Sept. 27, 1949. C. J. SMITH 2,483,109

LIFTING DEVICE OR ELEVATOR

Filed Aug. 30, 1946. 3 Sheets-Sheet 1

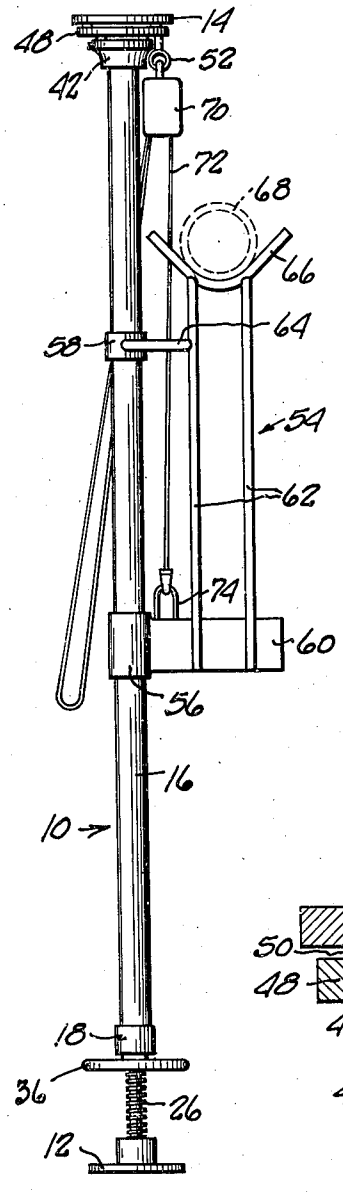


FIG. 1

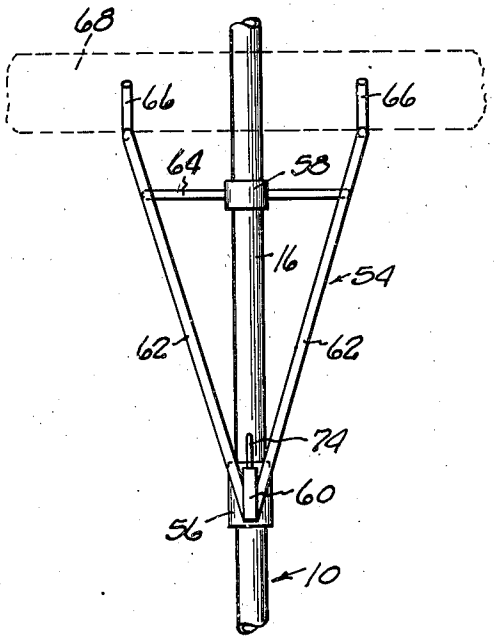


FIG. 2

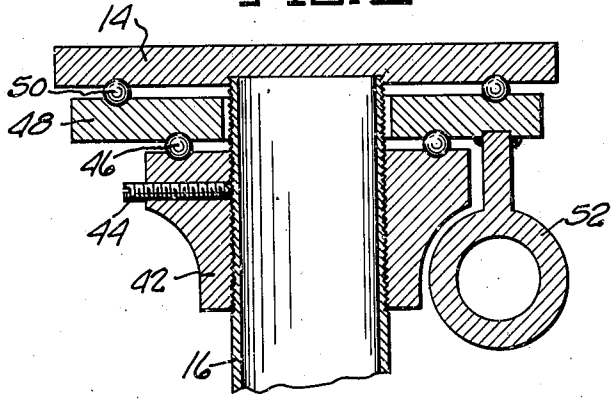


FIG. 3

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Sept. 27, 1949. C. J. SMITH 2,483,109

