March 4, 1947. J. S. ROTHERY 2,416,848

LIFTING JACK

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FIG. 1

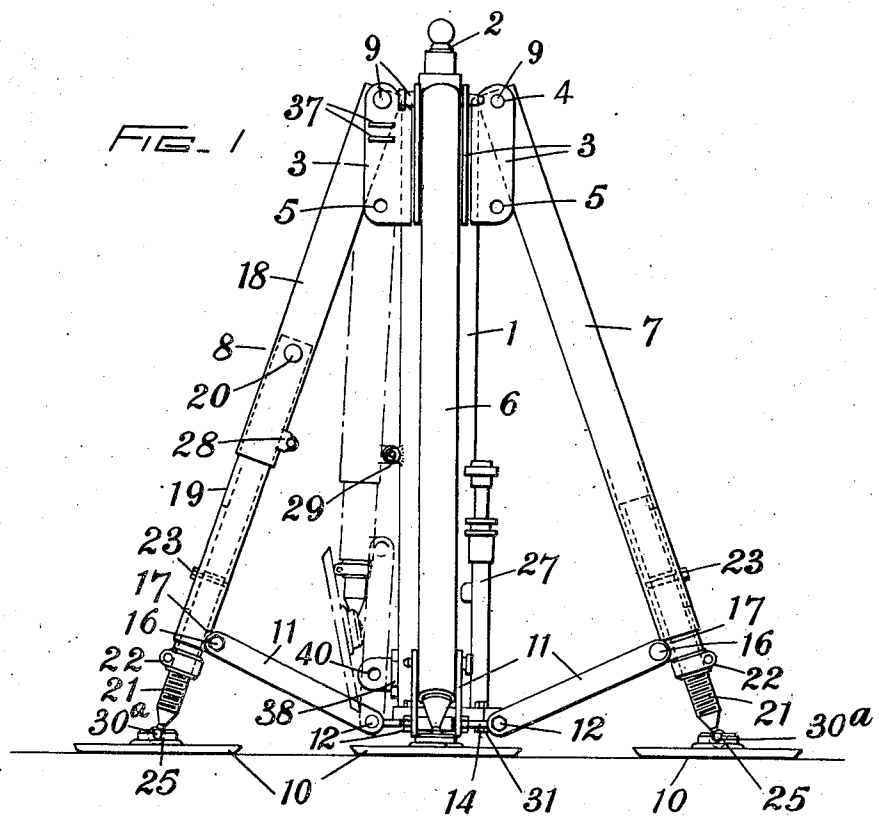
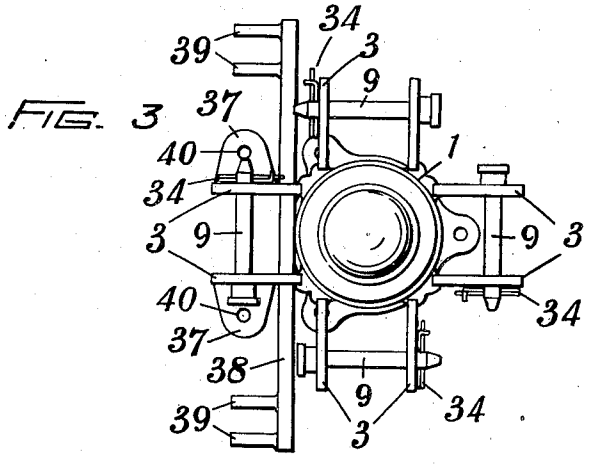


