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French, Jr. et al.

[11] **3,858,736**

[45] **Jan. 7, 1975**

[54] **PORTABLE HOIST**

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[73] Assignee: **Bell Telephone Laboratories, Incorporated**, Murray Hill, N.J.

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[21] Appl. No.: **440,150**

[52] **U.S. Cl.** ..... **214/671**, 212/59 R, 212/145, 214/1 D, 214/730

[51] **Int. Cl.** **B66f 9/18**

[58] **Field of Search** ..... 212/145, 59 R; 214/1 D, 214/1 R, 16.4 A, 671, 95 R, 730, 670, 75 R, 75 H; 254/2 R, 148

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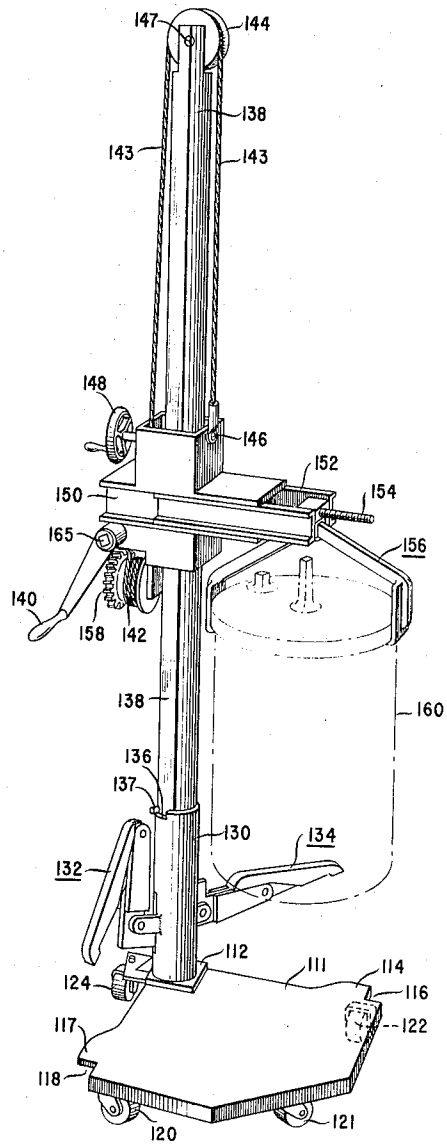
Attorney, Agent, or Firm—J. S. Cubert

[57] **ABSTRACT**

A portable hoist useful in transporting heavy objects has a movable base onto which a rotatable pole is vertically mounted. A vertical and horizontal translating mechanism attaches the transported object to the pole. The base includes an extension portion at one corner adapted to rest on an adjacent weight bearing surface and an extendible stabilizing member at a second corner. When the stabilizing member is extended to rigidly rest on the adjacent weight bearing surface, the transported object may be offset from the base over the weight bearing surface and stably supported between the base extension portion and the extended stabilizing member. Advantageously, the hoist provides stable support in limited space without the need for a counterbalance or floor level extension rails to support the offset object.

