Oct. 19, 1937. M. B. LUCKER 2,096,050

LIFTING JACK

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FIG. 1.

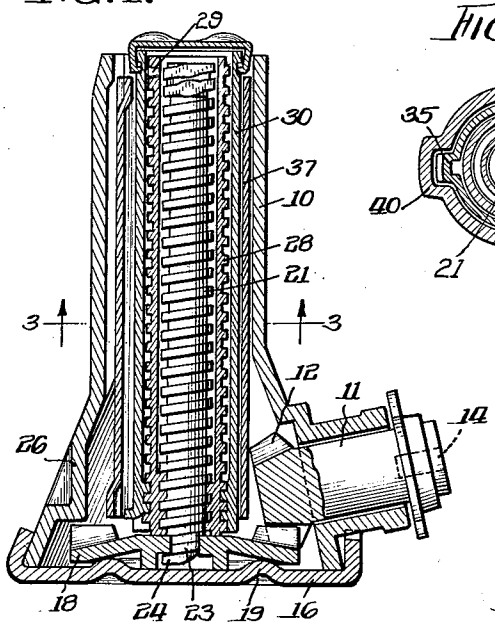


FIG. 3.

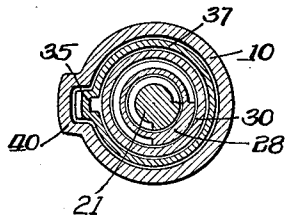


FIG. 2.

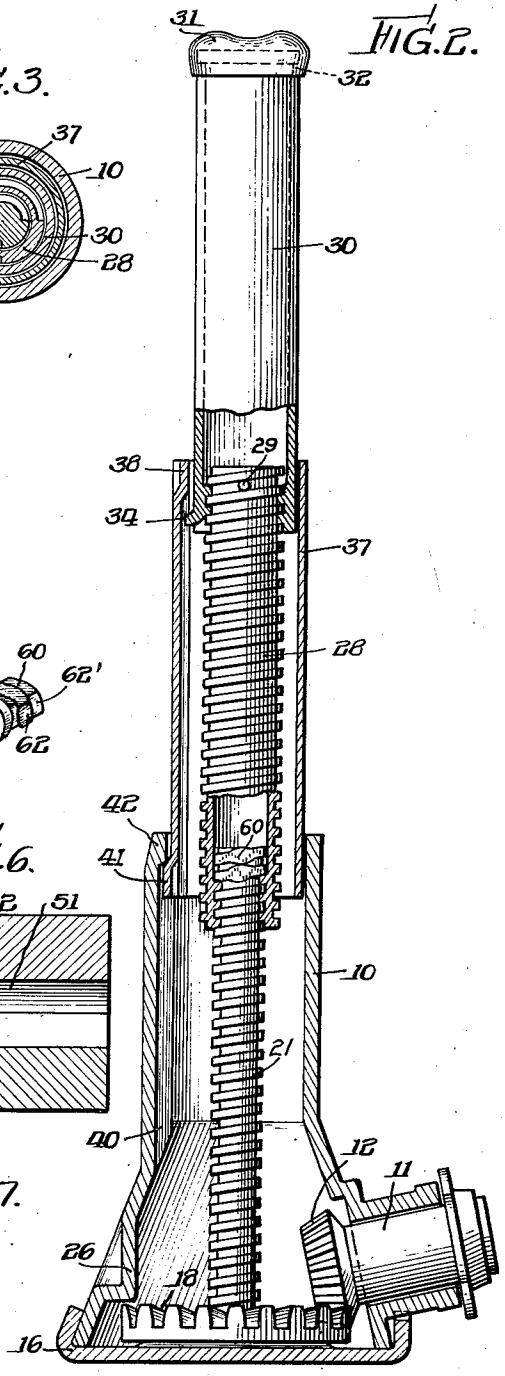


FIG. 4.

