Feb. 6, 1951

H. E. MORRISON

2,540,750

SELF-ADJUSTING LEG

Filed Nov. 8, 1947

2 Sheets-Sheet 1

Fig. 1

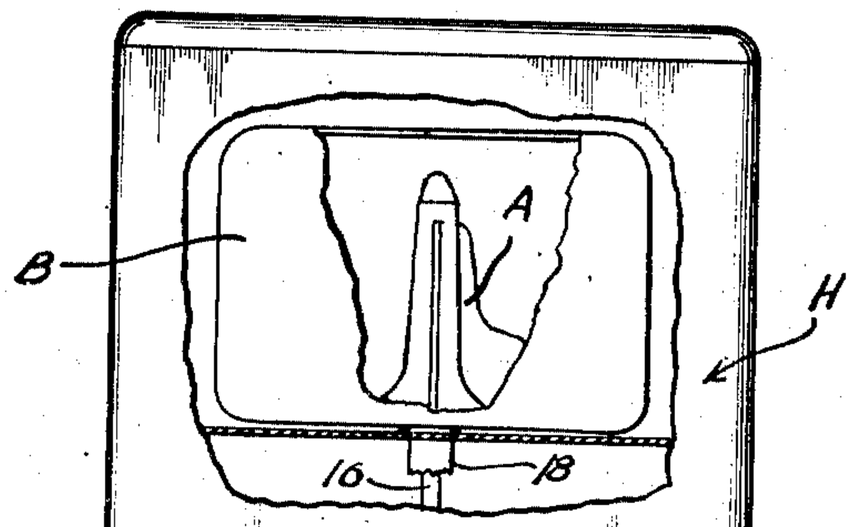

Fig. 2

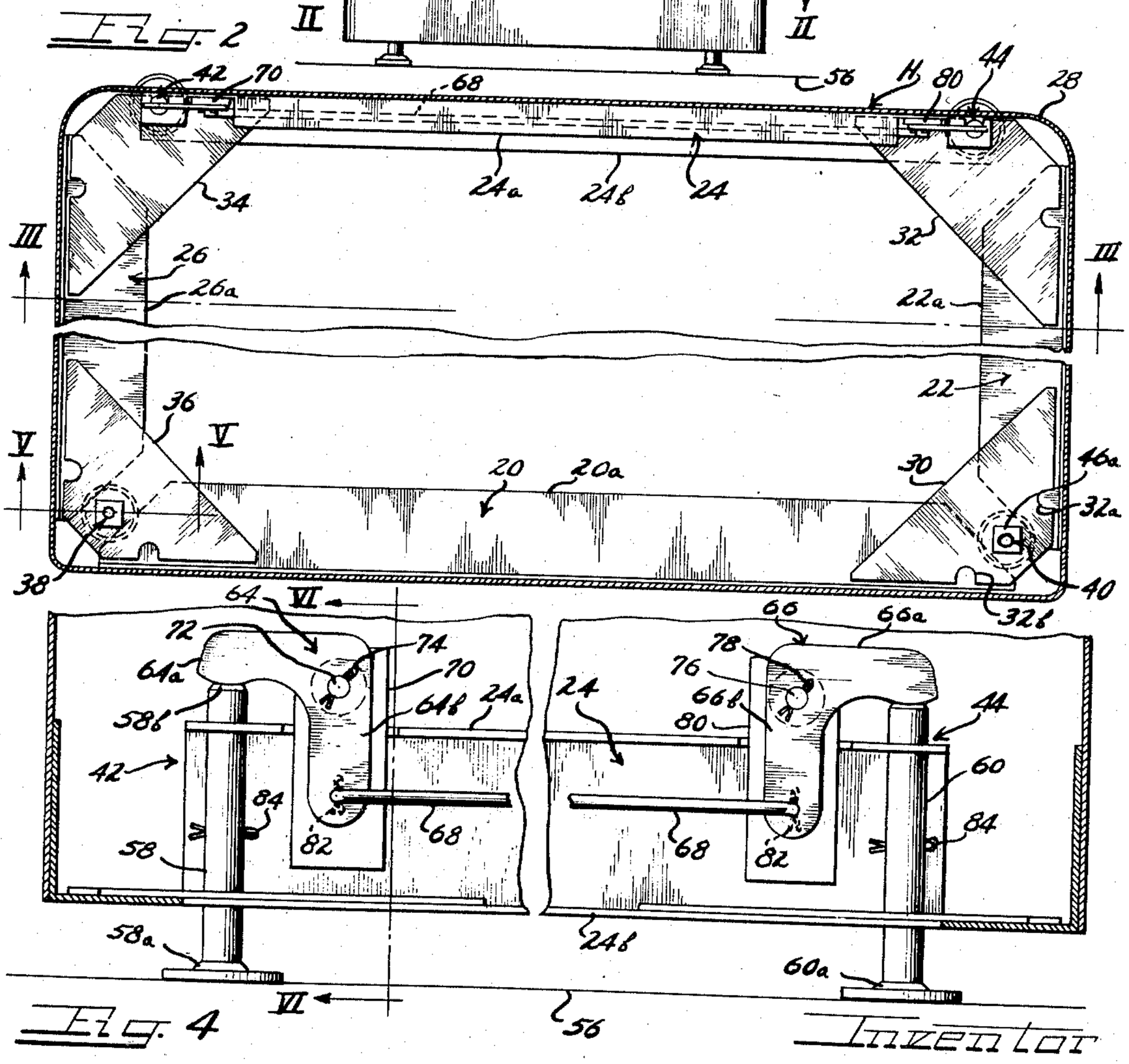

Fig. 4

Inventor

HAROLD E. MORRISON

HH

The Firm of Charleswfills

Attys.

