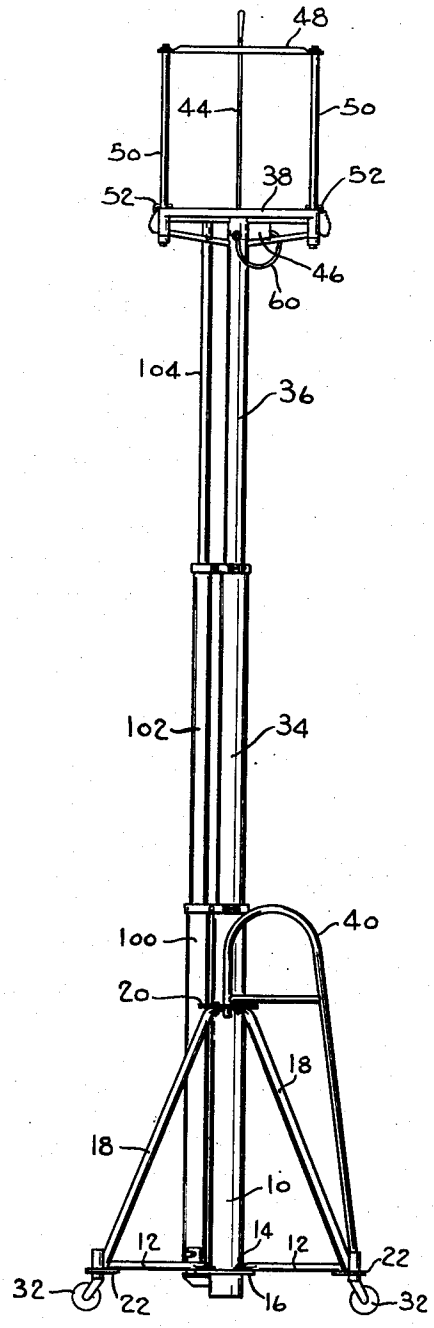
April 27, 1954 A. A. ANDERSON ET AL 2,676,677

TELESCOPIC TOWER

Filed March 17, 1950 3 Sheets-Sheet 1

FIG. 1



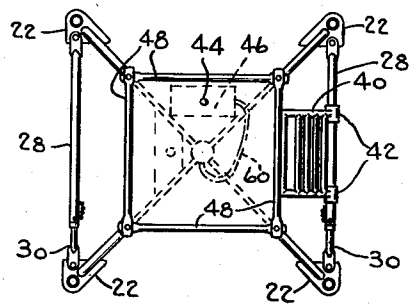
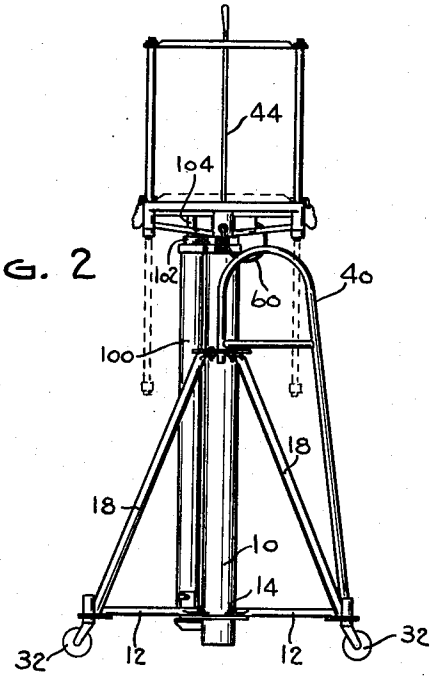