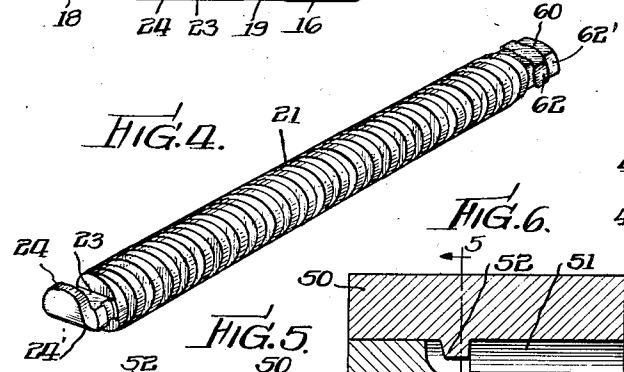


FIG. 6.

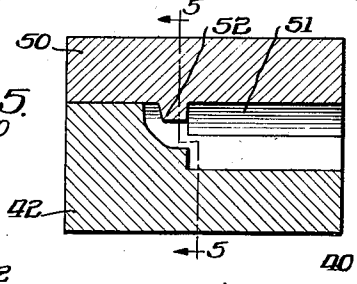


FIG. 5.

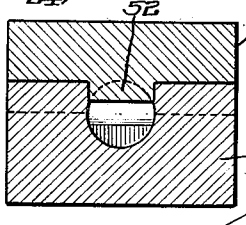
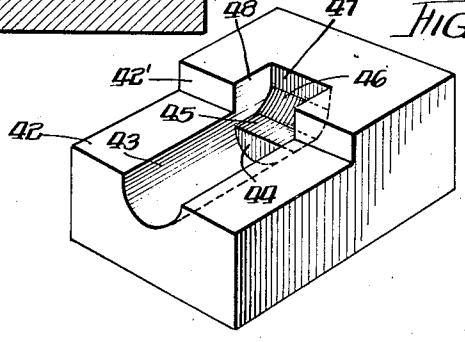


FIG. 7.



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FIG. 8.

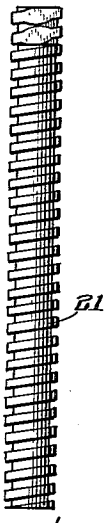


FIG. 9.

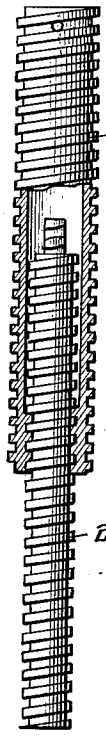


FIG. 10.

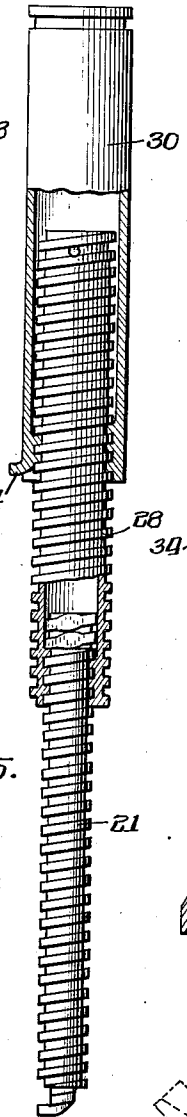


FIG. 11.

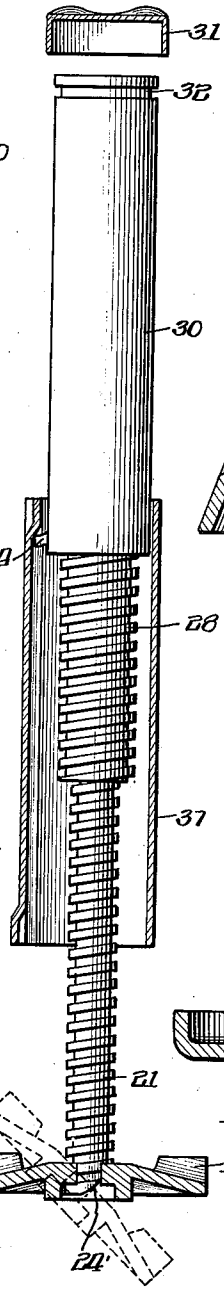


FIG. 12.