FIG. 3



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FIG. 2

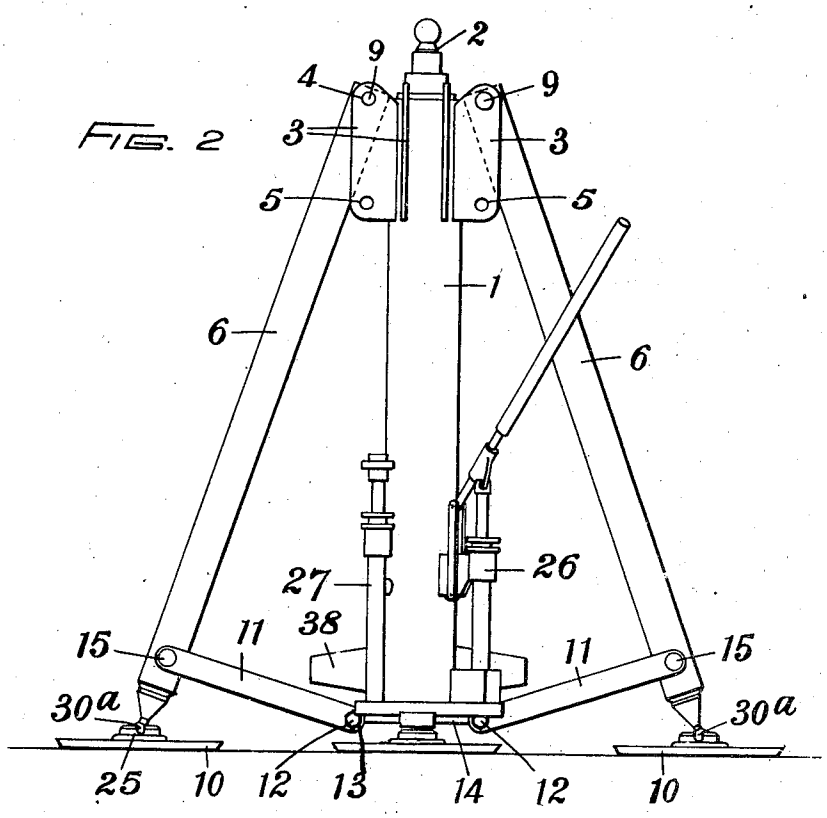


FIG. 4

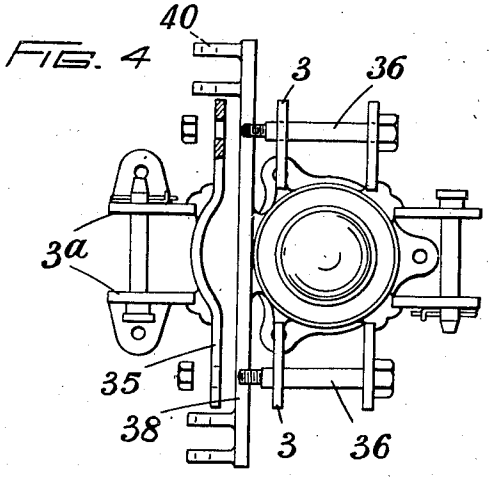
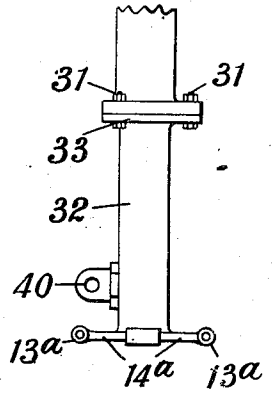