15 Claims, 5 Drawing Figures



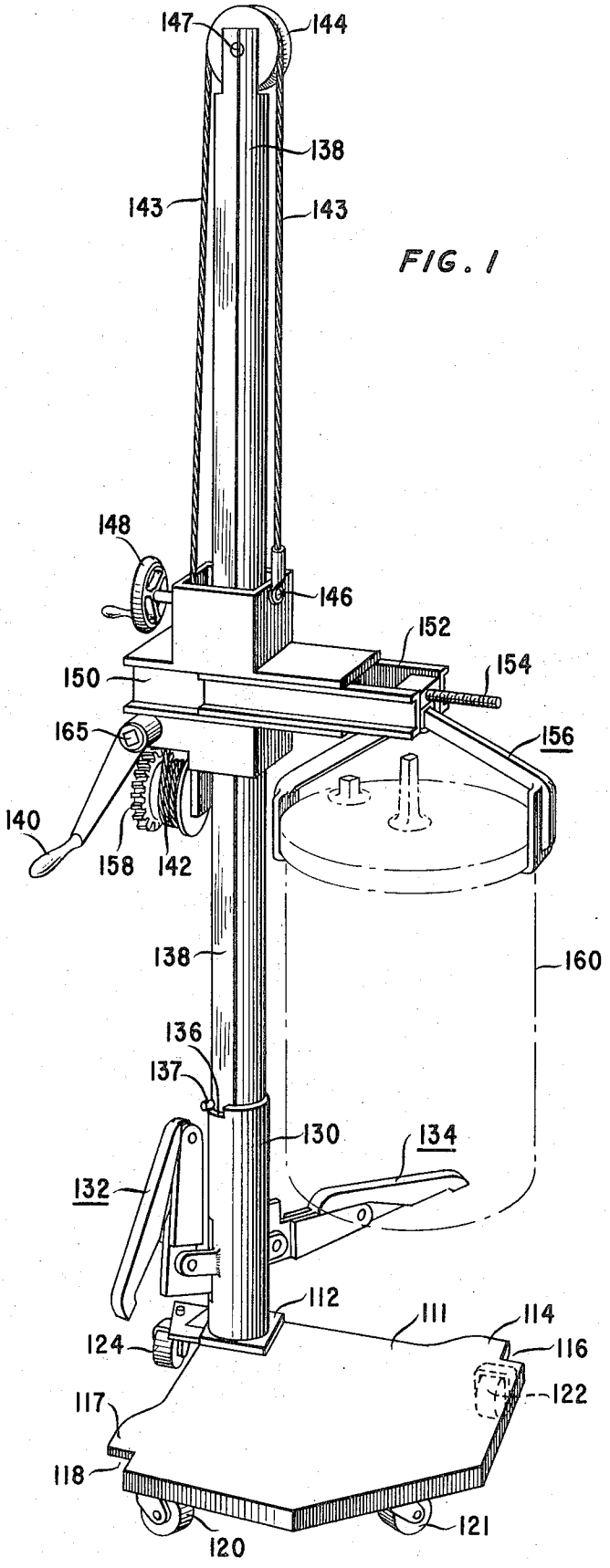

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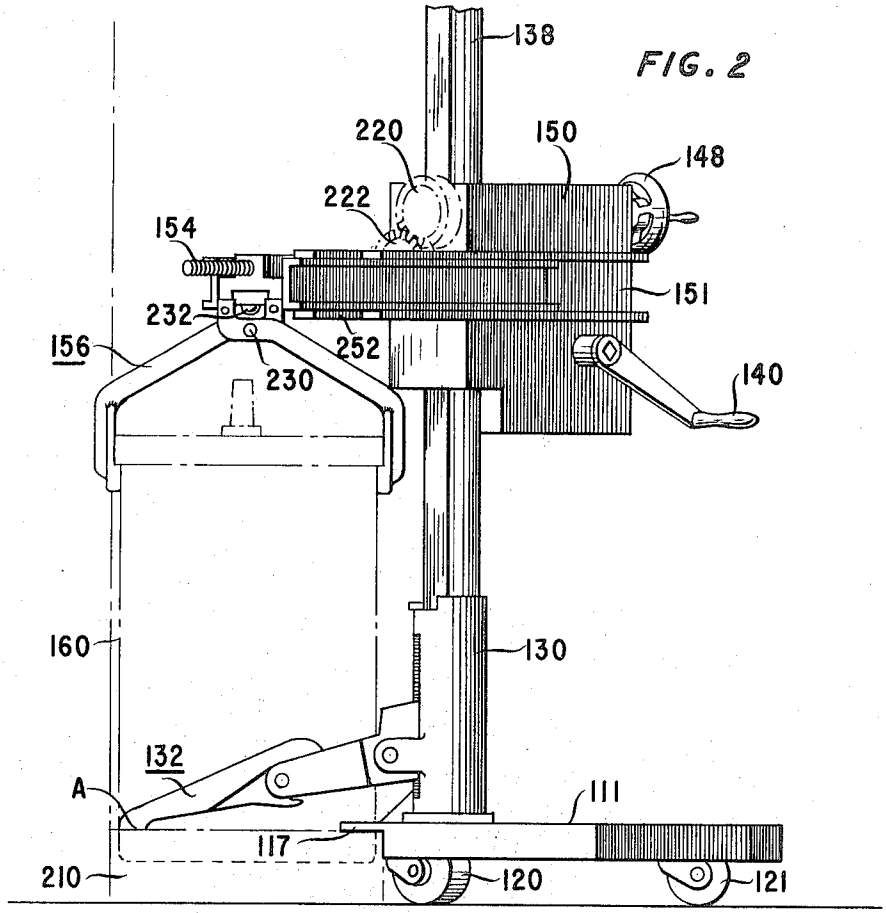
FIG. 1