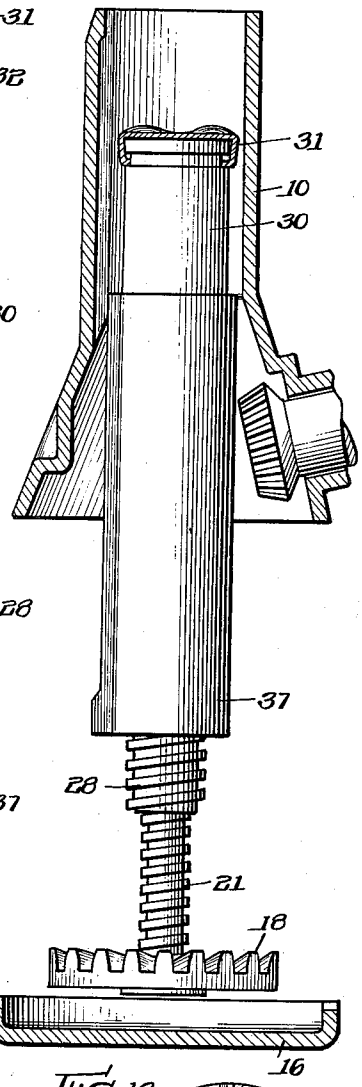


FIG. 14.

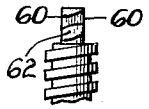


FIG. 13.

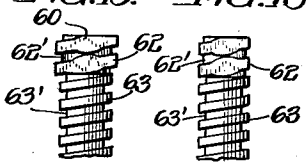


FIG. 15.

FIG. 16.

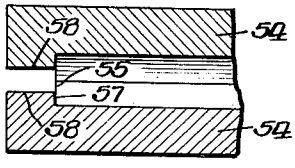


FIG. 17.

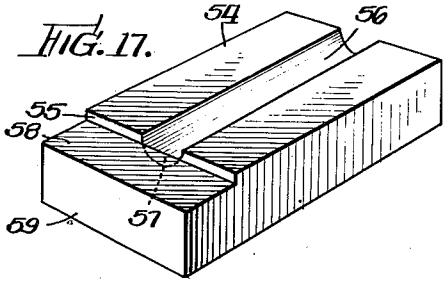
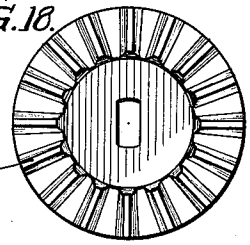


FIG. 18.



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Patented Oct. 19, 1937

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UNITED STATES PATENT OFFICE

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LIFTING JACK

Millard B. Lucker, Benton Harbor, Mich., assignor to Auto Specialties Mfg. Co., St. Joseph, Mich., a corporation of California

Application June 25, 1934, Serial No. 732,197

14 Claims. (Cl. 254—102)

This invention relates to lifting jacks of the screw type, and more particularly to the several lifting parts and to improved methods for producing them and assembling them into position.

It is an object of the invention to provide an economical and readily operable method for forming the lifting parts of a lifting jack and for assembling them into operative relation and position.

It is a further object of the invention to provide a method for forming a thread stop on a screw of a lifting jack which may be readily carried out by a cold forging operation, no drilling or fitting of parts being required.

It is a further object of the invention to provide a thread stop on a screw which is positive in action, which is strong and durable, which will not jam or lock, and which has no projections tending to cut or scratch the surface with which the screw engages.

It is a further object of the invention to provide in a lifting jack means for securing a lifting screw to its operating gear in non-separable relation merely by the inter-fitting of the parts without heading over or deforming them during assembly, but separation of the parts being readily permitted by a predetermined manipulation of them.