LIFTING DEVICE OR ELEVATOR

Filed Aug. 30, 1946 3 Sheets-Sheet 2

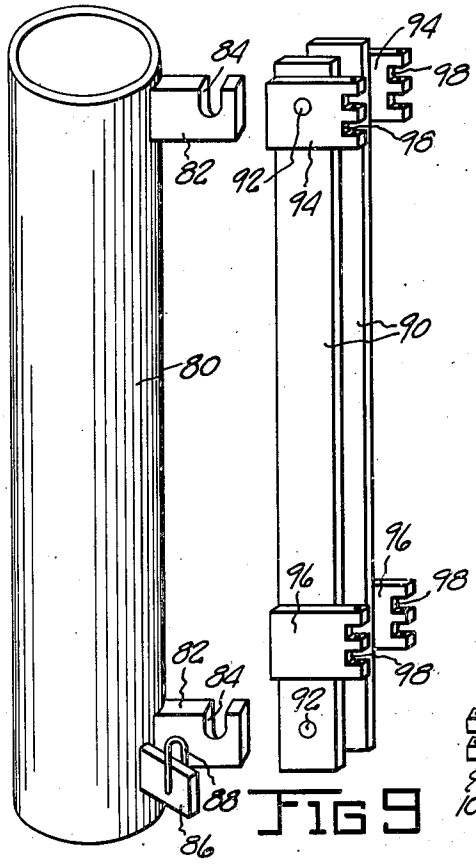


FIG. 9

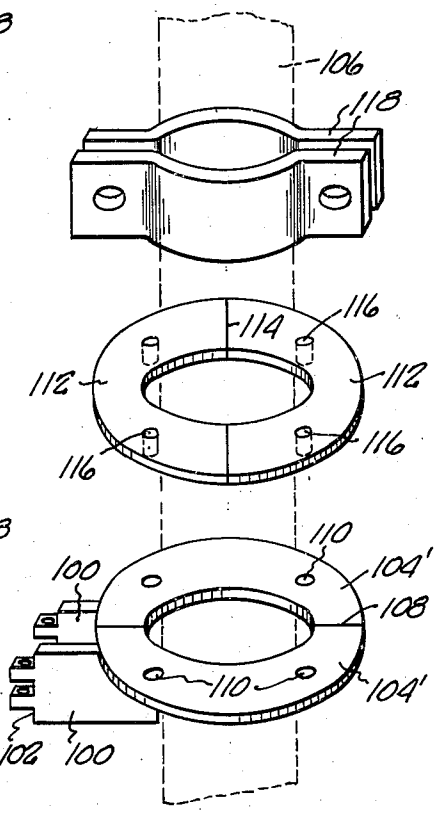


FIG. 10

FIG. 8

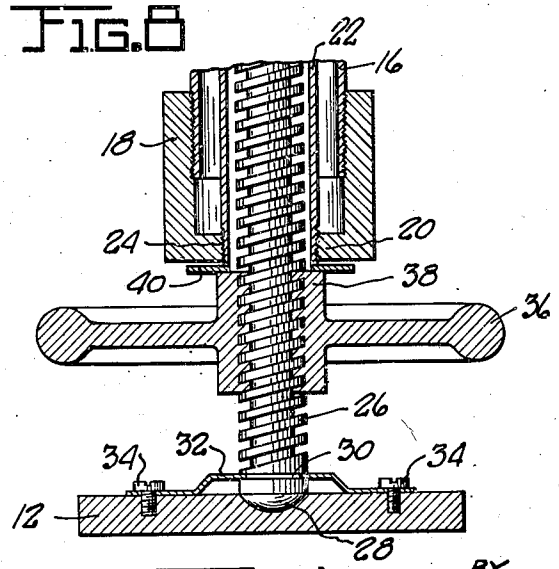


FIG. 4

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Sept. 27, 1949. C. J. SMITH 2,483,109