FIG. 2


138
220
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222
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A
111
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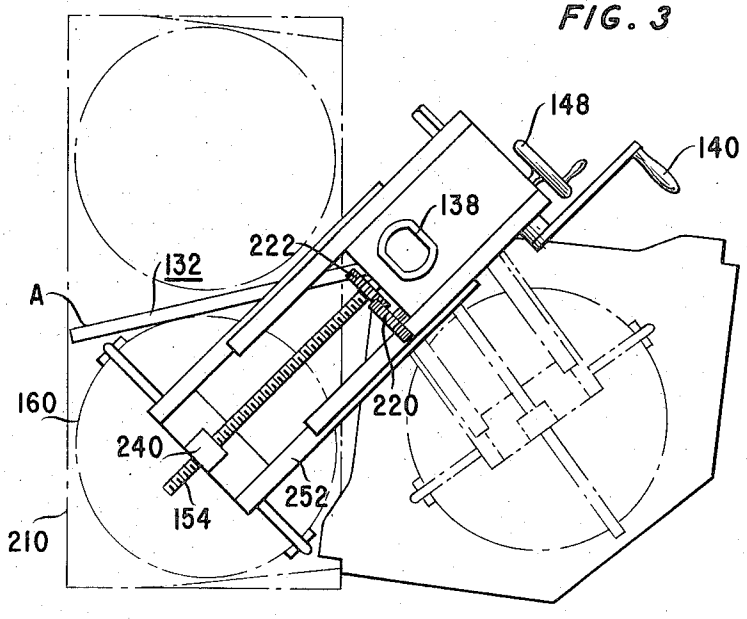
210
120
121

FIG. 3


148
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252
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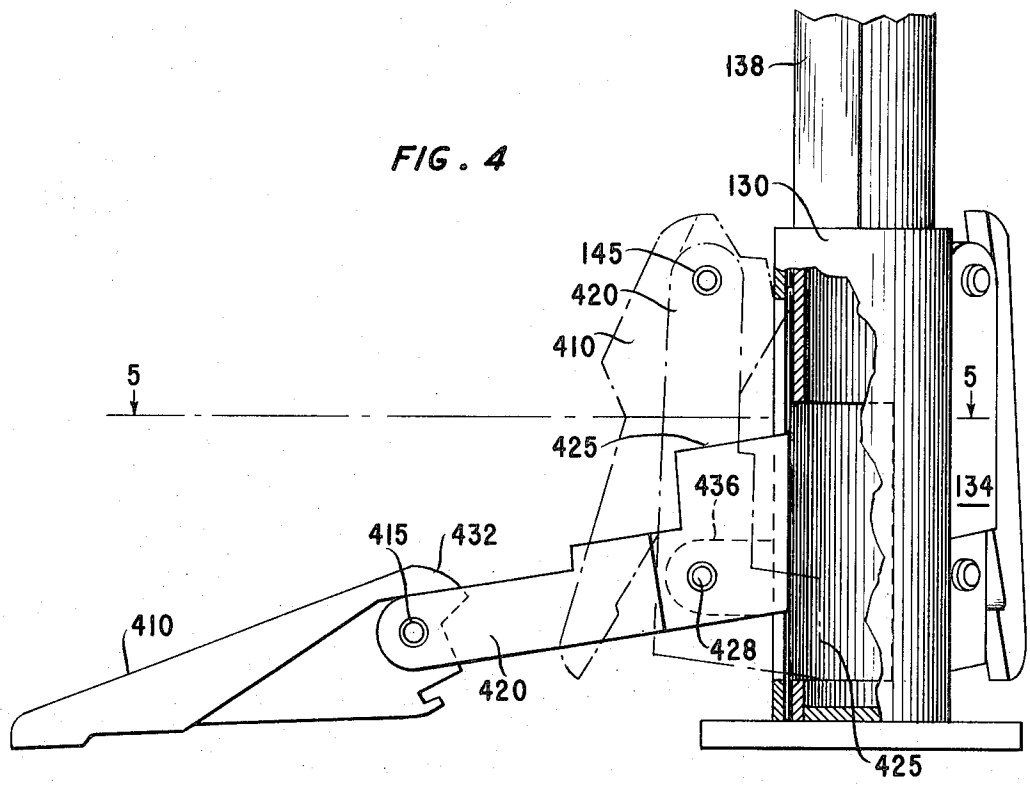
210

FIG. 4


138
130
145
420
410
5
5
425
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134
415
432
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428
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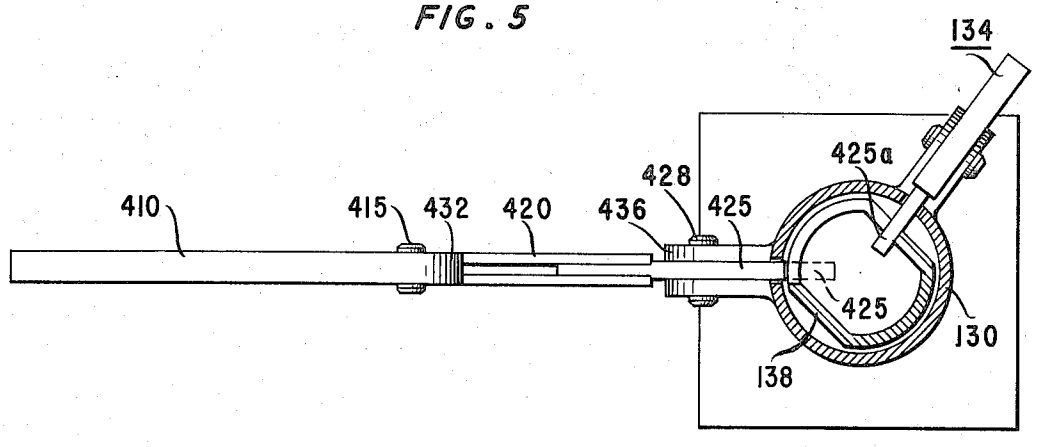
425

FIG. 5


134
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415
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130
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PORTABLE HOIST

Our invention relates to material handling apparatus, more particularly to hoist equipment for transporting objects between different locations, and more particularly to hoisting apparatus for transporting and placing heavy objects in space-limited locations.