It is a further object to produce an attachment lug on a lifting screw by a single cold forging operation, the lug which is produced being uniform and rugged so as not to be easily broken.

Other objects and advantages of the invention will appear from the following description taken in connection with the accompanying drawings, wherein certain preferred embodiments of the invention, and certain preferred method steps of manufacture and assembly are particularly set forth.

In the drawings wherein like reference numerals refer to like parts throughout,

Fig. 1 is a sectional side view of a screw type lifting jack embodying the invention, the several screws being in collapsed position.

Fig. 2 is a view similar to Fig. 1 but showing the lifting screws in extended condition.

Fig. 3 is a sectional view through the assembly of Fig. 1 taken on the line 3—3 thereof.

Fig. 4 is a perspective view of the inner solid lifting screw which embodies certain features of the invention.

Figs. 5, 6, and 7 are views of the die blocks used for forming the attachment lug at the lower end of the screw.

Figs. 8, 9, 10, 11, and 12 are views showing the several steps of assembling the jack parts.

Figs. 13, 14, and 15 are views showing the deformed thread stop at the upper end of the inner screw.

Figs. 16 and 17 are views of the die blocks used for producing a deformed thread stop, and

Fig. 18 is a plan view of the screw driving gear showing more particularly the opening in the center of the gear through which the attachment lug on the screw extends.

While the invention is shown for purposes of illustration applied to an extensible lifting jack of the type commonly used for raising automotive vehicles, it is to be understood that the invention is equally applicable to other types of screw jacks or equivalent devices.

In Figs. 1 and 2 there is shown an extensible bottom drive lifting jack of the general type disclosed in my prior patent, Reissue Patent No. 17,527, dated December 17, 1929. As shown, a generally cylindrical elongated casting 10 has formed in the bottom portion thereof a bearing for receiving a rotatable shaft 11 to which there is secured at the inner end and within the casting, a driving pinion 12. To the other end of the shaft 11 there is secured a member having a squared socket 14 adapted to receive a suitable handle by which the shaft and the pinion 12 may be rotated to extend the jack. Secured to the bottom of the casting 10 in a suitable manner is a base cap member 16, upon which there is supported a rotatable gear 18 in engagement with and adapted to be rotated by pinion 12. The gear 18 is centered with respect to cap member 16 by means of an upstanding circular ridge 19 formed on the cap member which engages the under side of the bevelled flange of the gear, as shown particularly in Fig. 1.

The inner or small solid screw 21 of the jack is carried upon the gear 18 and is secured thereto and constrained for rotation therewith by means of an attachment lug consisting of a generally rectangular or oblong extension 23, extending axially from the lower end thereof through a similarly shaped opening, best shown in Fig. 18, formed in the central part of the gear, and a projection 24, formed angularly at the end of the extension. The attachment lug co-operates with pinion 12 and an inwardly struck projection 26 formed in casting member 10 to hold screw 21 and the gear 18 in non-separable relation, as will be more particularly pointed out hereinafter. Screw 21 is threaded throughout its length, the threads at the upper end of the screw being deformed to form a thread stop.

The threads of screw 21 engage threads formed

internally on the lower upset or thickened end of an intermediate screw sleeve **28**. The screw sleeve **28** is threaded externally throughout its length, the external threads at the upper end of the sleeve having some suitable thread stop arranged therewith. In the instance shown a taper pin **29** arranged between the threads is used. The external thread on the screw sleeve **28** co-operates with the thread formed internally on the lower upset or thickened end on an outer or large threaded sleeve member **30**. At the upper end of sleeve **30** is secured a cap **31** which is adapted to engage the object to be lifted by the jack. The cap member **31** may be suitably secured to sleeve **30** by heading over a flange on the cap into an annular recess **32** cut in the upper end of sleeve **30**. Sleeve **30** is not externally threaded, but has at its lower extremity a radially extending projection **34** which slides within an elongated channel **35** running substantially throughout the length of a non-threaded sleeve member **37**, which embraces sleeve **30**. Channel **35** is struck inwardly at its upper end, as indicated at **38**, Fig. 2, to prevent the withdrawal of projection **34** upwardly from the channel. Channel **35** fits within and slides longitudinally of a co-operating channel **40**, formed longitudinally substantially throughout the length of casting member **10**. Channel **35** is formed with an outwardly struck portion **41** at its lower end which co-operates with an inwardly projecting portion **42** formed at the upper end of the channel **40** in casting **10**, to prevent withdrawal of sleeve **37** upwardly from casting **10**.