LIFTING DEVICE OR ELEVATOR

Filed Aug. 30, 1946 3 Sheets-Sheet 3

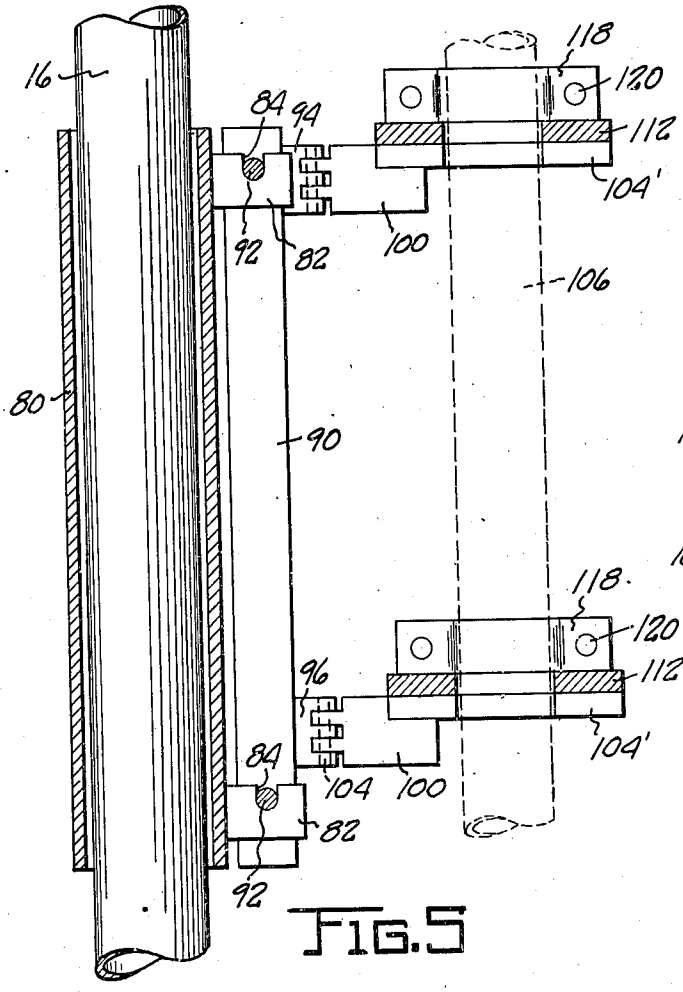


FIG. 5

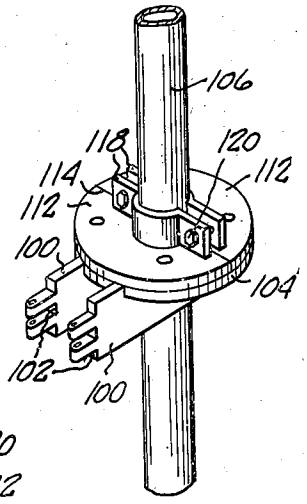


FIG. 7

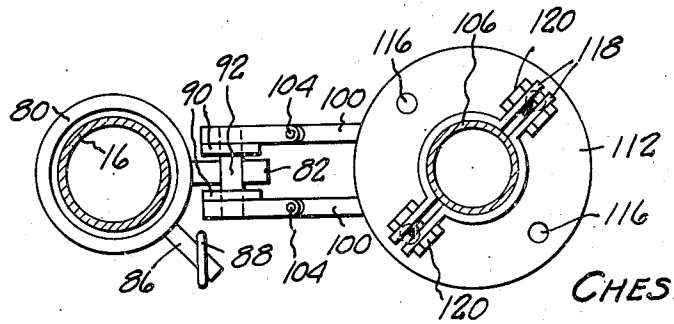


FIG. 6

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UNITED STATES PATENT OFFICE

2,483,109

LIFTING DEVICE OR ELEVATOR

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Application August 30, 1946, Serial No. 693,979

8 Claims. (Cl. 214—95)

1

This invention relates to improvements in lifting devices, and particularly to a device of this character which is usable in the construction industry and plumbing and steam-fitting trades.

It is frequently necessary to install some item or piece of equipment in a building at an elevation above the floor. For example, it is frequently desired to run steam, air or water lines of large size through a factory or other building and to locate that line at an elevation above the floor in order to avoid interference with the working space in the building. The use of space heaters positioned overhead is becoming increasingly common, and many other items and pieces of equipment, such as suspension brackets, power transmission equipment and the like, are commonly mounted in a building at an elevated position suspended from the ceiling and at a height above head level. These items, such as iron pipe of long section and large diameter, space heaters, power transmission machinery and the ilke, are quite heavy and a considerable amount of work and exertion is required in order to install this equipment. The common practice in performance of this work at present is to use jacks, to work from ladders or to build a scaffold. In either case considerable expense and exertion is required. Thus it is difficult to work on a ladder, and, if the object to be installed is heavy and must be held in accurate position while its mounting or suspending means are anchored, there is considerable danger due to the possibility of breakage of the ladder or dropping of the article while it is held in position to be secured in place. The use of special scaffolds is expensive because they must be made for the intended purpose and to fit the conditions of use and at the same time must be portable to permit relocation thereof as work progresses, as in the case of heavy overhead pipe lines. The use of jacks is slow and dangerous.

Therefore, it is the primary object of this invention to provide a device which overcomes the aforementioned limitations and difficulties with prior practices, and which permits the accurate positioning of heavy objects at an elevation with minimum physical labor and exertion by the workman.

A further object is to provide a device of this character which can be positioned or located easily and quickly and which can be used in buildings whose room heights or ceiling heights vary through a wide range.

A further object is to provide a device of this character by which the elevation, lateral position and other locational factors of the workpiece can be varied within a wide range, and upon which work can be shifted and rotated while in any selected elevated position to facilitate the securing or mounting thereof in the selected elevated position.