The moving and placing of heavy objects in manufacturing, warehouse, or other facility is generally done by means of hoisting apparatus. Where floor space is limited, the hoisting apparatus must be small in size and adapted to rotate and translate the transported object whereby the transported object can be positioned and placed with relative ease. The placement of the transported object from a limited width aisle generally requires that the object be held in an offset position with respect to the base of the hoisting apparatus. Unless adequate provisions are made, the weight of the object in the offset position can cause the hoist apparatus to overturn. Where access space is available underneath the final resting position of the object, it is known to add a plurality of extension rails to the hoist base to stabilize the hoist and the transported object when offset from the hoist base. In many applications, however, there is no space underneath the resting location of the object for extension rails. Alternatively, a counterbalance weight may be built into the hoist for stabilization of the hoist and the offset transported object. The counterbalance weight must be sufficient to stabilize the hoist at all elevations of the transported object. But such a weight increases the size and weight of the hoist and adversely affects its portability. It is, therefore, advantageous to design a portable hoist adapted to fit into a limited aisle without the need for a counterbalance or extension rails projecting beyond the hoist base.

In one application, hoists are used in telephone central offices to transport and place reserve energy batteries in rack arrangements. Recently, a lead acid cylindrical battery has been put into use in such central offices. This battery has a jar-shaped plastic case, weighs between forty and three hundred fifty pounds and can be lifted by its cover. The cylindrical battery is more fully described in the *Bell Laboratories Record*, Vol. 50, No. 7, pages 206–211, Aug. 6, 1972. Hoists adapted to transport batteries have generally used extension rails on the base thereof which fit into a space underneath the battery rack. The rails support the hoist when the battery is offset from the hoist base while being moved between the hoist and the battery rack. In order to improve the stability of the batteries in the rack assembly in earthquake or similar environments, it is desirable to place the batteries and the rack in the lowest possible position. In this way, a lower center of gravity is obtained but placement of extension rails becomes difficult. Counterbalance arrangements on the hoist to provide offset stability requires enlargement of the aisle space between racks and impairs the portability of the hoist. An alternative hoist arrangement is desired which provides the needed offset stability in the limited aisle space found in central office battery rack environments.

BRIEF SUMMARY OF THE INVENTION

Our invention is a hoist having a movable base including an extension portion thereof adapted to rest on a weight bearing surface offset from said base. A rotatable pole is vertically mounted on said base. A horizontal member is connected between the pole and an object holding means. The horizontal member includes apparatus for translating said holding means horizontally and the connecting arrangement between the horizontal member and the pole includes vertical translating means. An extendible stabilizing member is attached to the base and is extended beyond the base in a predetermined direction to fixedly rest on the weight bearing surface. The object in the holding means is stably supported by the base extension and the extended stabilizing member while the object is being moved between the base and the weight bearing surface.

According to one aspect of the invention, the movable base includes first and second extension portions positioned at diagonally opposite corners of the base and first and second extendible stabilizing members positioned on opposite portions of a pole housing at a third corner of the base. With one base extension portion and an extended stabilizing member resting on the juxtaposed weight bearing surface, the transported object may be offset from the base in a predetermined one of two directions.

According to another aspect of the invention, each extendible stabilizing member can be retracted into a folded position adjacent to the pole housing. A portion of the folded extendible member protrudes through an aperture of the pole housing into a cutout section in the rotatable pole shaped and dimensioned so that rotation of the pole in the direction of the folded stabilizing member is prevented. When both extendible stabilizing members are retracted, rotation of the pole is blocked and the transported object is held in a fixed stable position over the hoist base.

According to yet another aspect of the invention, each base extension portion is located at a base corner, at which corner a notch is formed to position the hoist with respect to the weight bearing surface so that the transported object may be placed in a predetermined location on the adjacent weight bearing surface. The extension of the stabilizing member onto the weight bearing surface releases the pole to rotate in the direction of the extended stabilizing member. The transported object may then be offset from the hoist base between the base extension and the extended stabilizing member over the predetermined location by pole rotation in the direction of the extended stabilizing member.