FIG. 5



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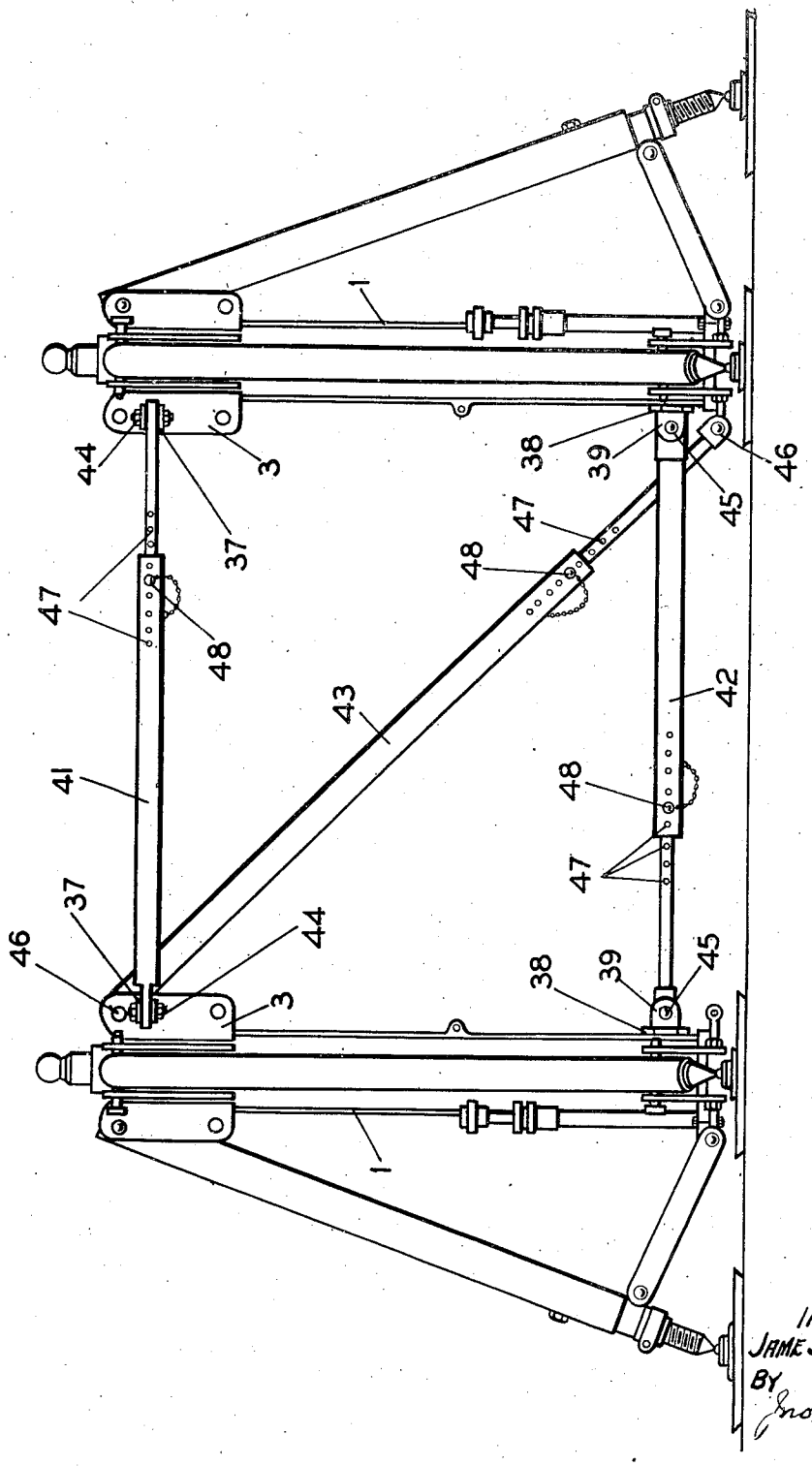


FIG. 6

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LIFTING JACK

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2 Claims. (Cl. 248—352)

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This invention relates to jacks designed more especially for lifting cantilever loads, i. e., loads which are supported at a zone or zones removed from the zone at which the jack head or saddle is applied and which, therefore, move sidewardly as well as upwardly when the jack is extended and move sidewardly as well as downwardly when the jack is collapsed. Loads of this nature frequently have to be dealt with when aircraft are raised and lowered and the jack forming the subject of the present invention is designed, more particularly, for use in connection with aircraft but its use is not limited to this field.

According to the invention the jack is provided in the bisector plane of the bipod legs with an axially adjustable support or "trail" leg and has directly opposite to this leg another adjustable or removable leg which is adapted to fold or collapse against the side of the jack so as to permit it and the said jack to be positioned closely adjacent the side of a nacelle or other obstruction and which can be extended to and axially adjusted or affixed to take an in use position when, or as and when, the obstruction is raised with respect to the lower part of the jack by the action of the ram, said leg thereby taking part of the load and imparting the requisite stability to the jack. Having two adjustable legs, a firm standing and vertical thrust may be obtained on uneven ground.

The said collapsible or removable leg provided as well as the trail leg above referred to, and the bipod legs, may be pivotally attached to the jack body or "heart" at their upper ends so as to be able to collapse against the body to facilitate transporting and storage, suitable pivoted links or struts extending from the base of the body to the lower ends of the legs being provided and being readily detachable from the legs and/or the said body to enable the legs to fold against the body. The collapsible leg or the strut and the jack body may each be provided with an eye in which an easily withdrawable pin may be placed to hold the leg in the collapsed or folded position.

The leg provided in accordance with the invention may be attached to the jack in easily removable manner. For this purpose the top of the leg and the body end of the links at the bottom of the leg may be hingedly secured to the said body by easily withdrawable hinge pins. Jacks according to the invention may be coupled together in pairs by means of horizontal top and bottom braces and a diagonal brace all secured to the jacks by the hinge pins, the said horizontal and diagonal struts preferably being telescopic

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or of other adjustable construction so that the spacing between the jacks may be adjusted as required.

The leg or strut provided according to the invention and the "trail" leg if provided may be extended in such a manner that the jack may be used as a normal jack.

The invention may be applied to jacks of any suitable kind and is preferably applied to a hydraulic jack.