The present invention relates particularly to gear **18** and screws **21** and **28**, and to the method for forming and securing these parts.

Screw **21** may be formed from a piece of cylindrical metal bar stock cut to desired length, and threaded throughout its entire length. The attachment lug formed at the lower end of the screw, and the several deformed threads forming a thread stop at its upper end are well shown in Fig. 4, a perspective view of the entire screw.

The die blocks for forming the attachment lug at the lower end of the screw which constitutes the means of attachment of the screw to the gear **18** are shown in Figs. 5, 6, and 7. Fig. 7 is a perspective view of the lower die block **42**. Fig. 6 is a longitudinal section through both die blocks, and Fig. 5 is a transverse section through the blocks taken substantially on the line **5—5** of Fig. 6. Lower die block **42** has running from one end thereof a semi-cylindrical groove **43** terminating in a vertical wall portion **44** in the plane of the stepped up portion **42'** of the die block, a horizontal face portion **45**, an angular portion **46**, and a second vertical wall portion **47**. Die faces **45**, **46** and **47** are bounded laterally by a pair of vertical walls **48**, forming a continuation of the semi-cylindrical groove **43**.

Upper die block **50** has a semi-cylindrical groove **51** running the length thereof adapted to mate with groove **43** and lower die block **42**, a stepped up portion co-operating with lower die stepped up portion **42'**, and a depending projection **52** which is adapted to extend downwardly between vertical side walls **48** of the lower die block toward but not in contact with horizontal die face **45**.

In forming the attachment lug, the threaded screw is placed between the separated die blocks with its lower end abutting the vertical wall **47** of the lower die block. The dies are then brought together forming the entire attachment lug by the single operation. This operation is exceedingly simple, only one operation of the dies being required, and by the operation a uniform and substantial lug is formed. The forging operation may be performed without heating the metal and, accordingly, there is no danger of destroying its tensile strength by overheating.

The means for forming the thread stop at the upper end of the screw is best described by reference to Figs. 13 to 17, inclusive. Figs. 14 and 15 are views taken from the side and top, respectively, of Fig. 4 of the upper deformed thread portion of the screw, Fig. 13 is a view similar to Fig. 15 but showing the deformed or mutilated screw thread in an intermediate process of formation, and Figs. 16 and 17 are views of the die blocks for forming the deformed threads.

The upper and lower die blocks **54** are in this instance similar, each having a longitudinally extending semi-cylindrical groove **56** running from one end substantially the length thereof and terminating near the other one end of the block in a vertical wall portion **57** in the plane of a vertically stepped down portion **55** formed in the face of the die. Due to the stepped down portions **55**, the faces **58** of the two die blocks will be separated, as shown in Fig. 16, when the die blocks are brought together.

In forming the deformed or mutilated threads, the threaded screw **21** is placed between the separated die blocks with its upper end in line with the end faces **59** of the blocks. The dies are then brought together, which forms on the screw a pair of substantially flat inwardly struck parallel walls **60** on the end of the screw, as shown in Fig. 14, the distance between the walls being that between the faces **58** of the dies when the dies are in closed or operated position. The threads will be mashed substantially smooth on the faces **60**. As the faces **60** are struck inwardly from their original cylindrical contour, the metal of the screw is squeezed out along the faces **58** of the die block so that the threads remaining on the ends of and substantially at right angles to the faces **60** have their top portions **62** and their bottom portions **62'** extending outwardly or farther from the axis of the screw than the similar outer and inner thread surfaces **63** and **63'** of the non-deformed screw thread, as shown in Fig. 13.