In an embodiment illustrative of the invention, a portable battery hoist comprises a movable truncated rectangular base and a rotatable pole housed in one corner of the base. The base includes a pair of extension portions located at opposite corners of the base equidistant from the pole housing. Each extension portion is adapted to rest on an adjacent battery rack shelf at predetermined locations. The transported battery is held by a pair of tongs attached by means of a ball joint to a horizontally translatable member. The horizontal member is movably connected to the pole by a vertical translating mechanism. A pair of extendible stabilizing arms are mounted on the pole housing. Each stabilizing arm may be extended outwardly from the pole housing in a predetermined direction to rest on the battery rack shelf. When the transported battery is offset from the hoist base, the battery is stably supported between the base extension portion and the extended stabilizing arm. Both the extension portion and the extended stabilizing arm rest on the battery rack shelf whereby the

weight of the transported battery is transmitted to the battery rack shelf.

With both stabilizing arms retracted into folded positions at the pole housing, stabilizing arm protrusions extend into cutouts on the pole and the pole is locked into position whereby the transported battery is stably held over the hoist base. The extension of one stabilizing arm to rest on the battery rack shelf permits rotation of the pole in the direction of the extended stabilizing arm. The transported battery may then be offset over the battery rack between the extension portion of the base and the extended stabilizing arm, both of which rest on the battery rack shelf. Rotation toward the folded stabilizing arm is blocked by the protrusion of the folded stabilizing arm into the cutout in the rotatable pole.

DESCRIPTION OF THE DRAWING

FIG. 1 depicts a perspective view of the hoist apparatus illustrative of the invention and shows a cylindrical battery held in an offset position on said hoisting apparatus;

FIG. 2 depicts the lower portion of the hoisting apparatus wherein a transported cylindrical battery is shown in a lowered position on an adjacent rack;

FIG. 3 shows a top plan view of a hoisting apparatus depicted in FIG. 2;

FIG. 4 shows an enlarged diagrammatic view of the stabilizing arms in both extended and retracted positions with respect to the rotatable pole of the hoisting apparatus; and

FIG. 5 shows a top sectional view of FIG. 4 wherein the pole cutout section is illustrated.

DETAILED DESCRIPTION

Referring to FIG. 1, the hoist illustrated therein comprises movable base **111**, rotatable pole **138**, and hoisting assembly **150**. Bearing housing **130** is fixedly attached to base **111** at base corner **112**. Pole **138** is rotatably mounted in bearing housing **130**, and extendible stabilizing arms **132** and **134** are mounted on housing **130**. Arm **132** is shown retracted into a folded position adjacent to housing **130**, and arm **134** is shown extended into a rigid position in a predetermined direction from housing **130**. Swivel casters **120**, **121**, and **122** are mounted underneath base **111**, and swivel caster **124** is mounted under an extension of base **111** adjacent to housing **130** at base corner **112**. An extension portion **117** of base **111** is located near corner **118** and another extension portion **114** of base **111** is located near corner **116**. Assembly **150** comprises horizontal slidable member **152** which is moved inwardly toward or outwardly away from pole **138** under control of rotation of wheel **148**. Vertical movement of the transported object is facilitated by rotation of arm **140** through a worm gear (not shown) and winch assembly **142**. Cable **143** is attached to winch assembly **142** and is further attached to assembly **150** by bolt **146**. Tongs **156** hold the transported object, cylindrical battery **160**, and are connected to slidable member **152** via a ball joint (not shown). The hoist of FIG. 1 may be moved about in any direction on swivel casters **120**, **121**, **122**, and **124** mounted under the base **111**. Base **111** has a truncated rectangular shape with the corner opposite bearing housing **130** removed so that the hoist including base **111** may be rotated in a limiting aisle space. The transported object may be offset from base **111** between base extension **117** and member **132** when extended over a juxtaposed battery rack shelf or offset between base extension **114** and extended member **134** adjacent to the same battery rack shelf in the opposite direction. The notch formed at corner **118** by extension **117** permits the base to be positioned at predetermined locations on the adjacent battery rack. Similarly, the notch at corner **116** permits base **111** to be accurately positioned to an adjacent battery rack in the opposite direction. In either direction, the mounting for swivel **124** positions bearing housing **130** against the adjacent battery rack.

Pole **138** is coated with a lubricant such as molybdenum disulfide and rotates in bearing housing **130** so that transported battery may be rotated to a position offset from base **111**. Stud protrusion **137** on pole **138** rotates with the pole and butts against stop cut **136** on base housing **130** to limit the pole rotation. The stud and stop cut arrangement prevents overtravel of the battery beyond the stable position between base extension **114** and extended member **134**. An additional stop cut on bearing housing **130** (not shown) provides a limiting position for the rotation of the pole when battery **160** is offset between base extension **117** and extended member **132**.

