Sept. 23, 1947. P. PLUTA ET AL 2,427,808

LIFTING JACK

Filed Nov. 21, 1945 2 Sheets-Sheet 1

Fig. 1.

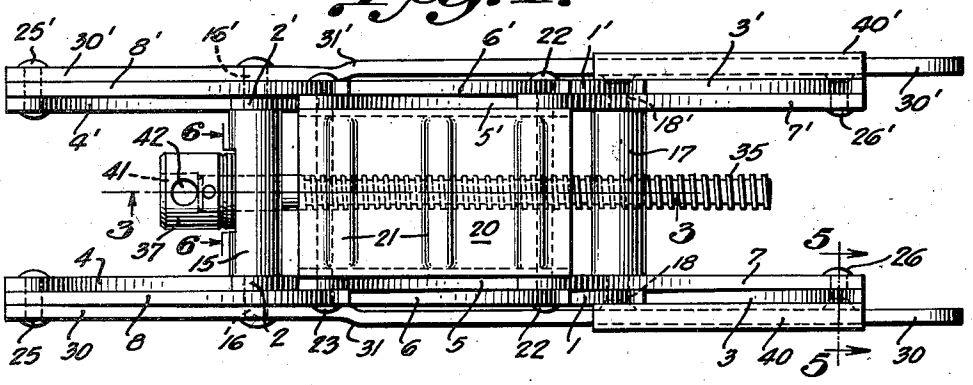
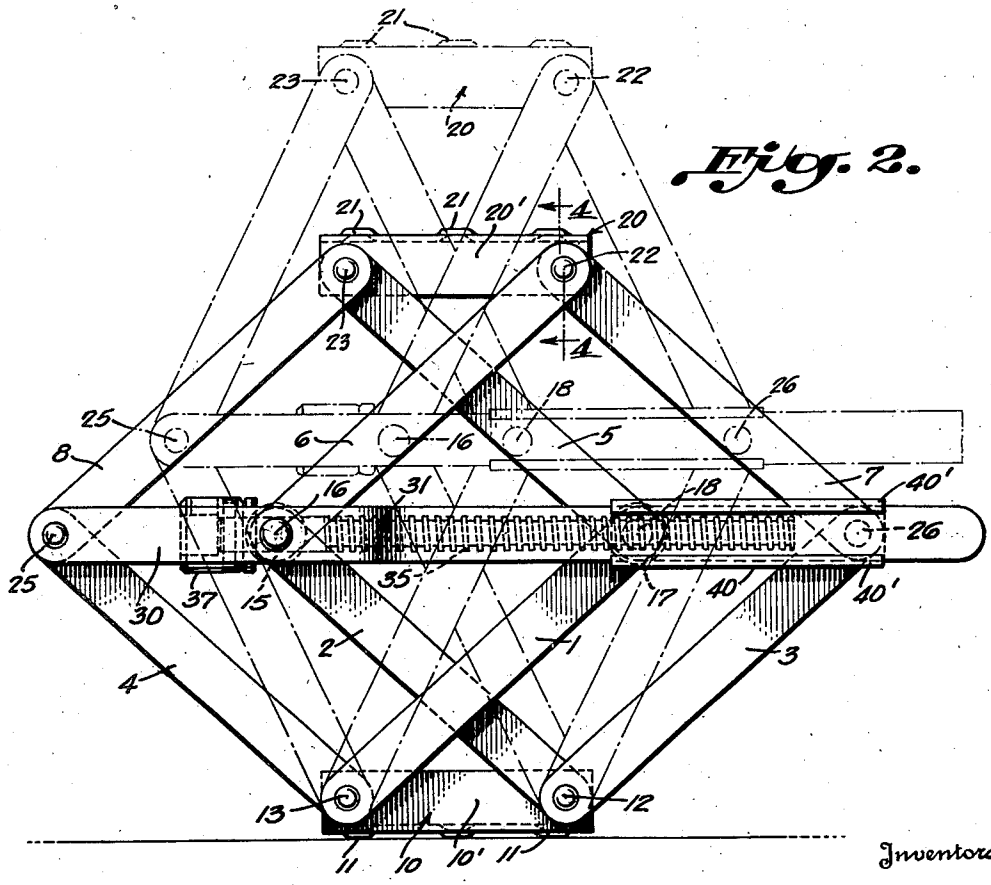


Fig. 2.