The jack body or the ram and cylinder thereof may be given a slight tilt (for example a tilt of 8° from the vertical) in a direction away from that in which the said body or ram and cylinder move when a load is lifted by the jack.

The invention will now be described with reference to the accompanying drawings wherein—

Fig. 1 is a side elevation of one form of the jack;

Fig. 2 is a side elevation of the same jack turned through 90° on a vertical axis;

Fig. 3 is a plan view of the body of the jack shown in Figs. 1 and 2, the scale being enlarged;

Fig. 4 is a view like Fig. 3 except the butts for the collapsible or fourth leg shown in Fig. 1 are removable;

Fig. 5 is a side elevation of an extension member attached to the jack body, the lower part of the body being shown and the extension member being provided to enable the jack shown in Figs. 1 and 2 to be used with longer legs and the initial height of the jack being alterable by this means.

Fig. 6 is a front elevation of a pair of the jacks braced together.

The jack is of hydraulic type; it comprises a body 1 in which is the liquid reservoir, the ram cylinder and the ram 2. Hinge butts 3 are welded to the top of the body. These butts are in pairs 90° apart and each pair of butts has aligned holes as 4 at its top and aligned holes as 5 at its bottom. Bipod legs 6, 6, the plane of which contains the axis of the body 1, are located at opposite sides of the said body, a trail leg 7 is located at one side of the said plane and a fourth leg (a collapsible leg) 8 is located at the other side of the said plane. The upper end of each leg lies between a pair of butts and pins 9 passing through holes 4 in the butts and through holes in the sides of the legs pivotally secure the legs to their butts. The legs terminate in feet 10 substantially of disc form. Struts 11 are arranged between the base of the body 1 and the lower ends of the legs. The struts are secured to the body by pins or bolts 12 which enter eyes as 13 on the

outer ends of radial arms 14 at the base of the said body; the struts for the bipod legs are secured to these latter by pins 15 passing through the legs and the struts for the legs 7 and 8 are secured by pins or bolts 16 extending through lugs 17 on the said legs.

The collapsible leg 8 comprises an outer tubular part 18 and a tubular part 19 slidable therein, the part 19 being secured to the strut by the pin 16. A removable pin 20 passing through holes in the parts 18 and 19 holds the said parts in the relatively extended position shown. The legs 7 and 8 are made adjustable as to operative length by the provision of telescopic parts 21 at their lower ends. The said parts 21 are screw threaded and the threads are engaged by nuts 22. Bolts 23 screwed into the upper ends of the parts 21 and extending through slots in the sides of the members in which they slide limit the travel of the said parts and also prevent their rotation when the nuts 22 are turned to effect the required adjustment. The said parts and the legs 6 are connected to their feet 10 by ball and socket joints 25 which enable the feet to adjust themselves to any irregularities of the ground. The said joints also permit the feet when out of use to fold against the legs as will be described.

The jack may be used in the condition shown in the drawings in which case it is stable in all directions, raising of the ram being effected by the hand pump 26 and lowering thereof by operating the release valve 27.

If the circumstances in which the jack is to be used wholly or initially preclude the use of four legs the pin 20 in the leg 8 may be removed and the leg collapsed to lie against the body 1 as indicated by line and dot in Fig. 1, the pin 20 being subsequently passed through holes in lugs 28 and 29 on the part 18 and the body 1, respectively, in order to retain the leg in the folded position. If during the lifting of the load the obstruction moves clear of the folded leg the latter can be brought into use, the nut 22 on it being turned in order to maintain ground contact as the angle of the leg to the vertical increases. It will be understood that the part 19 enters the part 18 as the leg is so folded or collapsed owing to the upthrust of the link 11 which takes the position shown in line and dot. Moreover, when the leg is restored to the in use position the link pulls the part 19 downwardly. The foot 19 folds against the leg 8 when the latter is collapsed owing to the provision of the ball and socket joint and to the provision of a slot 30a in the socket which slot accommodates the neck portion of the part 21 at the base thereof.

To facilitate transporting and storing the legs 6 and 7, as well as the leg 8, may be folded against the body 1. For this purpose the leg 8 is folded as above described and the pins 12 or 15 and a pin 12 or 16 associated with the leg 7 are removed, the legs 6 and 7 and the corresponding struts 11 then being foldable against the body 1. The sockets of the ball and socket joints 25 are slotted at 30a to accommodate the neck portions of the legs adjacent the balls so that the feet may fold as described with reference to the foot of the leg 7.

