understood, however, that the casing may be of different construction such as an assembly of two or more sections without departing from the spirit of the invention. The lower portion of the casing is provided with a laterally projecting cylindrical bearing portion 19 in the embodiment illustrated, the bearing portion being integrally formed with the casing and arranged to receive a member 20, rotatable by means of a handle, wrench or other suitable means for operating the lifting mechanism.

The base 12 supports a member 22 having an upturned flange portion 23 of circular configuration within which is accommodated a cup-shaped element or ball race 25 in which are positioned a plurality of bearing balls 26. The bearing balls 26 support a circular plate 28 provided with a downwardly extending peripheral flange 29 and a series of equally spaced perforations 31 circularly arranged adjacent the flange 29, forming a gear-like structure. A pinion 33 carried

by member 20 cooperates with the perforations 31 to impart rotary movement to the plate or gear 28 upon actuation of shaft 29. It is to be understood that a conventional bevel gear may be utilized in lieu of the plate gear herein shown. Plate gear 28 may be of sheet metal of sufficient thickness supporting a threaded element or screw 35 having a non-circular tenon 36 centrally riveted, swaged or otherwise secured to the gear 28 to form a unitary structure, which together with pinion 33 and its shaft 20 form the rotary elements of the device. Screw 35 is preferably provided with square threads 37 throughout the major portion of its length, a cylindrical reduced portion or neck 38 being provided at the lower end thereof which is entirely free of threads for a purpose to be hereinafter explained.

Interiorly of casing 11 is provided a member 39, preferably formed of a single sheet of metal member as illustrated in Figure 5, and is formed with a cam portion 57 and guide portions or channels 58. The portion 57 is provided with a plurality of angularly disposed walls 62 and 64 forming camming surfaces interiorly thereof. The guide 39 is preferably positioned within the casing 11 so that its lower extremity serves to position the gear 28 and prevent upward movement thereof. The upper end of guide member 39 is positioned with respect to the top of the casing 11 by means of a flange or collar 54 suitably secured to the casing 11. The guide member 39 may be welded as at 43 to the side walls of the casing or otherwise secured thereto in any suitable manner. One of the guide channels 58 is provided with an opening 59 to accommodate an extremity 60 of a leaf or plate spring 61, the other extremity of which is suitably anchored or secured to the tube 39 by means such as rivet 63.

Within the guide member 39 are provided a plurality of lifting elements or members 40 and 41, which are preferably constructed to fit or telescope one within the other and adapted for slidable movement with respect to each other and the guide 39. These members are not rotatable, being of non-circular formation in cross section and thus facilitating their manufacture from sheet material by the use of suitable dies. Innermost lifting member 40 is provided with a flat top surface or seat 42 which may be roughened as at 44 to engage the article or vehicle to be lifted, although such roughening is not essential as there is no tendency for the member 40 to turn on its axis as it is not capable of rotation. The lower end of the member 40 is provided with an internally threaded nut or head 45, preferably positioned and secured thereto by means of projections 46 thereof extending into recesses 47 which are swaged into depressions in the nut or otherwise secured to the lifting member. As shown in Fig. 11, the nut 45 is formed with a substantially rectangular portion 51 so that the corners or projections 53 extend outwardly beyond the slightly rounded corners of the lifting element or member 40 and serve as a stop means for limiting the upward movement of the lifting element 40 with respect to the outer lifting element 41. The inner corners of the outer lifting element 41 are provided with projections 52 suitably formed adjacent its upper end to cooperate with the corner projections 53 to carry upward outermost lifting element 41. The projections are preferably positioned to engage the nut 48 prior to the disengagement of the nut 45 from the screw 35 for purposes as will hereinafter appear.