2

Other objects will be apparent from the following specification.

In the drawing:

Fig. 1 is a side view of the device with a chain hoist used therewith illustrated diagrammatically.

Fig. 2 is a fragmentary side view of the device as viewed from the right in Fig. 1.

Fig. 3 is an enlarged fragmentary longitudinal axial sectional view of the upper portion of the device.

Fig. 4 is an enlarged fragmentary longitudinal axial view of the lower section of the device.

Fig. 5 is a fragmentary side elevational view of a modified embodiment of the device with parts shown in section.

Fig. 6 is a top plan view of the device illustrated in Fig. 5.

Fig. 7 is a perspective view of a portion of the device illustrated in Fig. 5.

Fig. 8 is a perspective detail view of one part of the Fig. 5 device.

Fig. 9 is a perspective detail view of another part of the device illustrated in Fig. 5.

Fig. 10 is an exploded view of the remaining parts of the Fig. 5 device.

Referring to the drawings, and particularly to Figs. 1 to 4 thereof, which illustrate one embodiment of the invention intended primarily for use in mounting horizontally extending runs of heavy pipe in elevated overhead position, the numeral 10 designates the body portion or standard of the device. The standard is rigid and extensible so that its base plate 12 may rest upon the floor and its top plate 14 bear against the ceiling in such a manner that the member 10 is held firmly in a vertical position and is prevented from tilting or from shifting.

Inasmuch as the ceiling height of buildings varies considerably, it is desirable and necessary for reasonable range of application of the device in use to provide some means by which the overall length of the unit can be extended. Such means are illustrated in Fig. 4. The main tubular portion 16 of the body 10, which may comprise any standard iron pipe or tube of requisite strength, has secured at its lower end, as by threading thereon, a sleeve 18 having an inwardly projecting flange 20 at its lower end. The sleeve or

collar 18 is preferably screw-threaded upon the tube 16. A second smaller tube 22 of any desired length and preferably shorter than the tube 16 is secured within the tube 16 in rigid concentric relation thereto as by the screw-threaded connection 24 between the same and the lower flange portion 20 of the collar 18. An elongated screw-threaded shaft 26 of any suitable length and of a diameter to fit freely and rotatably within the inner tube 22, but preferably with a minimum of play within said tube 22, is supported upon the base plate 12. For this purpose the lower end of the screw 26 may be provided with a rounded or part-spherical head 28 fitting within a complementary recess formed in the center portion of the body plate 12. The head at the bottom of the screw 26 may be provided with a circumferential groove 30 around which fits a retainer bracket 32 which is secured at its margin to the plate 12 as by the screws 34. A hand wheel 36 having an internally screw-threaded bore with a screw-thread fit around the shaft 26 is preferably provided with a hub 38 which is adapted to support the body 10. As illustrated in Fig. 4 a surface plate 40 may be provided at the lower end of the vertically adjustable unit for engagement with the uppermost end of the hub 38 to transmit the thrust imparted by the body 10 to the hand wheel 36 and the threaded shaft 26. It will be apparent that by rotating the hand wheel 36 relative to the shaft 26, the body portion including the tube 10 may be elevated and lowered simply and easily. For this purpose it will be desirable to make the hand wheel 36 of substantial diameter in order to provide torque to reduce the resistance to rotation of said wheel under stress or thrust.

Inasmuch as the unit is to be used in buildings which are already erected, as well as in buildings which are in process of erection, it is desirable to provide the upper plate 14 in order to minimize the danger of damage to the ceiling. It is also desired for other purposes to be brought forth hereinafter to provide means rotatable relative to the standard at the upper end of the device. A construction which serves this purpose is illustrated in Fig. 3. In this form a collar 42 is screw-threaded or otherwise secured upon the upper end of the pipe 16 and may be provided with a set screw 44 extending therethrough and engageable with the tube or pipe 16 to prevent rotation of said collar. The upper surface of the collar is preferably provided with a circular groove adapted to receive spherical bearing members 46. A rigid annular plate 48 rests upon and is supported by the collar 42 in a manner to be freely rotatable around the tube 16. For this purpose the bottom surface of the annular plate 48 is provided with a circular groove mating with the groove in the upper face of the collar 42 and adapted to receive the upper portion of the balls or bearings 46. A second circular groove is formed in the upper face of the annular plate 48 and forms a runway for spherical bearings 50. The top plate 14 is preferably screw-threaded upon the upper end of the tube 16 and the bottom face thereof has a circular groove formed therein adapted to receive the upper portions of the bearings 50. It will be observed that this construction provides for a firm and solid abutment of the plate 14 against the ceiling and at the same time provides freedom of rotation of the annular rigid plate 48. The rigid plate 48 is preferably of a diameter greater than the diameter of the collar 42 and mounts a depending hanger ring, such as the eyelet 52 illustrated in Fig. 3, in depending relation and outwardly spaced from the collar 42. The eyelet 52 may be welded or otherwise fixedly secured to the plate 48.