Rotatable pole **138** may comprise a plurality of connectable sections. Sections can be added to accommodate placement of the battery at varying heights. The battery may then be placed in one of several tiered shelves in the battery rack. Pole **138** can be removed from base housing **130** and disassembled. In like manner, hoisting assembly **150** can be separated from pole **138**. In this way, the disassembled hoist can readily be transported from floor to floor or from building to building. Pole **138** is flatted on two sides to key housing assembly **150** to the pole.

The vertical positioning of battery **160** is accomplished by turning crane handle **140**. Handle **140** is connected to a worm gear (not shown) attached to shaft **165**. The worm gear is engaged with gear **158**, and gear **158** is fixedly attached to winch **142**. Cable **143** may then be wound or unwound on winch **142** responsive to the turning of crane handle **140**. Cable **143** is routed around sheave **144** which is attached to the clevis at the top of pole **138** via shaft **147**. One end of cable **143** is attched to assembly **150** by means of bolt **146**. The other end of cable **143** is attached to winch **142**. Thus, the winding of cable **143** on winch **142** raises assembly **150** and the unwinding of cable **143** from winch **142** lowers assembly **150**. Advantageously, the frictional forces between gear **158** and the worm gear connected to handle **140** prevent turning of winch **142** after handle **140** is left at any position. It is to be understood that other arrangements well known in the art, such as a rack and pinion arrangement, may be used to provide vertical translation.

FIG. 2 shows the hoist placed adjacent to battery rack shelf **210**. In FIG. 2, extension **117** of base **111** is shown resting on the battery rack shelf, and member **132** is shown in its extended position also resting on battery rack shelf **210**. Shelf **210** includes a circular cavity into which battery **160** is lowered. The cavity increases the stability of the battery in the rack.

FIG. 3 shows a top plan view of the hoist of FIG. 2. In this view, extension **117** rests on battery rack **210** adjacent to the hoist and extended stabilizing member **132** rests on shelf **210** at a point A distant from the

hoist. Cylindrical battery **160** is shown offset from hoist base **111** and positioned at a predetermined location in the battery rack shelf by means of the notch at corner **118** of base **111.** The notch at corner **118** fits into a corresponding part of the battery rack shelf at a fixed location on the battery rack shelf with respect to the shelf cavity.

As shown in FIGS. **2** and **3,** the horizontal translation of battery **160** is accomplished by turning wheel **148.** Wheel **148** is connected to gear **220** via a shaft (not shown). Gear **220** engages gear **222,** which, in turn, is attached to threaded rod **154.** Rod **154** passes through collar **240** which includes an internal threaded support so that the rotation of wheel **148** causes slidable section **252** to move with respect to fixed section **251** responsive to the turning of wheel **148.** In this manner, slidable section **252** may be moved to horizontally position the transported battery with respect to pole **138.** Slidable section **252** bears on fixed section **251** by means of ball bearings. In this way, horizontal translation is accomplished. In FIG. **3,** battery **260** is shown after being moved into position in a cavity of the battery rack shelf from a position centered over the battery hoist. The placement of the battery is accomplished by rotation of pole **138** and the turning of handle **140** and wheel **148** in accordance with the foregoing discussion.

FIG. **4** shows extended stabilizing member **132,** folded stabilizing member **134,** bearing housing **130,** and the lower portion of pole **138** mounted in housing **130.** The stabilizing member **132** comprises stabilzing arm **410** and pivot arm **420.** Pivot arm **420** is connected to stabilizing arm **410** by means of pivot pin **415,** and pivot arm **420** is further connected to extension **436** of housing **130** via pivot pin **428.** In its extended position, the flanged portion of arm **410** rests on pivot arm **420** and the stabilizing member is thereby made rigid in its extended position. In this manner, a portion of the weight of the offset battery is transmitted to the battery rack floor through the stabilizing member via surface **434** of stabilizing arm **410.**

When stabilizing member **132** is in its extended position, section **425** of pivot arm **420** is entirely removed from rotatable pole **138** and housing **130** and pole **138** is free to rotate. When stabilizing member **132** is in its folded position as shown by the dotted lines, section **425** is inserted into the cutout section of pole **138** through an aperture of bearing housing **130.** The cutout section of pole **138** is shaped so that movement of the transported battery in the direction of the folded stabilizing member is prevented by projecting section **425** of stabilizing arm **410.** While being transported, battery **60** is held by tongs **156** on or over base **111.** Both stabilizing members **132** and **134** are retracted to a folded position adjacent to the base. Section **425** of pivot arm **420** is inserted into the cutout section of pole **138,** and section **425***a* of stabilizing member **134** is inserted into the same cutout section of the pole. In this manner, rotatable pole **138** is locked into a fixed position whereby the transported battery is held in a fixed position over base **111.**

FIG. **5** shows a top sectional view of the pole in the pole housing. In FIG. **5,** section **425***a* is shown protruding through an aperture in pole housing **130** and the cutout section of pole **138.** Extended member **132** is removed from the pole cutout section whereby the pole may be rotated toward extended stabilizing member **132.** With notch stabilizing arms retracted, the protrusions of sections **425** and **425***a* into the cutout section of pole **138** roll the pole so that the battery held thereby is positioned over the base.