Rotation of the gear 28 in one direction, when the parts are in the position shown in Figure 1, will raise the nut 45 and consequently the lifting member 40. The outermost lifting member 41 is provided with a threaded portion or nut 48 adjacent its lower extremity, the nut 48 being connected thereto by means such as a tongue and groove connection as at 49, the projections 54 of the tube being swaged into depressions formed in the nut as shown at 68 or otherwise fixedly secured together. Nut 48 is preferably provided with projections 50 serving as stop members extending beyond the sides of member 41, and is also provided with internal screw threads 54 adapted to cooperate with threads 37 on screw 35. The outer lifting member 41 and its cooperating threaded nut or head portion 48 are held in ineffective position during an upward range of movement of the inner lifting member 40 or until portion 51 engages the stop means provided adjacent the upper portion of the outer lifting element 41. Extremity 60 of the spring 61 is preferably formed so that a portion extends inwardly through the opening 59 in guide 39 to engage nut 45 and serve as a resilient stop means to hold the outer lifting element 41 in its lowermost position until the inner lifting element 40 has traveled through its independent range of movement upon rotation of the screw 35.

Forming a portion of the element 41 is a channel-shaped member 65 which is urged normally outwardly by means of the spring 67 while the outer lifting element 41 is in its lowermost position. The lower end of the channel member 65 engages the nut 48 and as this nut is moved upwardly into engagement with screw 35, the nut in turn elevates the channel member 65 in a manner hereinafter described. The channel member 65 forms a support between the lowermost portion of the inner lifting element and the nut 48 to provide a means for supporting inner lifting element as the outer lifting element is elevated.

The spring 67, preferably secured to the channel member 65 by means such as rivet 69, applies tension between the lifting elements 40 and 41 which tends to prevent movement of the outer member 41 upon upward movement of element 40. When the lifting element 40 is in the position indicated in Figure 9, the tension of spring 67 is decreased, being then in engagement with screw 35. As the nut 48 and element 41 move upwardly, the channel member 65 is moved inwardly toward the screw 35 by the angular or cam surfaces 62 and 64, the upper extremity of member 65 contacting the cam surface 64 and an angular projection 70 at the lower extremity of the member 65 engaging the cam 62, thus maintaining the member 65 substantially in a vertical position. Spring 67 holds the projection 70 in engagement with the inner surface of cam 57 during movement of element 41 and support 65 until they reach their approximate uppermost position as shown in Figure 12, at which time the tension of spring 67 is released. During downward movement of the elements 40 and 41, the spring 67 insures outward movement of channel 65 to permit the complete withdrawal of element 40 into the member 41.

As clearly illustrated in Figures 6 and 7, an alternative means is disclosed for resiliently locking the outer member in its lowermost position. Opening 72 through casing or housing 11 and

guide 39 accommodates a ball 74 which is positioned therein by means such as spring 75 suitably secured to the exterior of casing 11 by means such as rivet 77. A similar opening 78, but somewhat smaller than opening 72 is provided in the element 41 adjacent its lower extremity. As openings 78 and 72 coincide, the ball 74 is forced into the opening 78 by the tension of spring 75, normally resisting upward movement of the lifting element 41.

To operate the parts from retracted position, as illustrated in Figures 1 and 4, a suitable tool or operating handle 68 is inserted in an opening contained in the shaft 20 and the same rotated to cause rotation of gear 33 which, meshing with the plate gear 28, causes rotation of the screw 35. As the nut 45 fixed to the lifting member 40 is in mesh with the threads 37 of the vertical screw 35, the member will be elevated during rotation of the gears. When the member 40 has been extended substantially to the position indicated in Figure 9 or until the corners of the nut 45 engage with the stops 53 in the corners of the lifting member 41, continued rotation of the operating gears will initiate upward movement of the outer lifting member 41 by moving the threads of the nut 48 into engagement with the threads 37 on the vertical screw 35. Both of the lifting members 40 and 41 move upwardly in fixed relation as the member 65 is in engagement or in contact with the walls of the cam portion 57 in the guide member 39, which cam surface causes an inward movement on the supporting member 65. Thus, the member 65 is moved beneath the inner lifting member 40, to form a rigid and strong support therefor after the nut 45 has been moved out of the mesh with the threads 37 of the vertical screw. Further rotation of the screw 35 will extend the lifting elements 40 and 41 to substantially the position shown in Figure 12 or until the projections 50 of nut 48 are in engagement with the upper end of the end of guide channel 58.