Inventors

PETER PLUTA

LESTER FELDERSTEIN

By Samuel Feldman

Attorney

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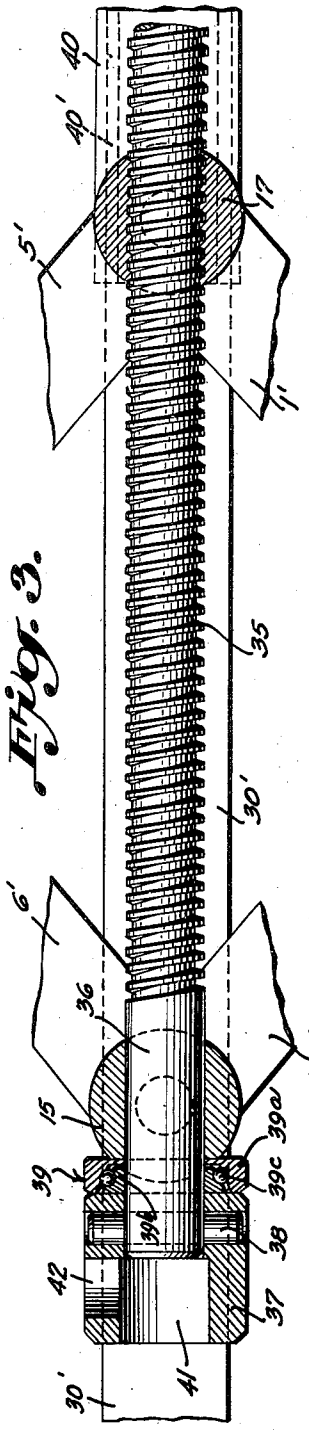


Fig. 3.

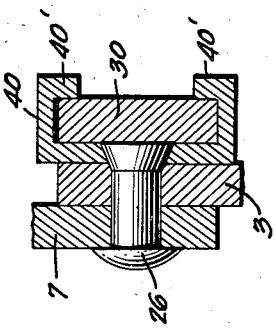


Fig. 5.

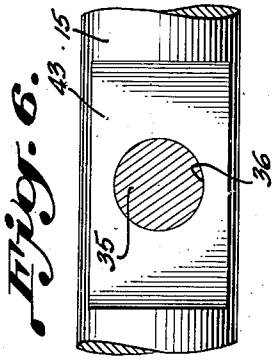


Fig. 6.

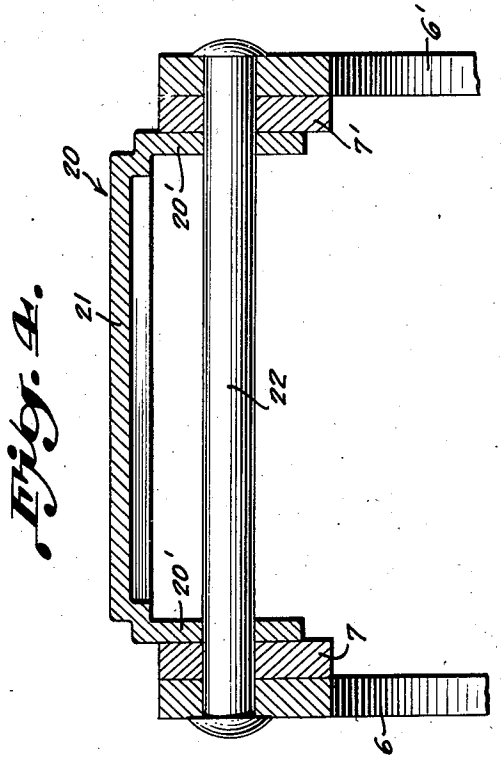


Fig. 4.

Inventors
PETER PLUTA
LESTER FELDERSTEIN
By Samuel Feldman
Attorney

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LIFTING JACK

Peter Pluta and Lester Felderstein,
Rochester, N. Y.

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8 Claims. (Cl. 254—122)

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This invention relates to a lifting device or jack, and more particularly to the type of jack operated by a horizontally disposed screw spindle.