After the initial forging operation the dies are separated and the screw is pulled rearwardly from the end faces **59** of the die blocks until its body lies wholly within the longitudinal grooves **56**. During this withdrawal of the screw it is rotated through 90 degrees. The dies are then brought together a second time. During this forging operation the top portions **62** of the deformed threads of the screw which were struck outwardly along the faces **58** of the die during the first forging operation are again flattened into their original semi-cylindrical contour being thereby thickened. The bottom portions **62'** of these threads, however, are substantially undisturbed during this operation. The final screw threads formed therefore, are as shown in Fig. 15, having their top portions **62** widened but lying in the plane of the top portions **63** of the undeformed screw threads, and their bottom portions **62'** struck outwardly with respect to corresponding bottom screw portions **63'** of the undeformed screw threads. A double thread stop is thus formed. The top portions **62** of the deformed threads being too wide to co-operate with the internal thread on sleeve **28**, and the bottom thread portions **62'** of the deformed threads being struck

outwardly from the axis of the screw so that they will likewise not co-operate with the internal thread of sleeve 28.

This method of forming a thread stop is exceedingly simple and may be very readily carried out. Only one pair of dies is required and the operation is therefore substantially a single one, although two die movements are necessary. The operation may be carried out without heating so that the tensile strength of the screw is not destroyed, and there is no machining, drilling, or fitting of separable parts.

Sleeve 28 may be formed by upsetting or thickening its lower end portion in any suitable manner, after which the internal threads are cut on the thickened portion and the external threads are cut throughout the length of the sleeve. After the threads are cut, the outer threads at the top of the sleeve are fitted with a suitable thread stop. As indicated in Figs. 1 and 2, in this instance a tapered pin 29 fitted into the wall of the sleeve and arranged between the threads is used but other equivalent stop means could be provided; or the threads at the upper end of screw sleeve 28 could be deformed to form the thread stop as in the case with screw 21, similar forging dies of larger size being used, and the sequence of operations being the same. However, if the threads were so deformed a center piece of hard metal should be inserted into the sleeve to preserve its interior cylindrical surface during the thread forging operations, so that screw 21 could fit within the upper end of the sleeve so as not to sacrifice any of the lifting range of the jack.

The manner of assembling the several parts of the jack is best understood by reference to Figs. 8 to 12, inclusive. The inner or small solid screw 21 threaded throughout its length and having its upper end threads deformed to form the thread stop, as shown in Fig. 8, is first threaded downwardly through the sleeve 28, as shown in Fig. 9, the sleeve 28 being in completed form, having both its inner and outer threads thereon and its upper end being arranged with the thread stop. At the time screw 21 is threaded through screw sleeve 28, the lower end of the screw 21 has not as yet been forged to form the attachment lug, as will be seen by reference to Fig. 9. This is essential for during the formation of parts 23 and 24 at the lower end of screw 21 by the forging operation thereon, the threads at the lower end of the screw are mutilated so that they could not thereafter be threaded through sleeve 28.

After screw 21 is threaded through sleeve 28 the attachment lug consisting of extension 23 and projection 24 is forged on the lower end of the inner screw, as previously described, and thereafter sleeve 28 carrying the screw 21 may be threaded downwardly through outer large threaded sleeve 30, as indicated in Fig. 10. Non-threaded sleeve 37 may then be dropped into position over sleeve 30, as indicated in Fig. 11, after which cap 31 may be secured to sleeve 30.