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Fig. 3

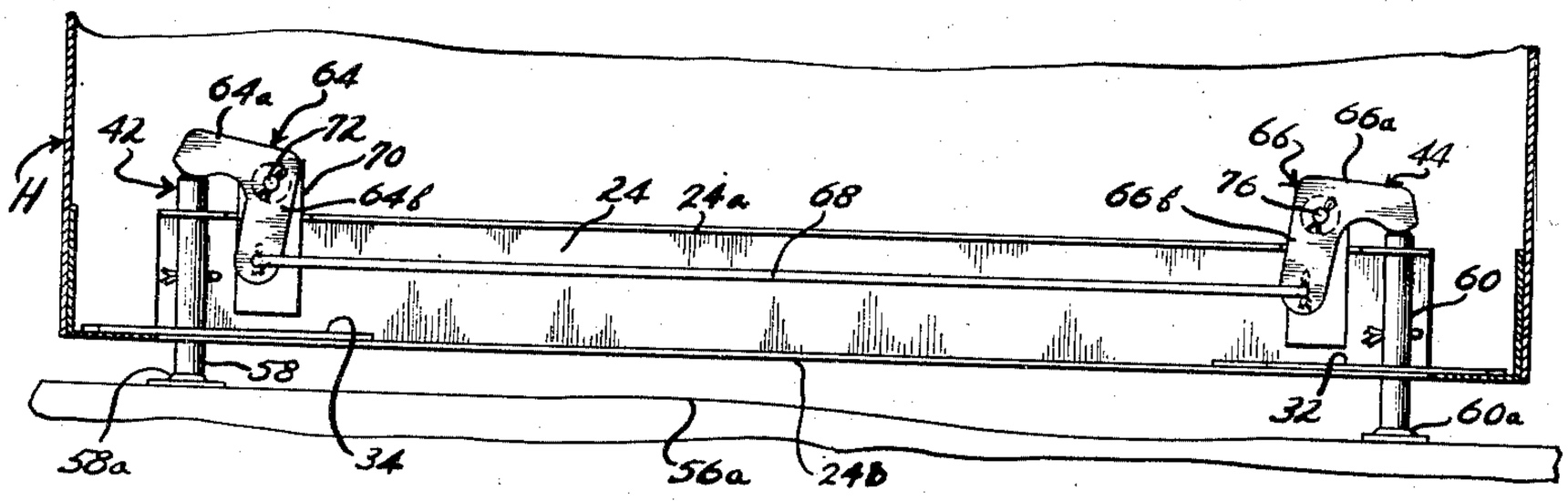


Fig. 5

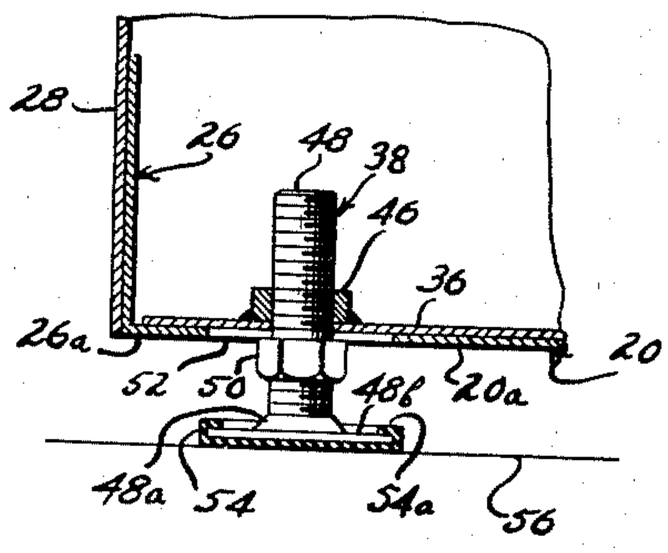
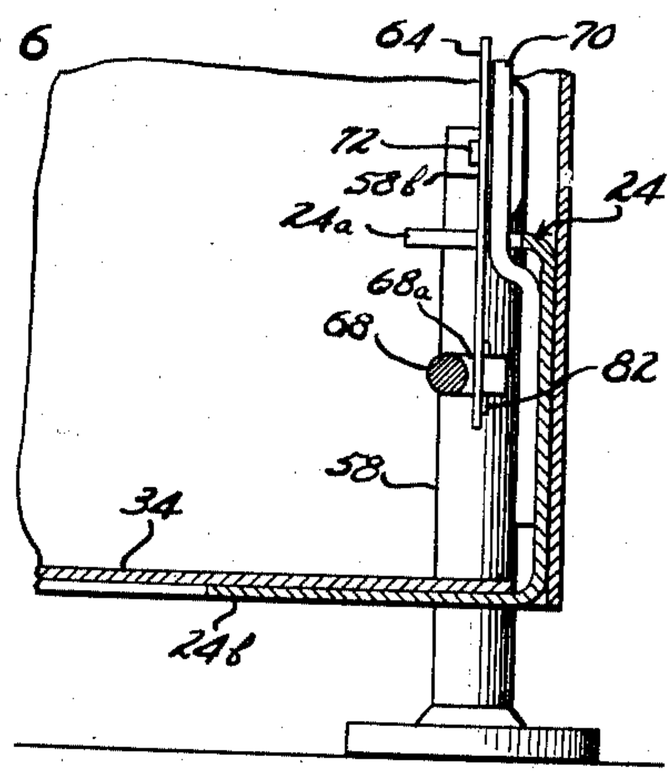


Fig. 6



Inventor

HAROLD E. MORRISON

By The Firm of Charlesworth Ills Attys.

Patented Feb. 6, 1951

UNITED STATES PATENT OFFICE

2,540,750

SELF-ADJUSTING LEG

Harold E. Morrison, St. Joseph, Mich., assignor to Nineteen Hundred Corporation, St. Joseph, Mich., a corporation of New York

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2 Claims. (Cl. 248—2)

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My invention relates to self-adjusting legs capable of automatically accommodating themselves to an uneven supporting surface to sustain an object in predetermined position relative thereto.

In automatic laundering machines and like mechanisms wherein rotational motions are imparted to unbalanced masses, it is of considerable importance that the mechanism be sustained from the supporting surface in a positive manner and at predetermined direction relative to the vertical. Moreover, it is important that each leg provided for this purpose sustain its share of the load. In this fashion, a maximum degree of stability is imparted to the structure and optimum performance procured. In accordance with the present invention, the mechanism such as a laundering machine is supported from four legs. One pair of these legs is individually adjustable for alignment of one axis of the machine in a vertical direction. The other two legs are mounted for up and down movements relative to the object and are inter-connected by elements operable to exert equal downward forces on each. Thus, if the machine is mounted on a tilted support surface and the first pair of legs is adjusted to align the axis of the machine in one direction, the other two legs automatically accommodate themselves to this alignment and will each sustain an equal proportion of the weight. The adjustable legs can then be simultaneously adjusted to align the axis of the machine in the other direction to achieve the desired orientation of the axis of the machine.

A frequently encountered difficulty in supporting an object from four legs resides in the fact that the lengths of the legs are not properly proportioned relative to the plane of the support to cause them to share the load equally. With the mechanism of the present invention, this problem is overcome by the automatic action of the elements described above which equalize the load between two of the legs and thereby cause each of the four legs to bear its proper share of the burden.