FIG. 3

FIG. 2



INVENTOR.
ARVID A. ANDERSON
BY ROBERT M. HAUCK
John W. Michael
ATTORNEY

April 27, 1954 A. A. ANDERSON ET AL 2,676,677

TELESCOPIC TOWER

Filed March 17, 1950 3 Sheets-Sheet 2

FIG. 4

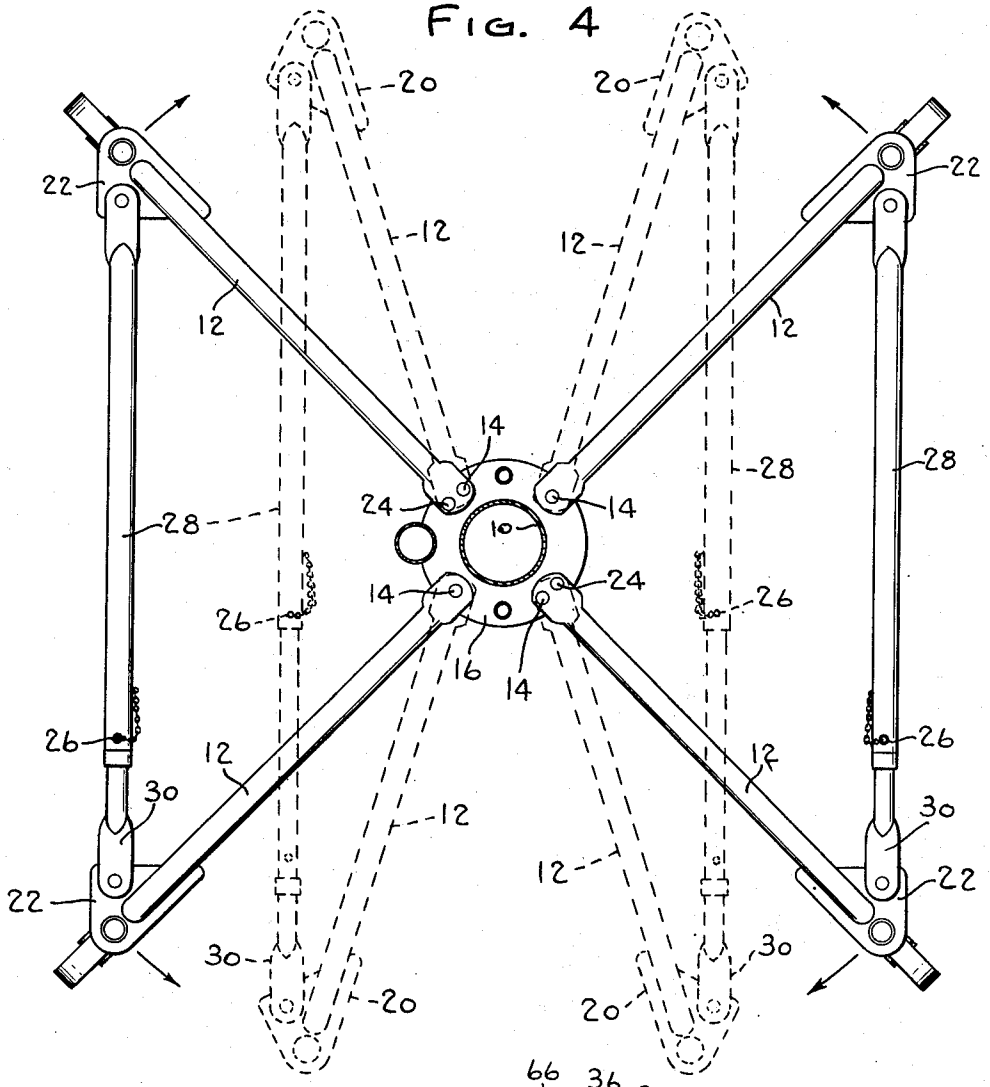


FIG. 9

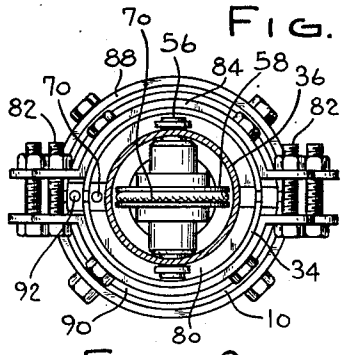


FIG. 8

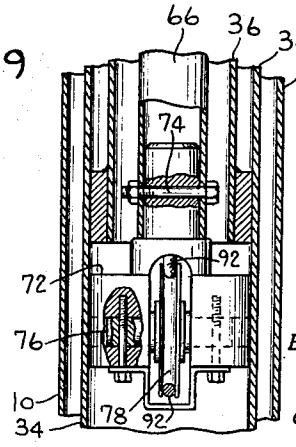
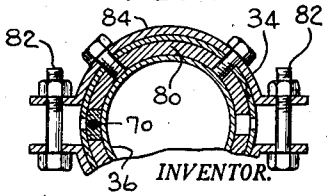