Gear 18 is now assembled on the lower end of screw 21, as indicated in Fig. 11, by first moving it to the dotted position shown, and thereafter moving it to the position shown in full lines. It will be noted that the angular face 46 of lower die block 42, forms an angular portion 24', Figs. 4 and 11, on the projection 24 which allows for the movement of gear 18 to assembled position. Casting 10 is now dropped over the assembly, as shown in Fig. 12, and cap 16 is brought up from below and secured to casting 10, as shown in Figs. 1 and 2, to form the completed jack. It will be noted by reference to Figs. 1 and 11 that removal of gear 18 from screw 21 is impossible unless the gear is moved angularly with respect to axis of the screw member 21 to its angular dotted line position of Fig. 11. In the completely assembled jack such relative angular movement of gear 18 is prevented by the pinion 12 and the inwardly struck projection 26 of casting 10 which engage the top of the gear at diametrically opposite points and hold it in position. The casting and the several sleeves hold the screw 21 upright, thus positively preventing any relatively angular movement between gear 18 and 21, even though an upward force is applied to screw 21, as by the turning of the jack upside-down or otherwise. Accidental separation of gear 18 and screw 21 is thereby positively prevented, however, these parts may be readily separated for repair and replacement, and the like, merely by the removal of cap member 16 and a reversal of the assembly operation previously described.

It will be seen that the means for assembling parts 18 and 21 is extremely simple, no heading over or hammering of extension 23 being required after the gear is placed in position with respect to the screw. The projection 24 being formed by a forging operation, may be made substantial and is thus definitely superior to a projection of variable and doubtful size or strength which might be put on the end of extension 23 manually with a hammer or the like, during the assembling of the parts.

In operation pinion 12 is rotated to effect the extension of the jack. The operation of pinion 12 rotates gear 18 meshing therewith, and operation of gear 18 rotates screw 21. Sleeve 30 is held from rotation by virtue of the engagement of its extension 34 with channel 35 in sleeve 37, and by virtue of the engagement of this channel 35 with the larger channel 40 formed in casting 10. Screw 21 is in threaded engagement with sleeve 28, and sleeve 28 is in turn in threaded engagement with sleeve 30. As screw 21 is rotated therefore, and sleeve 30 held from rotation, it will be seen that, due to the threaded engagement of the parts, sleeves 28 and 30 will be extended from screw 21 from the Fig. 1 to the Fig. 2 position of the parts. During this operation sleeve 28 may at times rotate with screw 21 and at times be held non-rotatable with sleeve 30. Ultimately, however, the parts will reach their Fig. 2 position.

The mutilated or deformed threads at the upper end of screw 21 and the stop 29 on sleeve 28 limit the upward movement of the parts. Due to the fact that the thread deformations or mutilations on screw 21 are sharply formed, the mutilated portions have no tendency to wedge or jam with their co-operating threads. The thread stop which is thus formed by the thread mutilation is strong and is positive in action inasmuch as a double stop is formed, one stop being the widened top 62 of the mutilated threads, and the other stop being the outwardly extending bottom portion 62' of the threads. There is no danger that the deformed portions will be sheared off in use, nor is there any chance that they will come loose. During the second forging operation between dies 54, the top portions 62 of the mutilated threads are positively formed into their original semi-cylindrical contour, and hence they have no tendency to scratch or mutilate the sleeve surfaces with which they co-operate. During operation and regardless of the position to which the jack is moved, gear 18 and

screw 21 are held in non-separable relation; however, these parts may be readily separated for repair, replacement or the like, upon removal of cover 16.

It is obvious that various changes may be made in the constructions and steps of formation and assembly which I have set out for purposes of illustration. My invention, however, contemplates the use of equivalents throughout, and I therefore do not wish to be limited to the precise constructions and method and assembly steps shown and described, but only as indicated in the following claims.

I claim:

1. In a lifting jack, a cylindrical screw, and a screw thread cut therein, the groove portion of the screw thread being deformed outwardly from the axis of the screw at one point to form a thread stop.

2. A screw comprising a screw body, and a helical thread cut therein, said thread having its top portion widened and its groove portion deformed outwardly from the axis of the screw at one point to form a thread stop.