It is the object of the present invention to provide a jack of rugged construction which is capable of assuming a wide range of positions between a fully expanded and a compact fully collapsed condition while exhibiting a uniform degree of stability at all of these positions, in order to effectively lift axles of automobiles or other parts thereof, as well as miscellaneous heavy loads.

It is a further object of the invention to provide a jack embodying a novel system of levers between a base and supporting member through which the loadings are transmitted from the latter to the former without straining the actuating mechanism of the jack.

It is a further object of the invention to provide a jack of improved design over the lazy tongs or toggle lever types of jacks known in the prior art and exemplified by such patents as that to Conrad, No. 1,576,721, March 16, 1926, and Marlowe, No. 2,071,470, February 23, 1937.

The invention proceeds upon the principle of providing additional load transmitting levers between the base and the supporting members of the jack in order to relieve the actuating mechanism of the jack from such loads. Furthermore, a stabilizing system of levers may be provided to equalize the loadings between the separate groups of levers at each side and/or end of the jack, which stabilizing system may be correlated between the ends of the jack so that the loads are equalized therebetween, thereby to eliminate any tendency for the jack to tilt or tip. At the same time, no hindrance is presented to the raising and lifting movements of the supporting member relative to the base occasioned by the operation of the actuating mechanism of the jack which assumes the form of a conventional screw spindle which serves to vary the relative displacement between two spacer blocks, the displacement between which controls the positioning of the levers of the jack and the resultant distance between the supporting member and the base.

It is a further object of the invention to provide a base and supporting member of comparatively light material which nevertheless is strong and which assures a secure engagement of the base or supporting member with the surfaces adjacent thereto.

Other objects and purposes will appear from the detailed description of the invention following hereinafter, taken in conjunction with the accompanying drawings, wherein

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Fig. 1 is a plan view of the jack in accordance with the present invention;

Fig. 2 is a front elevation thereof showing an alternative raised position of the jack in dotted lines;

Fig. 3 is a vertical sectional view along line 3—3 of Fig. 1;

Fig. 4 is a vertical sectional view along line 4—4 of Fig. 2;

Fig. 5 is a vertical sectional view along line 5—5 of Fig. 1; and

Fig. 6 is a vertical sectional view along line 6—6 of Fig. 1.

The jack shown in the drawing is a screw operated jack sometimes designated as a scissors type jack, embodying a base 10 and a supporting member 20 with a system of levers extending therebetween, explained fully below, for the purpose of varying the relative spacing between the base and the supporting plate to effect a raising or lowering of objects such as parts of automobiles, heavy loads, axles, etc. The positioning of the levers is modified by the rotation of a screw spindle extending horizontally midway between the base and the supporting plate and on which are mounted two variably spaced bearing blocks interconnected with the lever system, the adjustable spacing of which controls the disposition of the levers.

The lever system of the disclosed embodiment is duplicated upon the opposite sides of the base and the supporting plate, and to simplify their designation, corresponding reference numerals have been applied to both sets of levers, with one set being primed.

Figs. 1 and 2 show the base 10 with crossed levers 1 and 2 pivotally mounted thereto at 13 and 12, respectively, at longitudinally displaced points on the base. The base 10 may be of channel configuration and the levers pivoted thereto may lie adjacent the vertical flanges 10' thereof. As shown in the drawings, common bolts, pins or rivets 12 and 13 extend across the complete width of the base 10 and pivotally connect also the levers 1' and 2' on the opposite side of the base to the opposite flange 10' thereof.

Lever 1 extends upwardly from the base and is pivoted to a trunnion 18 extending from one of the spacer blocks 17 carrying the screw shaft or spindle 35. The lever 2 extends upwardly from the pivot 12 and is pivoted to a trunnion 16 extending from the spacer block 15 supporting the rotary screw shaft 35. Also mounted on the latter trunnion is one end of a lever 6 which extends upwardly from the block 15 and the op-

posite end of which is pivoted at 22 to the supporting member 20 at the flange 20' thereof. Similarly, another lever 5 extends upwardly from the trunnion 18 of block 17 and is pivoted to the supporting plate 20 at 23. Congruous levers 6' and 5' also extend upwardly from trunnions 16' and 18', respectively, to member 20. The supporting plate 20 is similar in construction to the base 10, that is, it may be of channel configuration and the pivotal connections thereto are in the form of upset bolts or rivets extending through the vertical channels 20' to mount the congruent levers on the opposite sides of the supporting plate by the same rivets. Of course, it is understood that bolts and nuts may be used in lieu of pins or rivets, or that separate pivotal mountings may be provided for each set of levers on the opposite sides of the base adjacent to the respective vertical flanges 10' and 20'.