FIG. 10



INVENTOR.
ARVID A. ANDERSON
BY ROBERT M. HAUCK
John W. Michael
ATTORNEY

April 27, 1954 A. A. ANDERSON ET AL 2,676,677

TELESCOPIC TOWER

Filed March 17, 1950 3 Sheets-Sheet 3

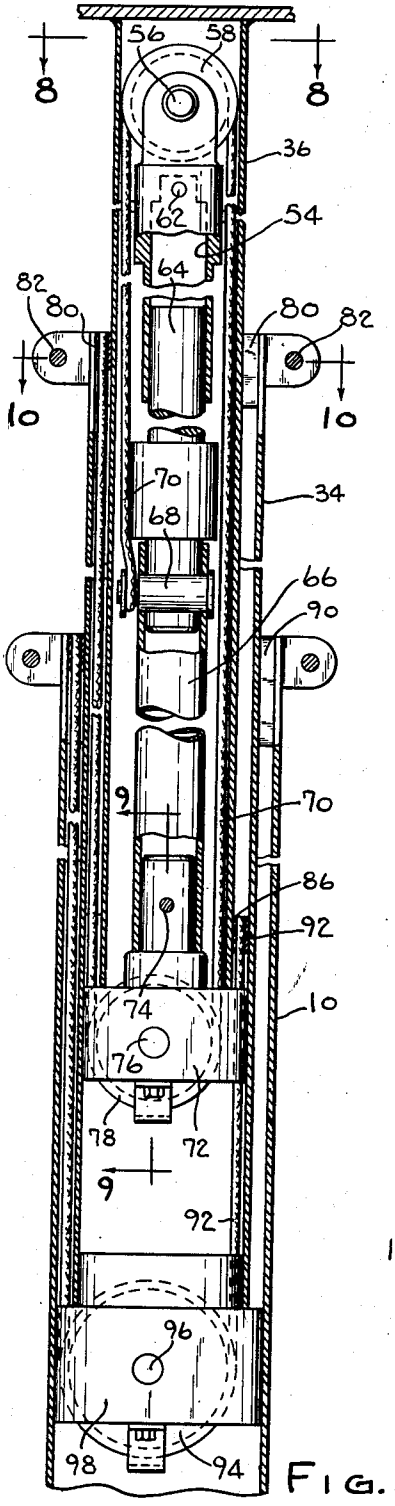


FIG. 5

FIG. 6

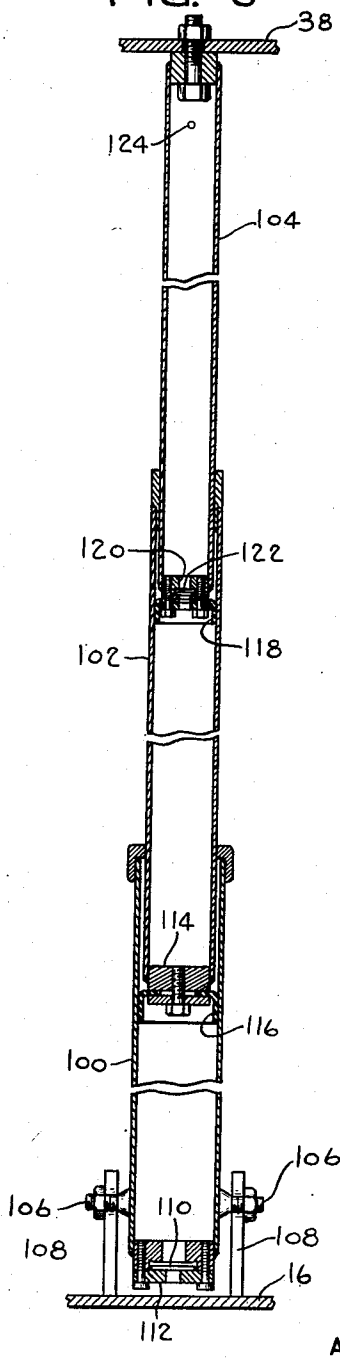
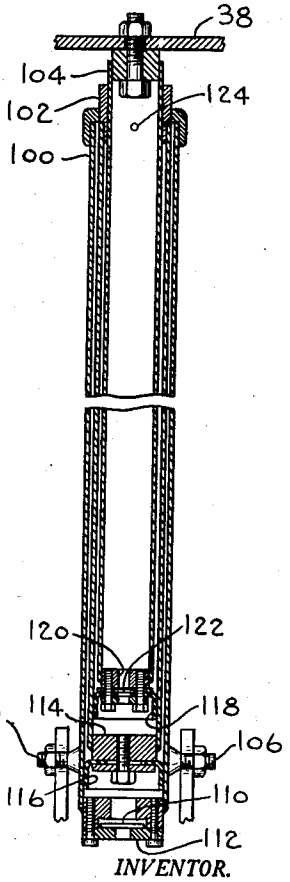


FIG. 7



INVENTOR.
ARVID A. ANDERSON
BY ROBERT M. HAUCK
John W. Michael
ATTORNEY

Patented Apr. 27, 1954

2,676,677

UNITED STATES PATENT OFFICE

2,676,677

TELESCOPIC TOWER

Arvid A. Anderson and Robert M. Hauck, Milwaukee, Wis., assignors to Safeway Steel Products, Inc., Milwaukee, Wis., a corporation of Wisconsin

Application March 17, 1950, Serial No. 150,282

3 Claims. (Cl. 189—26)

1

This invention relates to a telescoping tower particularly adapted for use in maintenance work and similar fields.

An object of this invention is to provide a telescoping tower which may be collapsed to permit free movement through narrow and low doorways while being completely stable when fully extended.

Another object is to provide a tower which may be raised and lowered easily and rapidly with smooth action.

Another object is to provide a tower having a central telescoping column actuated by novel hydraulic and mechanical means and having safety means insuring safe descent in the event the actuating mechanism should fail.

Still another object is to provide a telescoping tower which may be manufactured at low cost.