If it be desired to increase the initial height of the jack shown the pins 9 are removed, the body lifted until the holes 5 align with the holes in the tops of the legs and the pins 9 are inserted in the aligned holes.

The jack body and heart (the butts 3 and the body part thereadjacent) may, if desired, be adapted for use with legs longer than those shown.

For this purpose the arms 14 are removably secured to the base of the body by bolts and nuts as 31 and an extension member 32, Fig. 5, is provided. This member is flanged at its upper end at 33 whereby it can be secured to the base of the body 1 by the said bolts and nuts and its base is provided with arms 14a terminating in eyes 13a. The longer legs, not shown, are pinned to the jack heart and struts as 11, or struts longer than these, are pinned to the arms and the legs. It will be understood that two of the longer legs are bipod legs, one longer leg is comparable with the leg 7 and the other with the leg 8.

Pins 34, Fig. 3, are provided to prevent accidental displacement of the pins 9 when in use.

In a modified construction of jack according to the invention the fourth leg (leg 8) instead of being collapsible, may be removable. For example, a leg as 7 may be used in place of the leg 8 and this non collapsible leg may be removed from the jack after withdrawal of appropriate pins 9 and 16 or 9 and 12. Alternatively one pair of hinge butts may be removable, the leg used with the removable butts being collapsible or non-collapsible as desired. A jack heart having a pair of removable butts is shown in Fig. 4.

In Fig. 4 one pair of butts 3a is carried by a plate 35 the central part of which is curved so as to lie snugly around the body 1 and the ends of which are plane so as to lie against two tangentially opposite butts 3. The tangentially opposite butts and their fellows are provided with bolts 36 which are used in place of the pins 9 described previously and, with the aid of the nuts shown, enable the plate 35 to be removably secured in place. The leg, not shown, may be removed from the butts 3a by withdrawing the pin 9 or may be removed with the plate 35 from the jack. In either case a pin 16 or 12 is withdrawn to free the leg from the lower end of the body 1.

Jacks according to the invention may be braced together in pairs. In one way of enabling this to be done the butts 3 for the collapsible or removable leg are provided with lateral lugs 37 whilst the jack body is provided near its base with a transverse bracket 38 on which are lugs 39; and suitable tie bars or braces extend from the lugs on one jack to the lugs on the other, the braces being secured to the lugs by bolts or pins extending through them and through holes 40 in the lugs. The braces may be horizontal or horizontal and diagonal and are preferably adjustable in length, for example, they comprise telescopic tubes which are bored diametrically at a number of points along their length so that one or more pins passed through registering holes lock the parts together.

One such arrangement of braced jacks is shown in Fig. 6 of the accompanying drawings. The braces, which are of telescopic form, are indicated by 41 and 42 (horizontal braces) and 43 (a diagonal brace). The brace 41 extends between the lugs 37 and is secured to them by bolts 44; the braces as 42, of which there are two, extend between the lugs 39 and are secured to them by pins as 45. The diagonal brace 43 is secured at its top to two butts 3 of the left hand jack and its bottom is secured to the diagonally opposite radial arm 14 on the right hand jack, the securing being effected by pins 46. Holes 47 in the telescopic elements of the braces and captive pins 48 enable the effective length of the braces to be adjusted to requirements.

What I claim is:

1. A lifting jack comprising a jack body, in-

cluding bipod legs, a trail leg and a fourth leg, the axes of said bipod legs being in the plane containing the axes of the jack body, said trail leg and said fourth leg being at opposite sides of the said plane and said fourth leg being movable to an out of the way position when said trail and bipod legs are in an in use position, anchoring means for connecting bracing members to said jack body whereby two jacks may be connected together, said anchoring means being located at that side of the jack at which the removable leg is located and said means comprising elements adapted to secure said braces to the jack in detachable manner.

2. A lifting jack for aeroplanes or the like, including a jack body, bipod legs for the body having their axes in the planes of the axes of the body to permit the jack to be arranged for lifting the aeroplane with its included bipod and body plane parallel to the lift of the plane being lifted, a trail leg, a fourth leg, said trail and fourth

legs being on opposite sides of the bipod leg and body plane, the fourth leg being longitudinally adjustable, an extension member, means to secure said extension member to said jack body at the bottom thereof, and struts extending from the bottom of said extension member to the lower ends of said bipod, trail, and fourth legs.

JAMES STEWART ROTHERY.

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