An enlarged view of the blocks 15 and 17 and their relation to the rotary screw spindle 35 is visible in Fig. 3 which shows an unthreaded portion of the screw shaft 36 rotatably mounted in the block 15. A socket element 37 is keyed to the end of the shaft 35 by a pin 38 and a thrust bearing 39 is disposed between the socket 37 in a recessed portion 43 of the block 15 (Fig. 6). The disc 39*a* of the thrust bearing 39 remains fixed adjacent to the block 15 while the part 39*b* rotates easily with the spindle as a result of series of ball bearings 39*c* interposed between the races between the parts 39*a* and 39*b*.

A lever having a small crank offset is adapted to be rockably inserted through the enlarged open end 41 of socket 37, the crank of which extends upwardly into the smaller opening 42 to provide an effective coupling for the rotation of the screw shaft. Any other form of coupling unit may be provided at the end of the shaft for cooperation with a mechanical handle of a collapsible type for conveniently rotating the screw shaft.

As shown in Fig. 2, the effect of rotating the screw spindle serves to vary the spacing between the block 17 relative to the fixed block 15 on the spindle, which results in a modification of the arrangement of the levers 1, 2, 5 and 6 on one side of the jack and the congruent levers 1', 2', 5' and 6' on the other side of the jack to effect a raising or lowering of the load supported by the member 20 relative to the base 10. Jacks of this type are old in the art and these may employ two threaded blocks cooperating with a rotary screw spindle embodying oppositely threaded portions thereon to vary the spacing of the blocks thereon and to correspondingly vary the level of the lifting plate. The present invention presents improvements over jacks of this type by the incorporation of additional features which render the jack more rugged and reliable and stable under conditions of heavy and shifting loads.

To attain these new objectives, provision is made of additional or supplemental supporting levers 3 and 4 which are pivoted, respectively, to the points 12 and 13 and extend beyond the ends of the base 10. Corresponding levers 7 and 8 are pivotally connected to the supporting member 20 at 22 and 23, respectively. Levers 3 and 7, of the same length as levers 1 and 5, respectively, are pivotally joined at 26 to form two sets of parallelograms between the base 10 and supporting member 20. Likewise, levers 4 and 8, of the same lengths as levers 2 and 6, are pivotally joined together at 25, to form two similar

parallelograms in the opposite direction. A similar system of congruent levers 3'—7' and 4'—8' are connected to the opposite sides of the base 10 and supporting member 20 as shown in Fig. 1 and are pivotally joined at 26' and 25'. The sets of levers 8—4, 7—3, 8'—4' and 7'—3' transmit the loads from the supporting member 20 to the base 10 without straining the loading on the blocks 15 or 17 or the screw shaft or spindle on which they are mounted to eliminate any tendency for the elements to buckle and become misaligned under heavy loading conditions.

An equalization of the loadings on the several levers forming parts of corresponding parallelograms may be attained by connecting a lever 30 between the pivot points 25 of the outside levers 4 and 8 and the trunnion 16 of the block 15 to which are connected the inside levers 2 and 6. The spacing on lever 30 between points 25 and 16 is the same as the spacing between pivots 12 and 13 on the base and 22 and 23 on the supporting member. This lever 30 may be extended across the complete length of the jack and is provided with a slight offset portion 31. A channel member 40 may likewise be connected between the pivot 26 and trunnion 18 of the block 17, to provide for an equalization of the loading between the opposite sets of levers 7—3 and 5—1 forming the corresponding opposite parallelograms. The spacing between 26 and 18 is the same as that between 25 and 16. The channel 40 is shown riveted at the pivot 26 and trunnion 18 and is provided with flanges 40' extending in parallel to the base of the flange to form a guide track for the lever 30 as the same moves in parallel to the screw shaft and at the same level thereof. This accommodation of the lever 30 within the channel 40 is made possible by the offset portion 31 of the lever which is displaced by an amount corresponding to the thickness of the web of the channel as shown in Fig. 5. This coupling between the opposite ends of the jack, while affording the necessary freedom of movement therebetween, results in an equalization of loadings between the ends of the jack which would normally tend to tip the same.