A further object is to provide a tower which can be raised on a telescopic column which is provided with means for maintaining a precise fit between the parts for the life of the tower, thus insuring stability of the tower.

A still further object is to provide a stable, low-cost, completely safe telescopic tower which may be moved about and used in restricted areas.

Still another object is to provide a tower having a platform supported on a telescopic column which encloses the hoisting mechanism, thus presenting a neat appearance and preventing fouling the mechanism.

Other objects and advantages will be pointed out in, or be apparent from, the specification and claims, as will obvious modifications of the single embodiment shown in the drawings, in which:

Fig. 1 is a side elevation showing the tower fully extended;

Fig. 2 is a side elevation showing the tower in the collapsed position with the platform guard rail also being shown in a lowered position in dotted lines;

Fig. 3 is a top plan view of the tower;

Fig. 4 shows the base portion of the tower in its normal position (full lines) and in its collapsed position (dotted lines) permitting passage through narrow doorways, etc.;

Fig. 5 is a fragmentary, sectional view of the telescopic column containing the hydraulic and mechanical mechanism for raising and lowering the platform;

Fig. 6 is a fragmentary, sectional view of the air ram which constitutes a safety device preventing rapid descent of the work platform in the event the lifting mechanism should fail;

Fig. 7 shows the air ram of Fig. 6 in its collapsed position; and

2

Figs. 8, 9 and 10 are sectional views taken as indicated in Fig. 5.