In the form of the present invention, the automatically adjustable legs are mounted on bearings attached to the object to permit up and down movements relative thereto. Cranks, each having a horizontally disposed arm bearing on

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the top of one of the legs and a vertically disposed arm extending downwardly, are pivotally supported from the object. A bar is pivotally attached to the two downwardly extending crank arms to cause each crank to urge its corresponding leg downwardly with like force. This bar is tensioned by increased load and hence may be of relatively small cross section. When the unit is placed upon an uneven or tilted supporting surface, the legs move up and down until the forces supported by each are equal.

It is therefore a general object of the present invention to provide an improved automatically adjustable leg structure.

A further object of the present invention is to provide an improved automatically adjustable leg structure utilizing interconnecting elements held in tension.

It is yet another object of the present invention to provide an improved automatic leg structure wherein movable leg elements are frictionally supported to stabilize the unit and prevent rattle.

Another object of the present invention is to provide improved automatically adjustable leg structures suitable for use on automatic washing machines.

Still another object of the present invention is to provide an improved automatic laundering machine having leg elements automatically operable to distribute the weight thereof in a manner causing minimum tendency of the machine to "walk" or "creep" during operation.

My invention further resides in features of construction, combination and arrangement whereby improved automatic leg structures of simple and economical construction and reliable operation are achieved to the end that a unit of maximum utility is achieved.

The novel features which I believe to be characteristic of my invention are set forth with particularity in the appended claims. My invention, itself, however, both as to its organization and method of operation may best be understood by reference to the following description taken in connection with the accompanying drawings in which:

Figure 1 is a rear elevational view of a laundering machine having self-adjusting legs constructed in accordance with the principles of the

present invention and broken away to show the clothes basket and agitator portions of the mechanism;

Figure 2 is a view of the machine in Figure 1, as seen through the section II—II, Figure 1, and showing the self-adjusting legs, together with the remaining legs of the mechanism;

Figure 3 is an enlarged fragmentary view through the axis III—III, Figure 2, and showing the positions assumed by the legs on an uneven support surface;

Figure 4 is an enlarged fragmentary view of the elements shown in Figure 3, but showing the positions assumed by the legs on a level support surface;

Figure 5 is an enlarged cross sectional view through the axis V—V in Figure 2; and

Figure 6 is an enlarged cross sectional view through the axis VI—VI in Figure 4.

In Figure 1, there is shown at H a housing which encloses a machine to be supported. This machine may, for example, comprise an automatic laundering machine wherein a clothes laundering cycle is automatically carried out. In such a machine, for example, a rotatable clothes basket B is provided and an agitator A rotatably disposed therein. The agitator A is supported on the inner shaft 16 which imparts wobbling motions thereto when rotated and the basket B is supported on the shaft 18 for rotational movements therewith. During the sequence of operations during the automatic clothes laundering cycle, the basket B is rotated at high velocity to create centrifugal forces causing the water to be driven out of the clothes therein. During this portion of the cycle, experience has demonstrated that substantial vibrations are imparted to the rotating basket by reason of the inherent unbalances in the disposition of the clothes within the basket. These forces are transmitted by the shaft 18 to the housing H and the supports therefor, and thus tend to cause the unit to "creep" or "walk" relative to the supporting surface. For this reason it is essential that each leg provided to support the housing H bear its proportionate share of the total weight. Moreover, in a mechanism of this type, it is highly desirable to use four legs rather than three because of the increased stability associated with the presence of the four legs over the stability which can be obtained with only three legs.

As shown in Figure 2, a plurality of angle members 20, 22, and 26 are disposed with their bottom sides 20*a*, 22*a* and 26*a* in a horizontal plane about the bottom of this housing and extend along the front and two sides thereof. In addition, a U-shaped channel beam 24, having an upper flange portion 24*a* and a lower flange portion 24*b* is attached to the housing H with its lower flange portion 24*b* in the plane of the bottom sections of the angle members. The sides of the angle members 20, 22 and 26 and the web of the beam 24 are attached to the shroud or skirt portion 28 of the housing H by spot welding or a similar method. Each of the angle members 20, 22 and 26 is cut off at its end and the plates 30, 32, 34 and 36 mounted across the corners. The plates 32 and 34 are further attached to the lower flange 24*b* of the channel beam 24. Each of these plates acts to sustain the housing H and make a more rigid structure thereof, and, in addition, provides a support for the legs.

Two sets of legs may be seen in the view of Figure 2. One set, the front legs, includes legs 38 and 40 which are individually adjustable but not inter-connected. The other set of legs, including legs 42 and 44 are the rear legs and are interconnected in a manner described in further detail hereafter for automatic accommodation to the surface configuration of the support upon which the housing H is placed.