In the illustrated embodiment of the invention, congruously disposed stabilizing bar 30' is mounted upon the opposite side of the jack between pivot 25' and trunnion 16' and channel 40' is riveted between pivotal joint 26' and trunnion 18' for cooperation with the extension of bar 30'. If desired, the disposition of the parts may be reversed on the opposite side, i. e., the channel 40' may be connected between points 25' and 16' and the bar 30' may be connected between points 26' and 18'. Furthermore, the advantages of the invention may be realized in different degrees by providing equalization of loadings between the different sets of levers at less than the four points shown in the preferred embodiment.

Transverse ribs 11 are formed on the bottom surface of the base 10 and corresponding ribs 21 are formed in the top surface of the supporting member 20 to improve the gripping surface of these members with the ground, the load or any other surface with which they may come in contact.

While we have described our invention as embodied in a specific form and as operating in a specific manner for purposes of illustration, it should be understood that we do not limit our invention thereto, since various modifications will suggest themselves to those skilled in the art without departing from the spirit of our inven-

tion, the scope of which is set forth in the annexed claims.

We claim:

1. In a lifting device, two oppositely disposed bearing blocks, a base positioned below said blocks, a supporting member positioned above said blocks, a pair of crossing levers pivotally connected to each side of said base and said blocks, a pair of crossing levers pivotally connected to each side of said supporting member and said blocks, a rotatable screw spindle mounted in said blocks which when rotated in one direction draws said blocks together to raise said supporting member and when rotated in the opposite direction forces said blocks apart to lower said supporting member, a plurality of additional levers extending from each side of said base and said supporting member with the free ends of the respective pairs thereof pivotally connected to each other at the level of said blocks and the rotatable spindle extending therebetween, and bracing means extending at said level between at least some of said last-mentioned pivotal connections and the respective bearing block adjacent thereto comprising a horizontally disposed stabilizer bar extending from the connection thereof to the pivotal joint of a pair of said additional levers and the end of the bearing block adjacent thereto towards the opposite end of said lifting device.

2. In a lifting device, two oppositely disposed bearing blocks, a base positioned below said blocks, a supporting member positioned above said blocks, a pair of crossing levers pivotally connected to each side of said base and said blocks, a pair of crossing levers pivotally connected to each side of said supporting member and said blocks, a rotatable screw spindle mounted in said blocks which when rotated in one direction draws said blocks together to raise said supporting member and when rotated in the opposite direction forces said blocks apart to lower said supporting member, a plurality of additional levers extending from each side of said base and said supporting member with the free ends of the respective pairs thereof pivotally connected to each other at the level of said blocks and the rotatable spindle extending therebetween, and bracing means extending at said level between at least some of said last-mentioned pivotal connections and the respective bearing block adjacent thereto said bracing means extending parallel to said screw spindle at the level thereof and constrained to maintain said parallelism at all levels of said screw spindle between said base and said supporting member.

3. In a lifting device, two oppositely disposed bearing blocks, a base positioned below said blocks, a supporting member positioned above said blocks, a pair of crossing levers pivotally connected to each side of said base and said blocks, a pair of crossing levers pivotally connected to each side of said supporting member and said blocks, a rotatable screw spindle mounted in said blocks which when rotated in one direction draws said blocks together to raise said supporting member and when rotated in the opposite direction forces said blocks apart to lower said supporting member, a plurality of additional levers extending from each side of said base and said supporting member with the free ends of the respective pairs thereof pivotally connected to each other at the level of said blocks and the rotatable spindle extending therebetween, and bracing means extending at said level between

at least some of said last-mentioned pivotal connections and the respective bearing block adjacent thereto comprising a horizontally disposed stabilizer bar extending from the connection thereof to the pivotal joint of a pair of said additional levers and the end of the bearing block adjacent thereto towards the opposite end of said lifting device, and a horizontally disposed guide channel at said last-mentioned end of said lifting device connected between another pair of said additional levers and the corresponding end of the bearing block adjacent thereto for guiding the free end of said stabilizer bar in the course of its movement relative to said guide channel as said bearing blocks move to-and-fro.