Referring to the drawings in detail, the telescopic tower is provided with a base comprised of four legs pivotally connected to a central tube 10. The legs include a horizontal leg 12 pivotally connected at 14 to the lower flange 16 on tube 10 and a downwardly and outwardly projecting strut 18 pivotally connected to the upper tube flange 20 and secured to plate 22 carried by the free end of the horizontal leg 12. Reference to Fig. 4 will show that one pair of diametrically opposed legs 12 may be locked with respect to the lower flange 16 by dropping a pin 24 through cooperating holes in the leg and flange. Diametrically opposed pairs of legs may be locked with respect to each other by passing a pin 26 through cooperating holes in telescopic members 28, 30 which are pivotally connected to plates 22. Thus when the base is in its normal position (full lines Fig. 4) the telescopic members 28, 30 are locked with respect to each other and one leg of each of the locked pairs of legs is locked with respect to the lower collar or flange 16 by means of a pin 24. This provides complete stability for the base. Caster wheels 32 secured to each plate 22 are preferably of the type wherein the wheels may be locked with respect to the rotational axis of the wheel and of the caster swivel, such as shown in the Uecker et al. Patent No. 2,262,433.

Should it be necessary to move the tower through a narrow opening, the pins 26 and 24 may be removed to permit the legs to be pivoted to the dotted line position shown in Fig. 4. If desired, the telescopic struts can be locked in their elongated position by means of the pin.

Tube 10 comprises the lower or bottom section of a telescopic column which includes coaxial nested tubes 34, 36. The work platform 38 is secured to the top of upper tube 36. When the column is collapsed, access to the platform 38 may be conveniently had by means of the ladder 40 removably secured to the upper tube collar 20 by means of a pin and hole connection and seated on a telescopic strut by means of U-shaped saddles 42. A person standing on the platform 38 can readily raise or lower the platform by actuating lever 44 which operates a pump in housing 46 to regulate fluid flow to or from the hydraulic ram to be described hereinafter. The worker on the platform is assured of safety by means of toe board around the periphery of the platform and a guard rail 48 carried on the upright members 50 which are locked in their raised position by means of pins 52. The

pins 52 may be removed to permit the guard rail assembly to drop through sockets to the dotted line position shown in Fig. 2. After removal of the pump handle, the tower may be moved through a relatively low opening.

As indicated above, the telescoping and collapsing movement of the column is regulated hydraulically. Hydraulic cylinder 54 is fixed in upper tube 36 by means of its connection to trunnion 56 which also serves as the pivot axis for sheave 58. Oil flow from the pump in housing 46 passes through flexible conduit or hose 60 into hole 62 in the upper end of the cylinder to force piston or ram 64 downwardly. Spacer tube 66 is connected to the lower end of ram 64 by means of pin 68 which additionally serves as an anchor for cable 70. A guide and pulley block 72 is connected to the lower end of spacer tube 66 by means of bolt 74. This block is adapted to slide in the middle tube 34 to guide the lower end of the ram while serving as a support for pin 76 which rotatably mounts sheave 78. As mentioned before, cable 70 is anchored at the lower end of ram 64. This cable is reeved over the fixed pulley 58, passes down over pulley 78 and up to an anchor in bearing block 80 carried by middle tube 34 as illustrated in Fig. 10. Since cable 70 passes inside tube 36 on the right and between tubes 34 and 36 on the left side of pulley 78, the pulley pivot pin 76 is off-center with respect to tubes to prevent chafing the cable.

Referring to Figs. 5 and 10, it will be noted that the upper end of middle tube 34 is split. Bearing and cable anchor 80 is also split. This construction permits manufacturing errors to be taken up simply by tightening bolts 82 to draw U-shaped clamps 84 together and close the bearing onto the upper tube. A bearing member 86 is fixed to the lower end of tube 36 to slide inside tube 34 and guide the bottom of the upper tube. The split construction permits of considerable adjustment for wear and allows use of liberal manufacturing tolerances without sacrificing stability.