To place the transported battery into position on the battery rack shelf from the hoist, the hoist is first juxtaposed to the rack. Assume, for purposes of description, the battery rack is in a clockwise direction with respect to the hoist base as indicated in FIG. **2** and extension portion **117** and stabilizing member **132** are used. The hoist is positioned so that base extension portion **117** rests on the battery rack shelf at a prescribed location and the mounting for swivel **124** is placed against the battery rack shelf. Stabilizing member **132** is extended to rest on the battery shelf at point A in FIGS. **2** and **3.** The extension of stabilizing member **132** releases pole **138** so that it may be rotated clockwise toward stabilizing member **132.** The battery is raised to a height needed to clear the battery shelf by turning handle **140.** Handle **140** is connected as indicated in FIG. **3** so that the handle may be turned from the side of the hoist facing away from the battery rack. Responsive to the turning of the handle **140,** cable **143** is wound on winch **142** and the shortening of cable **143** raises assembly **150.** Pole **138** and member **150** are then rotated in the clockwise direction in bearing house **130** and the battery is in bearing house **130** and the battery is horizontally translated over the cavity in the rack shelf by means of wheel **148** which drives slidable section **252** via threaded rod **154.** The battery and tongs **156** are then rotated about the battery axis by means of a ball joint so that the battery terminals are correctly aligned with respect to the rack. Assembly **150** is then lowered by unwinding cable **143** from winch **142** and the battery is placed in the battery shelf cavity. Tongs **156** are then moved apart to release the battery from the hoist.

The movement of the battery from the rack to the hoist is accomplished in a similar manner. After the hoist has been positioned at the battery location and stabilizing member **132** is extended to rest on the battery rack shelf, tongs **156** are adjusted to hold the battery. Hoisting mechanism **150** is then raised by the turning of handle **140.** Mechanism **150** and pole **138** are rotated in a counterclockwise direction to a position over the hoist base while the battery is horizontally translated to be centered over the hoist base. Stabilizing member **132** is then retracted into a folded position against bearing housing **130,** whereby the battery is locked into position over the hoist base. In similar fashion, the hoist may be placed adjacent to battery rack shelf in a counterclockwise direction with respect to the hoist base. In this direction, extension portion **116** and extendible stabilizing member **134** are used to provide a stable support when the battery is rotated counterclockwise over the offset battery shelf.

What is claimed is:

1. Apparatus for transporting an object between different locations comprising a movable base having an extension portion thereof adapted to rest on an adjacent weight bearing surface; a vertical pole rotatably supported on said base; means attached to said pole for holding said object adapted to horizontally and vertically translate said object with respect to said pole; and an extendible member attached to said base adapted to extend in a predetermined direction from said pole to fixedly rest on said adjacent weight bearing surface, said object being stably supported between said base extension portion and said extended member while

being moved between said base and said adjacent weight bearing surface.

2. A hoist comprising a movable base including an extension portion adapted to rest on a weight bearing surface offset from said base; a pole; means for rotatably mounting said pole on said base; means for holding an object; means for horizontally translating said holding means with respect to said pole; means connecting said horizontal translating means to said pole for vertically translating said object with respect to said pole; an extendible stabilizing member attached to said pole mounting means normally assuming a folded position over said base and adapted to extend in a predetermined direction from said base to rest on said offset weight bearing surface, said object being stably supported between said base extension portion and said extended stabilizing member while said object is being moved between said base and said weight bearing surface.

3. A hoist according to claim 2 wherein said pole mounting means comprises a bearing housing fixedly attached to said base into which said pole is inserted, said bearing housing including an aperture through which a portion of said retracted stabilizing member protrudes, the portion of said pole inserted into said housing including a section having a cutout through which said portion of said bolded stabilizing member protrudes, said cutout section beind shaped and dimensioned to block rotation of said pole when said stabilizing member is retracted.

4. A hoist according to claim 3 wherein said movable base comprises a truncated rectangular shaped member having said bearing housing located at a first corner and said extension portion located at a second corner; a plurality of swivel casters fixedly attached to the lower surface of said base for moving said base in any direction, the side of said base between said first and second corners being juxtaposed to said offset weight bearing surface while said object is being moved between said base and said offset weight bearing surface.