The construction of the legs 38 and 40 may best be understood by reference to Figure 5, which is a cross sectional view through the axis V—V, Figure 2, and which shows the leg 38 in elevation. As will be evident from this view, a nut 46 having a threaded opening is welded to the upper surface of the triangular support plate 36 which is, in turn, attached by spot welding or similar means to the lower portions 20*a* and 26*a* of the angle irons 20 and 26. The triangular support plate 36 is provided with an opening immediately below the threaded nut 46, to permit the latter to receive the threaded support bolt or leg 48. A jam nut 50 is mounted in threaded engagement with the bolt 48 and underneath the washer 52 to bear against that washer and plate 36 and lock the leg 48 against rotation.

At its bottom end, the bolt 48 enlarges to a conical portion 48*a* which expands out to form the dish shaped head 48*b*. A cup-shaped shoe 54 of rubber or similar resilient material is interposed between the dish shaped head portion 48*b* of the bolt 48 and the surface 56 upon which the unit rests. This shoe fits snugly about the portion 48*b* of the bolt 48 and is provided with an inwardly extending upper peripheral flange portion 54*a* to sustain it thereon when the unit is lifted.

The leg 40 is constructed like the leg 38 and is likewise individually adjustable by rotation relative to the triangular support plate 30 to which the nut 46*a* is attached.

The construction of the legs 42 and 44 may best be understood by reference to Figures 3, 4 and 6. As shown in Figure 3, the legs 42 and 44 each comprise cylindrical shaft or leg members 58 and 60 respectively, having a headed lower end 58*a* and 60*a*, respectively, with a rubber friction shoe attached thereon. The head portions 58*a* and 60*a* of the members 58 and 60 are like the head portions of the support bolt 48, Figure 5. The shaft 58 rides at its lower portion in an opening formed in the triangular support plate 34 and the lower flange 24*b* of the channel 24. At its upper portion, the member 58 rides in an opening provided in the upper flange 24*a* of the channel bar 24. This opening may be seen in the view of Figure 2. Similarly, the shaft 60 is supported at its lower end by openings in the triangular plate 32 and the lower flange 24*b* of the channel 24 and at its upper portion by an opening provided in the upper flange 24*a* of the channel beam 24.

The triangular support plates 30, 32, 34 and 36 are made of identical construction to facilitate mass production. Two openings, such as 32*a* and 32*b*, are provided in each of these brackets so that each may be placed in any corner and with either side up and will then have an opening to receive the member 58 or 60 as necessary.

The members 58 and 60 of the legs 42 and 44 are interconnected by the cranks 64 and 66. These cranks have arms disposed at right angles to each other, the arm 64*a* of crank 64 and the arm 66*a* of crank 66 bearing on the tops of members 58 and 60 respectively. The other arms 64*b* and 66*b* of the cranks 64 and 66 extend downwardly and are attached to opposite ends of non-extensible rod 68. Crank 64 is supported from the web portion of beam 24 by an upwardly ex-

tending plate 70 which is attached to the web portion of beam 24 by spot welding or similar means and supports the pin 72 at its upper portion. The crank 64 is pivotally supported by this pin and held thereagainst by cotter pin 74. The support bracket 70 is bent inwardly to align the crank arm 64 with the axis of the shaft 58 as will be evident from the view of Figure 6. The shaft 58 is terminated in a flat portion 58*b* at its upper end to receive the arm of crank 64 for positive engagement therewith.

The crank 66 is mounted for pivotal movement about the pin 76 and held thereagainst by the cotter pin 78. The pin 76 is mounted in the support bracket 80 which is attached by spot welding or other suitable means to the web portion of the beam 24.

The rod 68 extends between the downwardly extending arms 64*b* and 66*b* of the cranks 64 and 66. At each of its opposite ends, the rod 68 is bent at right angles to extend in a direction away from the observer in the views of Figures 3 and 4 and towards these cranks. This construction is seen best in the view of Figure 6 in which the bent in end portion of the rod 68 is indicated at 68*a*. The cranks 64 and 66 are each provided with an opening to receive these bent ends of the rod 68 for pivotal movement relative thereto. The ends of the rod 68 are inserted in these openings and held therein by cotter pins 82.

The shaft or leg members 58 and 60 are held in position when the housing H is lifted by the cotter pins 84 which are positioned in suitable openings in these members and are located between the upper and lower portions of the beam 24.