Tube 34 is supported and guided in the lower tube 10. The upper end of bottom tube 10 is split and provided with the clamps 88 adapted to draw up bearing 90 carried by tube 10. This bearing also serves as an anchor for cable 92 which is reeved over pulley 94 pivoted on pin 96 in bearing block 98 secured to the lower end of tube 34. Since cable 92 passes upwardly inside the middle tube 34 through a cooperating slot in block 72 to its anchor in bearing 86 (fixed to tube 36) the pivot pin 96 is offset as in the case of pulley pivot 76. Therefore middle tube 34 is guided by bearing 90 and by tube bearing block 98. With this construction and with the adjustability afforded by the split tube construction described above, the tower can be maintained stable when fully extended and throughout its entire life.

When oil is pumped into the hydraulic ram, downward movement of the piston causes the cable anchor 68 and the sheave 78 to move away from the cylinder. Considering sheave 78 to be fixed in space for the moment, it will be appreciated that one inch of ram extension will cause tube 36 to rise one inch with respect to sheave 78. In order to move the ram one inch, the cable anchor 68 must move one inch, causing two inches of cable to be taken up. Now considering sheave 78 to be free, as it actually is, it will be noted that the two inches of cable necessary for the ram movement can be obtained only by raising the sheave two inches since cable 70 is anchored in bearing 80. Raising sheave 78 two inches necessarily raises the upper tube 36 two inches. Therefore one inch of ram movement causes the upper tube 36 to move a total of three inches (one plus two) with respect to the middle tube 34. The same linear movement is transmitted to the middle tube by means of cable 92 which is anchored to the upper tube at a bearing 86 and to the lower tube at bearing 90. Therefore, when the upper tube moves three inches with respect to the middle tube, the middle tube moves three inches with respect to the lower tube. It will be apparent, therefore, that one inch of ram movement results in a total of six inches of platform movement. In one embodiment this mechanism is used to raise the platform ten feet with only a twenty-inch ram stroke.

It will be appreciated that this lifting mechanism provides a simple and convenient method for raising and lowering the work platform by means operated from the platform. When a worker desires to raise the platform, the pump lever 44 is oscillated to pump oil to the hydraulic ram. The platform may be lowered by opening a conventional valve mechanism to bleed fluid from the ram to the sump through a restricted opening the size of which will determine the rate of descent. Under normal operating conditions this mechanism provides for a simple, rapid and quiet operation of the tower.

A telescopic air ram is provided adjacent the telescopic column and acts between the base and the platform to prevent the platform from rotating on the lifting column and to retard the gravitational descent of the platform in the event the lifting mechanism should fail. The air ram is comprised of three tubular members 100, 102, 104 the lowermost of which is secured to the lower tube collar 16 by means of laterally projecting bolts 106 engaging the notched uprights 108. The upper ends of the lower tubular member 100 and of the middle tubular member 102 may be conveniently strapped to the telescopic column for movement therewith. The upper end of the upper tubular member is secured directly to the underside of platform 38 as illustrated in Figs. 6 and 7. The lower end of the lower tube 100 is provided with a disk valve 110 adapted to seat on the centrally apertured plate 112. The lower end of the middle tubular member is provided with a plunger 114 including a rubber annulus 116 cooperating with the inside of the lower tube 100 to form a seal. The lower end of the upper member is provided with a similar rubber annulus 118 to create an effective seal between the upper and middle tubular members. Air may by-pass this seal through central opening 120 regulated by a disk valve 122. The top of the upper member 104 is vented by means of a hole 124.