5. A hoist comprising a movable base having at least three corners, including a first extension portion located at said first corner; a second extension portion located at said second corner, each of said first and second extension portions being adapted to rest on a weight bearing surface adjacent to said base; a vertically positioned pole; means for rotatably mounting said pole on said base at said third corner; object holding means; horizontal translating means connecting said object holding means to said horizontal translating means; vertical translating means connecting said horizontal translating means to said pole; a first stabilizing member attached to said pole mounting means at said third corner normally folded against said pole mounting means and adapted to extend outwardly in a first direction from said base to rest on said adjacent weight bearing surface whereby said object is stably supportable between the first base extension portion and the extended first stabilizing member; and a second stabilizing member attached to said pole mounting means at said third corner normally folded against said pole mounting means and adapted to extend outwardly in a second direction from said base to rest on said adjacent weight bearing surface whereby said object is stably supportable between said second base extension portion and said extended second stabilizing member.

6. A hoist according to claim 5 wherein said pole mounting means comprises a bearing housing into which a portion of said pole is inserted, said bearing housing having a first aperture through which a portion of said folded first stabilizing member protrudes and a second aperture through which a portion of said second stabilizing member protrudes, the portion of said pole inserted into said housing having a cutout section through which the portion of said folded first and second stabilizing members protrude, said cutout section being shaped and dimensioned to block rotation of said pole in the direction of the folded stabilizing member.

7. A hoist according to claim 6 wherein said movable base comprises a truncated rectangular member, the side defined by said first and third corners of said base being juxtaposed to said weight bearing surface when said object is being moved between said first extension portion and said extended first stabilizing member, the side defined by said second and third corners being juxtaposed to said weight bearing surface when said object is being moved between said second extension portion and said second stabilizing member.

8. A hoist according to claim 7 wherein said object holding means comprises a pair of tongs, said means for connecting said horizontal translating means to said object holding means comprises a ball joint fixedly attached to said horizontal translating means and adapted to permit rotation of said tong pair.

9. A portable battery hoist comprising a movable base, said base including an extension portion adapted to rest on a battery rack shelf offset from said base; a bearing housing fixedly mounted on said base; a rotatable pole vertically insertable into said base housing; a horizontally translatable member; tong-holding means connected to said horizontal translating member for holding said battery; means for raising and lowering said horizontal member with respect to said pole; and a stabilizing member fixedly attached to said bearing housing and adapted to assume a retracted position against said bearing housing and to assume an extended position fixedly resting on said battery rack shelf, said held battery being stably supported between said base extension portion and said stabilizing member in its extended position while said held battery is offset from said base.

10. A portable battery hoist comprising a movable truncated rectangular base having a first extension portion at a first corner thereof and a second extension portion at a second corner thereof diagonally opposite said first corner, each extension portion being adapted to rest on a juxtaposed battery shelf; a bearing housing fixedly attached to said base at a third corner thereof; a rotatable pole vertically inserted into said housing; a pair of battery holding tongs; a horizontal translating member connected to said tong pair; a vertical translating member connecting said horizontal translating member to said pole; a first extendible stabilizing member attached to said housing normally folded against said housing and outwardly extendible from said housing in a first direction to rest on a juxtaposed battery shelf whereby said held battery is stably supported over said juxtaposed shelf between said first extension portion and said extended first stabilizing member; and a second extendible stabilizing member attached to said housing normally folded against said housing and outwardly extendible from said housing in a second direction to rest on a juxtaposed battery shelf whereby said

held battery is stably supported over said juxtaposed battery shelf between said second extension portion and said second extended stabilizing member.

11. A portable battery hoist according to claim **10** wherein said housing comprises a first aperture for receiving a portion of said folded first stabilizing member and a second aperture for receiving a portion of said folded second stabilizing member, and said pole comprises a cutout section inserted in said housing into which cutout section said folded first and second stabilizing members protrude, said cutout section being shaped and dimensioned to block rotation of said pole in the direction of the folded stabilizing member.

12. A portable battery hoist according to claim **11** wherein said tong pair is connected to said horizontal translating member by a ball joint fixedly attached to said horizontal translating member, said tong pair being rotatably attached to said ball joint whereby said battery may be rotated about its center.

13. A portable battery hoist according to claim **12** wherein said horizontal translating member comprises a fixed section; a slidable section bearing on said fixed section; and means for moving said slidable section inwardly toward and outwardly away from said pole.

14. A portable battery hoist according to claim **13** wherein said vertical translating member comprises a worm gear; a circular gear engaging said worm gear; a winch fixedly attached to said circular gear; a cable attached to said winch and to said horizontal member fixed section, said cable running along said pole around a sheave rotatably mounted on the uppermost extremity of said pole; means for turning said worm gear whereby the winding of the cable on the winch raises said horizontal translating member and the unwinding of said cable from said winch lowers said horizontal translating member.

15. A portable battery hoist according to claim **13** wherein said vertical translating member comprises a pinion rotatably attached to said horizontal translating member fixed section; a rack fixedly attached along the length of said pole engaging said pinion; and means for turning said pinion whereby said horizontal translating member is raised and lowered.

* * * * *