Referring now to Figs. 1 and 2, a carrier unit 54 is provided upon the tube 16 which is adapted for sliding movement longitudinally of said tube. This carrier unit is so constructed that lateral play thereof relative to tube 16 is held at a minimum and is provided with means in the nature of a work holder or rest. One form of such a device is illustrated in Figs. 1 and 2 wherein a lower collar 56 and an upper collar 58 are provided in spaced relation encircling tube 16 with clearance sufficient to prevent binding but also limited to restrain lateral movement or play thereof. The lower collar 56 has welded or otherwise fixedly secured thereto a radially projecting rigid bar or other member 60. A plurality of generally upwardly extending rigid bars or rods 62 are secured at their lower ends to the member 60 and preferably extend in diverging relation as illustrated in Fig. 2. These bars may be suitably reinforced and cross-connected and are secured adjacent their upper ends to the upper collar 58 by means of rigid bars or rods 64. The upper ends of the bars 62 mount a work holder or cradle. As here illustrated, for the purpose of supporting a pipe, bars 66 bent substantially at right angles to form a V-way are mounted in laterally spaced relation upon the upper ends of the opposite pairs of upright frame parts 62. It will be observed that this support or platform should be of a width less than the center spacing of the unit 54 from the tube 16 so that the work-piece 68 resting thereon is spaced laterally from the tube 16.

The eyelet 52 provides means from which may be suspended the upper portion 70 of a conventional chain hoist, well known in the art and illustrated only diagrammatically herein. Such hoists are conventionally provided with hooks for their suspension, which hook will engage within the eyelet 52 in supporting relation. The unit 54 is provided with means to which the end of the lifting chain 72 may be connected. This means here shown as a staple or eyelet 74 is preferably located at the lower end of the unit 54 as by being secured to the member 60. Consequently, with this arrangement of parts, the chain hoist 70 may be used to elevate the unit 54 upon the tube 16 to any desired position while the work-piece 68 is mounted upon the cradle 66. This provides an easy means for elevating the work-piece while the workman stands upon the floor.

In the use of the device the work-holding unit 54 will normally be positioned at the lower end of its travel, that is, with the lower end of the collar 54 bearing upon the upper end of the collar 18, assuming that the standard unit 10 has first been properly erected and tensioned so that it is firmly positioned. In this connection the standard will be positioned in laterally offset relation to the location at which the work-piece is to be secured by an amount equal to the spacing between the centers of the standard 10 and the work-holding unit 54. The chain hoist 70 is then anchored to the eyelet 52, and the work-piece is positioned upon the floor adjacent the base of the standard 10. The work-lifting run 72 of the chain hoist is then passed around the work-piece and secured thereto. During this operation the unit 54 may be positioned at the side of the standard opposite that at which the work-piece

is located, for example, in diametrically opposed relation best illustrated in Fig. 1, that is, to the left of the standard 10, assuming that the work-piece 68 is positioned at the right of the standard 10 as viewed in Fig. 1. The chain hoist may then be operated to lift the work-piece 68 to a level above the level of the cradle 66. Thereupon the work-holding unit 54 may be rotated about the tube 16 to a position underlying the partially elevated work-piece 66, whereupon the chain hoist can be operated to lower the work-piece onto the cradle or surface 66 of the work-holding unit 54. During this operation it will be understood that the work-holding unit 54 is at a low level position with reference to the standard, as at a position bearing upon the upper end of the collar 18 fitting around the tube 16. The work-engaging lead or run 72 of the chain hoist is then disconnected from the work-piece 68 and is reconnected to the staple 64 at the bottom of the work-holder. Thereupon, further elevating operation of the chain hoist serves to elevate the work-holder 54. In this manner it will be apparent that it is possible to raise the work-piece 66 to any desired elevation, for example, into abutting engagement with the ceiling. In other words, it is possible to lift the work-piece 66 above the level of the upper portion of the chain hoist 70 because of the connection of the chain hoist with the lower portion of the work-holding unit 54 at a point substantially below the work-supporting cradle 66.