As the column is raised by the lifting mechanism, the tubular members comprising the air ram will telescope outwardly. The rubber seal 116 between the middle and lower tubular members will create a partial vacuum causing air to be drawn into the lower tubular member past the disk valve 110. Similarly, the outward movement of seal 118 with respect to the middle tube will cause air to be drawn through hole 124 in the upper tube past disk valve 122 into the middle tube. As the platform is lowered, the pressure in the lower and middle tubes will increase, tending to seat valves 110 and 122 and compress air

in the tubes to prevent collapse of the air ram. Since the pressure is not high, the valves do not seat securely and the leakage past the valves renders the effect of the air ram substantially negligible. However, should the lifting mechanism fail, the sudden drop of the platform will increase the pressure rapidly causing the valves to seat firmly. Valves such as these are, however, subject to some leakage and this leakage permits the ram (and the platform) to descend slowly in complete safety. In practice the platform may drop freely for about six inches before the air ram takes over and lowers the platform slowly.

The utility of this tower for plant maintenance work should be apparent. In one form the platform may be raised from a low position of seven feet to a maximum height of seventeen feet in about ninety seconds. This ten-foot rise is obtained with a twenty-inch ram stroke. Since the guard rail may be lowered, the tower can be rolled under relatively low overhead obstructions. The base, normally about fifty inches square, can be retracted to pass through an opening of about thirty inches. Even when fully extended the column is stable since slack in the bearings can be adjusted readily. Rotation of the platform about the axis of the cylindrical lifting column is prevented by the off-center air ram. The air ram operates upon failure of the lifting mechanism to safely lower the platform.

From the above description it will be appreciated that this tower could readily be adapted for mounting on a truck or other vehicle. A power take-off could be employed in lieu of the manual pump when the tower is mounted on a truck. Similarly, a motor driven pump could be employed on the tower illustrated and described. These and other changes readily occur to those skilled in the art and are considered within the spirit of this invention. With the possibility of such changes in mind this invention is to be limited only by the scope of the claims.

We claim:

1. Telescopic apparatus comprising first, second and third tubes, hydraulic ram means having one part fixed with respect to said first tube and its other part movable with respect to said first tube, a pulley fixed with respect to said first tube, a sheave mounted on said other part of said ram means, a cable connected to said other part of said ram means and to said second tube and reeved over said pulley and said sheave, another sheave fixed to the bottom of said second tube, another cable reeved over said other sheave and being connected to said third tube and to said first tube, and means for regulating fluid flow to and from said ram means.

2. Telescopic apparatus comprising a first tube nested within and slidable with respect to a second tube, bearing means at the upper end of said second tube and operative to guide said first tube within the second tube, hydraulic ram means mounted within said first tube and having one part fixed with respect to said first tube and its other part movable with respect thereto, a pulley fixed with respect to said first tube and said one part of said ram means, a sheave mounted on the other part of said ram means, a bearing mounted on said other part of said ram means and slidable within said second tube to guide said other tube, a cable connected to said other part of said ram means and to said second tube and being reeved over said pulley and said sheave, means for regulating fluid flow to and from said ram means, a third tube telescopically receiving said second tube and provided with a bearing adjacent its upper end to guide said second tube, a bearing on the lower end of said second tube and slidably engaging the interior wall of said third tube to guide the lower end of the second tube in its telescopic movements with respect to the third tube, a sheave mounted on the lower end of said second tube, and a cable connected to said third tube and said first tube and reeved over the sheave at the lower end of the second tube, extension of said ram means a given distance being operative to raise said first tube three times said distance with respect to said second tube and six times said distance with respect to said third tube.

3. Telescopic apparatus according to claim 2 in which the hydraulic ram cylinder is fixed in the upper end of said first tube.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
381,672	Brown	Apr. 24, 1888
394,224	Stone	Dec. 11, 1888
557,501	Ennis	Mar. 31, 1896
870,998	Schapler	Nov. 12, 1907
1,188,760	Hagenbusher	June 27, 1916
1,337,487	Schlatter	Apr. 20, 1920
1,609,437	Stimpson	Dec. 7, 1926
1,735,992	Bode	Nov. 19, 1929
1,917,011	Bird	July 4, 1933
1,947,647	Holden	Feb. 20, 1934
2,183,679	Hillis	Dec. 19, 1939
2,196,511	Wagner	Apr. 9, 1940
2,204,671	Erickson et al.	June 18, 1940
2,384,279	Calhoun	Sept. 4, 1945