4. In a lifting device, two oppositely disposed bearing blocks, a base positioned below said blocks, a supporting member positioned above said blocks, a pair of crossing levers pivotally connected to each side of said base and said blocks, a pair of crossing levers pivotally connected to each side of said supporting member and said blocks, a rotatable screw spindle mounted in said blocks which when rotated in one direction draws said blocks together to raise said supporting member and when rotated in the opposite direction forces said blocks apart to lower said supporting member, a plurality of additional levers extending from each side of said base and said supporting member with the free ends of the respective pairs thereof pivotally connected to each other at the level of said blocks and the rotatable spindle extending therebetween, and bracing means extending at said level between at least some of said last-mentioned pivotal connections and the respective bearing block adjacent thereto, said bracing means at one end of the lifting device being in the form of horizontally disposed levers extending towards the opposite end of the lifting device and the bracing means at said last-mentioned end being in the form of horizontally disposed guide channels for guiding the free ends of said last-mentioned levers.

5. A jack comprising a base, pairs of crossing congruent levers pivotally mounted to said base at longitudinally displaced points thereon on the opposite sides of the longitudinal median of said base, a pair of bored spacer blocks pivotally mounted between the corresponding pairs of said congruent levers, at least one of which is internally threaded, a screw spindle rotatably mounted in said blocks for varying the spacing between said blocks by the rotation of said screw spindle, additional pairs of crossing congruent levers pivotally mounted on opposite ends of said blocks and extending upwardly therefrom, a supporting member pivotally mounted to the free ends of said last-mentioned levers, supplemental supporting levers pivotally mounted at one of the ends thereof to said base and to said supporting member around axes common to pivotal axes of said congruent crossing levers therewith and extending outwardly beyond said axes, pivotal connections between the opposite ends of corresponding pairs of said supplemental supporting levers at the level of said spacer blocks to form parallelograms with said crossing levers, a horizontal bracing bar extending between one of said last-mentioned pivotal connections and one end of the spacer block adjacent thereto towards the opposite end of said jack, and a guide channel connected between another one of said last-mentioned pivotal connections and the corresponding end of the spacer block at said last-mentioned end of said jack to serve as a guide for said bracing

bar to equalize the loadings on the jack therebetween.

6. A jack comprising a base, pairs of crossing congruent levers pivotally mounted to said base at longitudinally displaced points thereon on the opposite sides of the longitudinal median of said base, a pair of bored spacer blocks pivotally mounted between the corresponding pairs of said congruent levers, at least one of which is internally threaded, a screw spindle rotatably mounted in said blocks for varying the spacing between said blocks by the rotation of said screw spindle, additional pairs of crossing congruent levers pivotally mounted on opposite ends of said blocks and extending upwardly therefrom, a supporting member pivotally mounted to the free ends of said last-mentioned levers, supplemental supporting levers pivotally mounted at one of the ends thereof to said base and to said supporting member around axes common to pivotal axes of said congruent crossing levers therewith and extending outwardly beyond said axes, pivotal connections between the opposite ends of corresponding pairs of said supplemental supporting levers at the level of said spacer blocks to form parallelograms with said crossing levers, a horizontal bracing bar extending between each one of a congruous pair of said last-mentioned pivotal connections and the corresponding end of the spacer block adjacent thereto towards the opposite end of said jack, and a guide channel connected between each one of another congruous pair of said last-mentioned pivotal connections

and the corresponding end of the spacer block at said last-mentioned end of the jack, said guide channels adapted to serve as guides for the respective bracing bars to equalize the loadings on the jack between the sides and the ends thereof.

7. In a lifting device as set forth in claim 1, wherein said base and said supporting member are formed of sheet metal provided with projections on the surface thereof to secure a firm engagement with bodies in contact therewith.

8. A jack as set forth in claim 5 wherein said base and said supporting member are formed of sheet metal of channel formation provided with a plurality of projections in the web thereof extending transversely to the longitudinal axis of the jack, and said crossing and supplemental supporting levers are pivoted to the flanges thereof.

PETER PLUTA.
LESTER FELDERSTEIN.

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