It will be observed that clearance of the parts can readily be provided to prevent interference with the elevation of the work to desired level, for example, interference by the chain hoist, by rotating the plate 48 to a position clear of the work-piece 68 and the work-holder 54 as the latter are elevated to positions at which the hoist parts might interfere. Assuming that the standard 10 has been positioned accurately, the work 66 when elevated to a particular height is positioned accurately at the desired point. However, if the work is at the proper elevation but is not accurately located, for example, with reference to the pipe line with which the pipe 68 is to be connected, it will be apparent that the rotatable connection of the work-holder 54 with the tube 16 will permit adjustment of the angular relation of the pipe to bring it into desired alignment for connection by couplings or other means with the pipe sections to which it is to be secured. At the same time it will be observed that the work-piece is free to rotate upon the cradle 66 as that may be necessary incident to the connection of the parts by screw-threaded unions and the like. The work-piece 68 is held at the desired elevation and in the desired position by the device without effort on the part of the workman and with sufficient clearance around the work-piece to permit access to any part thereof as may be required in order to anchor the elevated part securely in its proper position. For instance, if the work-piece is a pipe, workmen may work around the pipe and reach therearound for the purpose of applying pipe hangers and of securing those pipe hangers to the ceiling. Also, it will be apparent that, while the V-type of cradle has been illustrated herein, other forms of work holders may be provided which will provide for lateral movement of the work, as upon a platform, if that is necessary to adjust the work to its proper position. This may be desirable to avoid the necessity for extreme accuracy of location of the standard 10 relative to the position which the work-piece is to assume.

After the work-piece 68 has been secured to the ceiling so that support is no longer required, the chain hoist may be operated to lower the work-holding unit 54 away from the work and to its lowermost position. Thereupon, the chain hoist can be disconnected from the device and the standard can be released by simply rotating the hand wheel 36 to the extent necessary to permit the standard to be moved or to be lowered to a portable position.

It is sometimes necessary, depending upon the character of the work-piece, to provide for use with the device a special type of work-holder. One such instance is encountered by plumbers and steamfitters in connection with the handling of heavy, large diameter pipe sections to be used to make up a vertical pipe assembly running through a building. A device intended for this purpose is illustrated in Figs. 5 to 10, inclusive.

In the form of device illustrated for this purpose the tubular portion 16 of the standard 10 of the device has an elongated tubular section 80 fitted therearound, said tubular portion 80 having a sliding and rotatable fit about the tube 16. A pair of ears 82 project laterally from the tube 80 in a common plane and are positioned in spaced relation adjacent the opposite ends of the tube 80. The ears are rigidly secured to the tube 80 as by welding and are themselves of sufficient strength and rigidity to sustain a heavy weight. The upper edges of the ears 82 are preferably notched at 84, as best illustrated in Fig. 8. Another ear 86 is rigidly secured to the lower end of the tube 80 adjacent the lowermost ear 82 and angularly displaced therefrom as by welding, and this ear 86 mounts a staple or eyelet 88 welded or otherwise rigidly secured thereto and adapted to form the anchor member to which the lower end of the run 72 of a hoist mechanism 70 may be connected detachably. An adapter unit, best illustrated in Fig. 9, is adapted for supporting connection with the tube 88 as illustrated in Figs. 5 and 6 and comprises a pair of similar parallel spaced rigid bars 90 of a length substantially equal to the length of the tube 80. These bars are spaced apart a distance slightly greater than the thickness of the ears 82 and are connected rigidly at their opposite ends by pins 92, which are preferably spaced exactly the same distance as the upper edges of the ears 82 are spaced. These pins are adapted to fit within the slots 84 of the ears 82, whereby the adapter unit will be detachably but fixedly secured to the tube 80 in such a manner that weight applied thereto is sustained by the tube 80 without play. In this connection, the inner faces of the bars 90 which bear against the opposite faces of the ears 82 prevent lateral play of the adapter. A pair of plates 94 is secured at the upper end of the adapter unit as at the outer faces of the bars 90 and a similar pair of plates 96 is secured to the outer faces of the bars 90 adjacent the lower ends thereof. The plates 94 and 96 project laterally beyond the bars 90 at one side thereof and are slotted at 98 at their projecting ends whereby each forms one unit of a hinge.