3. In a lifting jack, a lifting screw body, a screw thread cut substantially along the length of said body and formed at one end with a mutilated portion, said mutilated portion comprising a widened thread top and a shallow thread groove, and a lifting screw sleeve having threaded engagement with said first-mentioned thread.

4. In a lifting jack, a lifting screw formed at one end with an axial extension having a projection thereon having a symmetric lateral extension from the screw axis, and an operating gear for a lifting screw having an opening through which the extension projects.

5. In a combination with a gear and a shaft operable therewith, means for securing the shaft to the gear comprising a hook-like extension on said shaft adapted to extend axially and laterally from the shaft through an opening in the gear, and means for holding said gear from movement angularly with respect to the axis of the shaft.

6. In a combination with a gear and a shaft operable therewith, means for securing the shaft to the gear comprising a hook-like extension on said shaft adapted to extend axially and laterally from the shaft through an opening in the gear, means for holding said gear from movement angularly with respect to the axis of the shaft, said holding means comprising a support assembly for holding said shaft in upright position, a plate member fixed with respect to said support assembly for engaging one face of the gear, and a pair of projections secured to the support assembly for engaging the other face of the gear in substantially diametrically opposed relation.

7. In a lifting jack, a support, a gear rotatably carried by said support, a lifting screw carried by said gear and held upright by said support, and means for securing the screw to the gear for rotation therewith comprising a hook-like extension on the screw adapted to project through an opening formed in the gear, a projection on said support engaging the upper gear face, and a driving pinion for the gear also engaging the upper face thereof and held in position by the support, said projection and said driving pinion being substantially diametrically arranged with respect to said gear.

8. In a lifting jack, a driving gear, a lifting screw, means for securing the lifting screw to the driving gear for rotation therewith comprising a hook-like extension formed on said screw projecting through an opening in said gear and means for preventing relative movement between said gear and screw, a thread formed on said screw, a threaded sleeve threadedly embracing said screw, said sleeve forming part of the means for preventing relative movement between said gear and said screw, the thread of said screw being mutilated at one end to prevent axial separation of said screw and said sleeve.

9. A lifting jack having a rotatably driven member and a threaded lifting element, a portion of the thread of said element being widened at the top and decreasing in depth to provide a stop.

10. In a lifting jack, in combination with a housing including a basal portion upon which the jack is adapted to rest, a gear freely resting on the upper surface of the base, a threaded driving element having a freely detachable connection with said gear and enclosed in said housing, said connection being positioned in operative relationship by said housing.

11. In a lifting jack, in combination with a lifting housing having a base, a driving pinion in said housing, a driving gear freely resting on the bottom of said base and meshing with the teeth of the pinion, a driving threaded element having a freely detachable connection with said gear and enclosed by said housing, said housing forming means for preventing the detachment of said detachable connection when said jack is in operation.

12. In a lifting jack, the combination of a housing, a plurality of threaded lifting screws in said housing adapted for relative actual movement, means for operating said screws including a gear and means for non-separably securing one of said screws to the gear to permit operation of said screw by said gear upon rotation of said gear and merely by the interfitting of a part of said screw to said gear without heading or deforming said screw or gear during assembly, said means permitting separation of said screw from said gear by a predetermined manipulation of them.

13. In a lifting jack, the combination of a housing, a gear in said housing, means for rotating said gear, a plurality of relatively movable inter-threaded members, one of said threaded members having a freely detachable connection with said gear including means for causing rotation of said threaded member by said gear in the normal operation of the jack, said housing including means for preventing detachment of said threaded member from said gear during the normal operation of the jack.

14. In a lifting jack construction, a driving gear, a lifting screw, said gear being rotatable about the axis of the screw and also being bodily displaceable with respect to the screw axis, means forming a connection between the gear and screw whereby said screw is rotatably driven as the gear is rotated, said connection being freely detachable upon bodily displacement of the gear with respect to the screw axis, and means for holding the gear from such bodily displacement as the gear and screw are normally mounted in the jack construction.

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