In the view of Figure 4, the cranks 64 and 66 are shown in the position corresponding to a level support surface 56. As will be evident from this view, the two shafts 58 and 60 extend in equal distance above the top flange 24*a* of the beam 24 and bear against the cranks 64 and 66 to cause them to assume like positions relative to the pins 72 and 76. Since the crank 64 tends to rotate in a clockwise direction by reason of the upward forces exerted by the member 58 and the crank 66 tends to rotate in a counterclockwise direction by reason of the upward forces exerted by member 50, the rod 68 is tensioned and holds both of the members in position.

In the view of Figure 3, however, the mechanism is shown for the condition wherein the support surface 56*a* is not level. In this case, the forward legs 38 and 40 are individually adjusted to align the axis of the housing H in a vertical direction as seen in the view of Figure 1. The members 58 and 60 thereupon assume positions corresponding with this alignment. Thus, the member 58 is shifted upwardly relative to the housing H and swings the crank 64 in the clockwise direction. This pulls the arm 68 and shifts the crank 66 in the same direction, thereby forcing the shaft 60 downwardly until the supporting effort by member 58 is equal to that of member 60.

It will be observed that the point of application of force from the member 58 against the upper arm 64*a* of the crank 64 is the same distance from a pin 72 as is the point of application of force from the member 60 on the portion 66*a* of the crank 66 is from the pin 76. Moreover, since the distance between the pins 72 and 76 and the axis of rod 68 is the same, it will be evident that equilibrium is established in the system shown in Figure 3 only when the actual load on

the member 58 is equal to the load on the member 60. Accordingly, the legs 58 and 60 are in equilibrium only if they bear equal loads and shift in accordance with the previous adjustment of the legs 38 and 40 until the four legs provided for the housing H share the total load thereon.

It will further be evident that the nonextensible rod 68 is under tension at all times since the forces exerted by the member 58 tend to rotate the crank 64 in the clockwise direction and the forces of member 60 tend to rotate the crank 66 in the counterclockwise direction. It is accordingly unnecessary to construct the rod 68 of any greater diameter than is necessary to sustain the tension exerted thereon. Moreover, a cord, a wire, or other element may be used in place of the rod 68.

It will be apparent to those skilled in the art that in the foregoing form of my invention, I provide mechanism suitable for use with an automatic laundering machine and which is operable to assume an equilibrium position wherein the force exerted by the legs on the supporting surface is the same.

While I have shown particular embodiments of my invention, it will, of course, be understood that I do not wish to be limited thereto since many modifications both in the elements employed and the structures disclosed may be made without departing from the spirit and scope of my invention. I, of course, contemplate by the appended claims to cover any such modification which falls within the true spirit and scope of my invention.

The term bearing is intended in the appended claims to indicate broadly a device to sustain a leg or other element for movements in a predetermined direction while opposing tilting or shifting movements in other directions.

What I claim is new and desire to secure by Letters Patent in the United States is:

1. In a self-leveling support of the type particularly adapted to support a rotating object in a level condition, a base, a plurality of legs supporting said base in vertically spaced relation with respect to the ground, means for mounting at least two of said legs on said base for free vertical slidable movement with respect thereto, means transmitting the vertical movement of one of said movable legs to the other of said movable legs in an opposite direction from the direction of movement of said one leg including two rocking members pivotally mounted on said base intermediate their ends for movement about parallel spaced horizontal axes, each of said rocking members having one arm having supporting connection with one of said legs and having another arm extending at angle with respect to said first arm, and a transversely movable tension link connecting the other arms of said rocking members together and oppositely moving one of said rocking members upon movement of the other solely by the tension on said link.

2. In a self-leveling support of the type particularly adapted to support a rotating object in a level condition, a base, a plurality of legs supporting said base in spaced relation with respect to the ground, means for mounting the legs on one side of said base for vertical slidable movement with respect thereto, and means restraining vertical slidable movement of said legs and moving one of said legs in an opposite direction from the direction of movement of the other upon vertical movement of said one leg including two bell crank members, means pivotally mounting

said bell crank members on said base for pivotal movement about parallel axes disposed intermediate their ends, each of said bell crank members having one arm engaging the top of one of said legs and restraining vertical movement thereof, and having another arm depending therefrom, and a tension link connecting the depending arms of said bell crank members together and moving one of said bell crank members oppositely to the other, to depress its associated leg or to allow it to move vertically upon vertical movement of the other of said legs solely by the tension imparted thereto by the other of said bell crank members.

HAROLD E. MORRISON.

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