Vertical hinge bars 100, best seen in Figs. 7 and 10, slotted at 102 at their outer ends in a manner complementary to slots 98 whereby the slotted parts 98 and 102 interfit freely, form means adapted to be connected by suitable hinge pins 104 to provide hinges on the adapter pivoted about vertical axes. The outer or projecting ends of the plates 100 each mount a semi-circular, semi-annular horizontal jaw-shaped bearing

plate 104' whose inner diameter is preferably larger than the outer diameter of a work-piece such as a pipe 106 adapted to be supported in the device. It will be observed that the jaws 104' are adapted, when in abutting relation as shown in Fig. 10, to form a complete ring separated by a parting line 108 in a plane parallel to and between the arms 90. Each of the jaws is preferably provided with a plurality of openings 110.

A split ring formed of substantially the same dimensions as the ring formed by the jaws 104' is made up of a pair of semi-annular plate portions 112 adapted to abut along the radial line 114. Each of these plates carries a pair of pins 116 so located that when the plate parts 112 are positioned upon the jaws 104' with the line of separation 114 therebetween disposed 90 degrees or at any other selected angle to the supporting line 108 between the jaws, the pins 116 will fit in the openings 110 when the parts each abut. This provides a detachable connection between the jaws 104' which holds them in ring shape, and provides a smooth continuous upper surface for the ring parts 112. The arrangement in consequence provides a pair of annular retainers, spaced vertically, within which a vertically positioned pipe 106 is guided and retained. Also the arrangement provides a flat continuous circular surface upon which a stop or abutment of the pipe 106 may rest. For example, clamp parts 118 may be secured together about the pipe 106 by suitable bolts 120 and, when clamped fixedly upon the pipe 106 at a proper position, can bear against one of said annular plate surfaces in a manner to hold the pipe 106 against endwise movement relative to the guides without, however, restraining or preventing rotation of the pipe 106 as may be necessary for the purpose of effecting a threaded connection or joint with other pipe sections.

It will be observed that the device possesses the same advantages and may be used in substantially the same way in which the first described embodiment of the device is used. Specifically, assuming that the adapter tube 80 has been mounted upon the standard tube 16 and that the adapter bars 90 have been properly secured or anchored to the ears 82 by means of the pins 92, the jaws 104' being swung open, the work-piece 106 can be raised on end in a vertical position and so placed that the jaws 104' may be closed therearound. Thereupon the plates 112 can be applied to the plates 104' with their pins detachably locking the jaws in closed position. These operations will be performed while the tube 80 is supported at the lower end of the standard so that the weight of all parts is taken by fixed abutment and the weight of the pipe 106 is borne by the floor. The clamp 118 is then secured to the work-piece 106 with its lower edges bearing upon the top surface of the plates 112. Thereupon the hoist 70 can be operated to elevate the work-holder assembly to desired position, it being assumed that the standard will have been positioned accurately relative to the axis of the work-piece. Absolute accuracy or centering of the standard relative to the center line of the work, namely, the axis of the previously connected or assembled pipe line is not essential because the inner diameter of the openings in the parts 104' and 112 may be sufficient to provide a limited lateral play. For example, the inner diameter of said openings may be an inch or more greater than the outer diameter of the pipe or work-piece 106. After the hoist has elevated the work-holder to the desired location, it may be held in position while the joint between the work-piece and the previously assembled pipes is completed.

It will be understood that the construction of the standard embracing members 56, 58 of Fig. 1 and 80 of Fig. 5 is illustrative. For instance, the tube 80 may be used in place of the members 56 and 58 of Fig. 1, or a modified arrangement, for example, the use of two sleeves 56 and 58 rigidly connected by longitudinal webs or ribs, may be used in the Fig. 5 device in place of the tube 80. Also, it will be apparent that the same detachable connection of the parts which is illustrated in the Fig. 5 device may be used in the Fig. 1 device, so that any one of a number of different rigid work carriers, each designed for some specific purpose or function, may be provided in a set and used interchangeably by means of a detachable connection comparable to the arrangement illustrated in Fig. 5, wherein the ears 82 are adapted to suspend such a work support and are engaged by pins 92 or other means to hold the work support detachably but in a rigid position and against lateral play. Such a device would have all the advantages which have been mentioned herein, including the advantage of rotation upon the standard, which will permit the manipulation of the device to clear obstructions if such exist around the location at which the work is to be performed. In other words, the work can be applied to the device while the work holder is in one radial position relative to the standard and can then be elevated until such a time as any obstacle, such as machinery or the like, adjacent the working area, are cleared and the carrier or work holder can then be rotated to bring the work piece into register with the location at which it is to be used.