Rotation of the gears and the vertical screw in the opposite direction will retract the lifting members until the threads of the nut 45 again mesh with the threads of the screw 35 and, for a short period of rotation of the screw, both nuts 45 and 48 are in mesh with the threads on the vertical screw. At approximately this time, the member 65 has reached a position with respect to the guide 57 which permits it to be moved outwardly by means of the spring 67 away from position beneath the inner lifting element 40 so as to permit the latter to be further retracted. The nut 48 in the outer lifting element 41 reaches its lowermost position as indicated in Figure 9, being out of threaded engagement with the threads of the screw, which is the lowermost position of the outer lifting element. Further rotation of the screw will retract the inner lifting element substantially to its initial or completely retracted position.

It has been found desirable to construct a lifting jack of this character so that the frictional coefficient between the outer lifting element and its guide member is greater than the coefficient of friction between the contacting surfaces of the inner and outer lifting elements. This has been accomplished by providing the tension spring between the inner and outer lifting elements in their lowermost position to maintain friction between the outer lifting element and the screw and a partial release of friction component when the lifting elements are in the uppermost position. By means of such an arrangement, should the jack be used in a position that a lateral strain is imposed upon the lifting elements, friction between outer and inner lifting elements will tend to prevent the outer lifting element from being carried upwardly during upward movement of the inner member prior to the engagement of corners of the nut with the projections in the outer lifting element, thereby providing a satisfactory and smoothly operating mechanism.

It is apparent that, within the scope of the invention modifications and different arrangements may be made other than are herein disclosed, and the present disclosure is illustrative merely, the invention comprehending all variations thereof.

What I claim is:

1. A lifting jack including a casing; a gear in said casing; a plurality of lifting elements in said casing; a rotatable screw; means associated with said lifting elements and cooperating with said screw for successively elevating and retracting said lifting elements; means for supporting one of said lifting elements when in elevated position including a laterally movable member; means normally urging said member to ineffective position; means to move said member laterally into position to support one of said lifting elements; and resilient means cooperating with one of said lifting elements to retain same within the casing during elevation of another of said lifting elements.

2. A lifting jack including a casing; a gear in said casing; a plurality of lifting elements in said casing; a rotatable screw; means associated with said lifting elements and cooperating with said screw for successively elevating and retracting said lifting elements; means for supporting one of said lifting elements when in elevated position including a laterally movable member; spring means normally urging said member to ineffective position; means including a cam to move said member laterally into position to support one of said lifting elements; and spring means engageable with one of said lifting elements to retain same within the casing during elevation of another of said lifting elements.

3. A lifting jack including a casing; a gear in said casing; a plurality of lifting elements in said casing; a rotatable screw; means associated with said lifting elements and cooperating with said screw for successively elevating and retracting said lifting elements; means for supporting one of said lifting elements when in elevated position including a laterally movable member; spring means normally urging said member to ineffective position; means including a cam to move said member laterally into position to support one of said lifting elements; one of said lifting elements having a recess; and resilient means relatively fixed with respect to said housing and adapted for cooperation with said recess for retaining one of said lifting elements within the casing during elevation of another of said elements.

4. A lifting jack including a casing; a sleeve fixed within said casing; a gear in said casing; a plurality of lifting elements in said casing; rotatable screw means associated with said lifting elements for successively elevating and retracting said lifting elements; means for supporting one of said lifting elements when in elevated position including a laterally movable member; spring means normally urging said member to ineffective position; means including a cam to move said member laterally into position to support one of said lifting elements; one of said lifting elements

having a recess; and resilient means cooperating with said sleeve and the recess in said lifting element for retaining the latter within the casing during elevation of another of said lifting elements.

5. A lifting jack including a casing; a gear in said casing; a plurality of lifting elements in said casing; a rotatable screw; means associated with said lifting elements and cooperating with said screw for successively elevating and retracting said lifting elements; means for supporting one of said lifting elements when in elevated position including a laterally movable member; spring means normally urging said member to ineffective position; means including a cam to move said member laterally into position to support one of said lifting elements; an opening in a wall of the casing; one of said lifting elements having a recess; a ball contained within the opening in said casing wall; spring means urging said ball into the recess in said lifting element whereby said lifting element is retained within said casing during elevation of another of said lifting elements.

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