It will be understood that while the constructions here illustrated and described are preferred, other constructions may be utilized within the scope of the claims without departing from the spirit of the invention.

I claim:

1. In combination, a rigid portable upright standard, a work holder shiftable longitudinally on said standard, means carried by said standard for raising and lowering said work holder, said work holder including a pair of horizontal jaws each pivoted about a vertical axis, a two-part annular bearing plate supported on said jaws, and means for anchoring each part to the pivot jaws.

2. In combination, a rigid portable upright standard, a work holder rotatably mounted on said standard and shiftable longitudinally thereon, means carried by said standard for raising and lowering said work holder, said work holder including a pair of horizontal jaws each pivoted about a vertical axis, a two-part annular bearing plate supported on and spanning said jaws, and a plurality of sets of interfitting pins and sockets on said jaws and parts.

3. A portable lifting device adapted to be used in an enclosure having a floor and a ceiling, comprisng an elongated rigid member of substantially circular cross-sectional shape, longitudinally adjustable means carried by and cooperating with said member to provide an extensible standard adapted to firmly abut said floor and ceiling, a work holder having annular support means rotatably embracing and longitudinally slidable on said member, and a chain hoist anchored to the upper end of said standard and connected to said work holder, said work holder including a ver-

tically elongated rigid frame portion anchored to said annular support means at vertically spaced points and offset laterally from said first member and a pair of horizontally spaced V-shaped cradle members carried by the upper end of said frame portion and adapted to support a work piece in horizontal position adjacent to but clear of said first member.

4. A portable lifting device adapted for use in an enclosure having a floor and a ceiling, comprising an extensible standard spanning said floor and ceiling and including a rigid elongated member having enlarged end portions, a vertically elongated rigid slide slidable on said member between said end portions, an anchor member carried by the upper end of said standard, an anchor member carried by said slide at a point below the upper end thereof, said anchor members being adapted for detachable connection of a hoist member thereto, said slide including a pair of rigid vertically spaced lateral projections each having a socket, and a rigid elongated work holder having a pair of lateral projections spaced vertically similarly to the spacing of said sockets and detachably seated in said sockets.

5. A portable lifting device, comprising a rigid upright standard, a work holder, a guide member slidable longitudinally on said standard, means for releasably connecting said work holder in predetermined fixed relation to said guide, said work holder including separable cooperating work-encircling parts, and means including a pair of abutting horizontal plates bearing on said parts for locking said parts in fixed operative position to provide a continuous substantially smooth horizontal supporting surface surrounding a work-receiving opening.

6. A device for lifting an elongated work piece endwise, comprising a rigid upright standard, a work holder slidable vertically on said standard, and attachment means for connection of a hoist mechanism at the upper portion of said standard and at a portion of said work holder spaced below the upper end thereof, said work holder being provided with an apertured horizontal platform adapted to encircle said work piece and to support a laterally projecting member on said work piece, said platform including a pair of work embracing jaws, each pivoted on a vertical axis, and arcuate plates bearing upon and releasably interlocked with said jaws in transverse relation thereto for locking said jaws in work embracing relation.

7. A portable lifting device, comprising a rigid upright standard, a work holder, a guide member slidable longitudinally on said standard, means for releasably connecting said work holder in predetermined fixed relation to said guide, said work holder including separable cooperating work-encircling parts, and means for locking said parts in fixed operative position to provide a continuous substantially smooth horizontal supporting surface surrounding a work-receiving opening, said work holder and guide including a pair of vertically spaced cooperating sets of rigid inter-engaging hook units.

8. A portable lifting device, comprising a rigid upright standard, a work holder, a guide member slidable longitudinally on said standard, means for releasably connecting said work holder in predetermined fixed relation to said guide, said work holder including separable cooperating work-encircling parts, and means for locking said parts in fixed operative position to provide a continuous substantially smooth horizontal supporting surface surrounding a work-receiving opening, said work holder and guide including vertically elongated rigid lateral projections fixedly carried thereby, the projection carried by said guide having vertically spaced sockets open at their tops, the projection carried by said work holder having transverse studs spaced similarly to the spacing of said sockets and removably seating therein, said lateral projections extending side by side to prevent lateral swinging of each work holder relative to said guide about a vertical axis common to the points of engagement of said studs with said sockets.

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