July 4, 1933. F. A. BIRD 1,917,011

TELESCOPING STAGE

Filed July 6, 1931 3 Sheets-Sheet 1

Fig. 1.

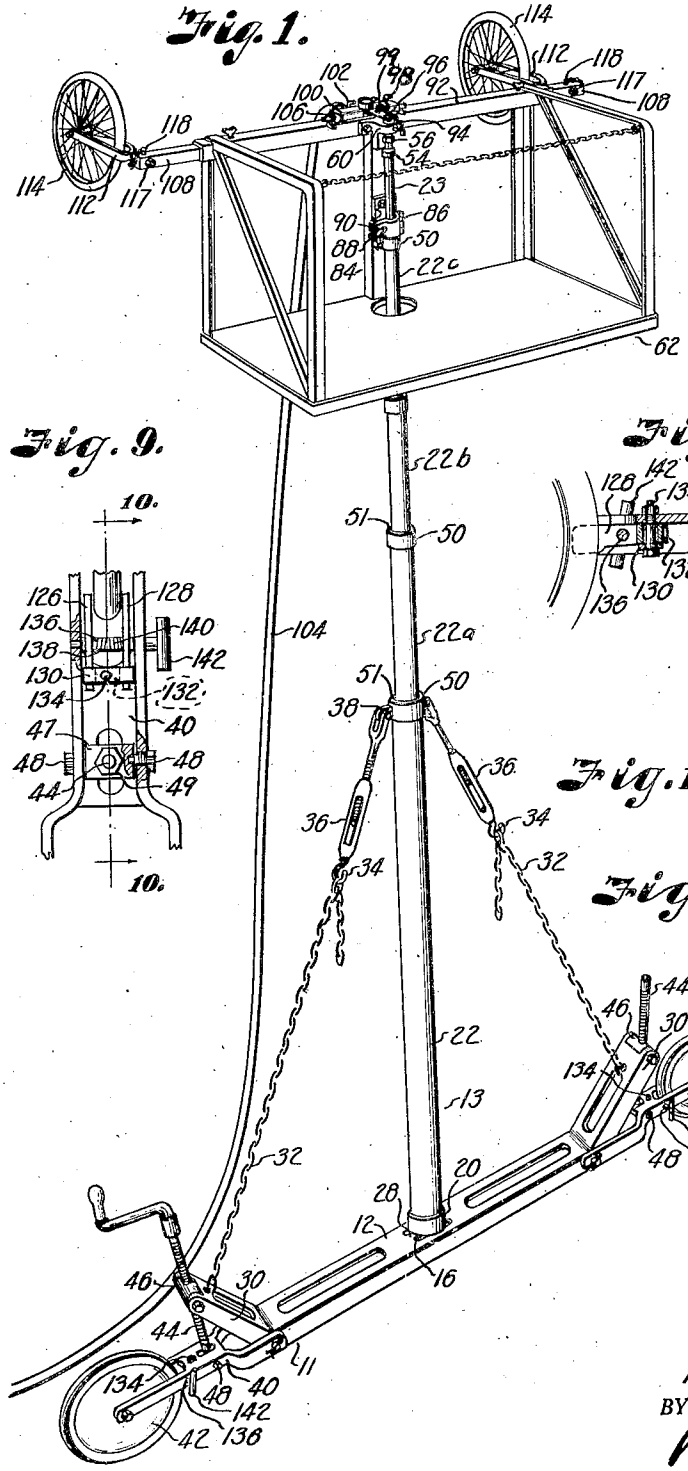


Fig. 9.

Fig. 10.

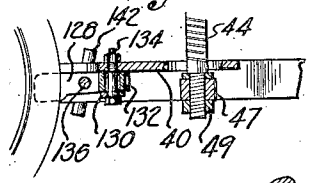


Fig. 11.

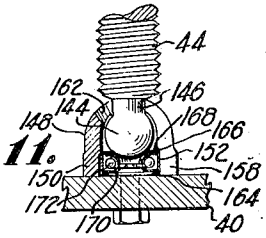
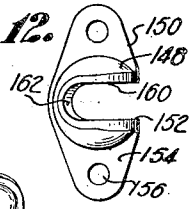


Fig. 12.



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Fig. 2.

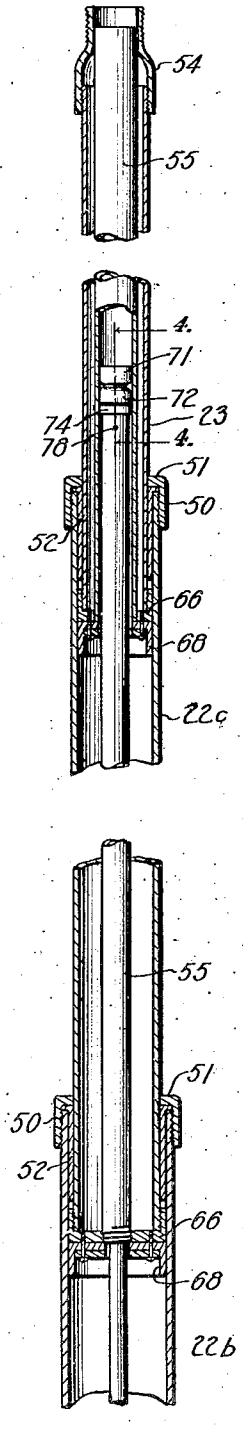


Fig. 3.

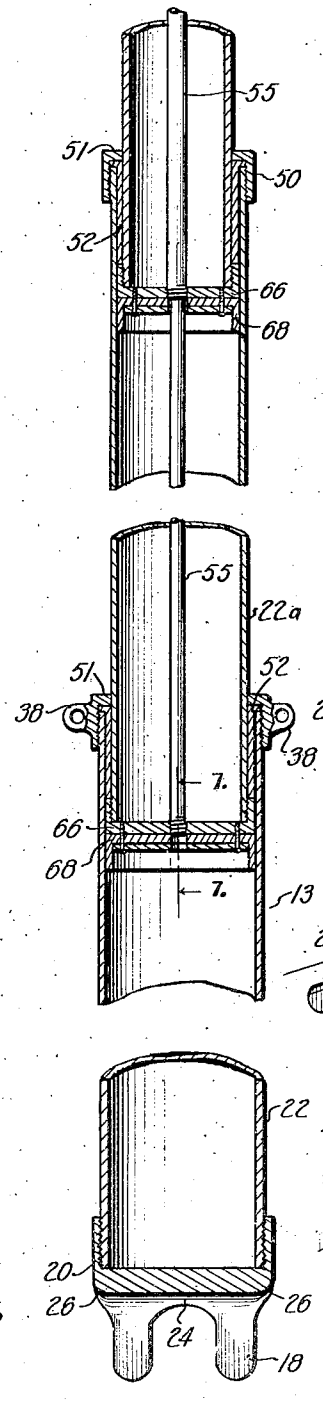


Fig. 4.

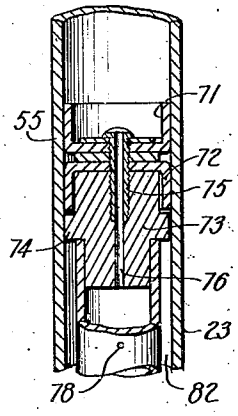
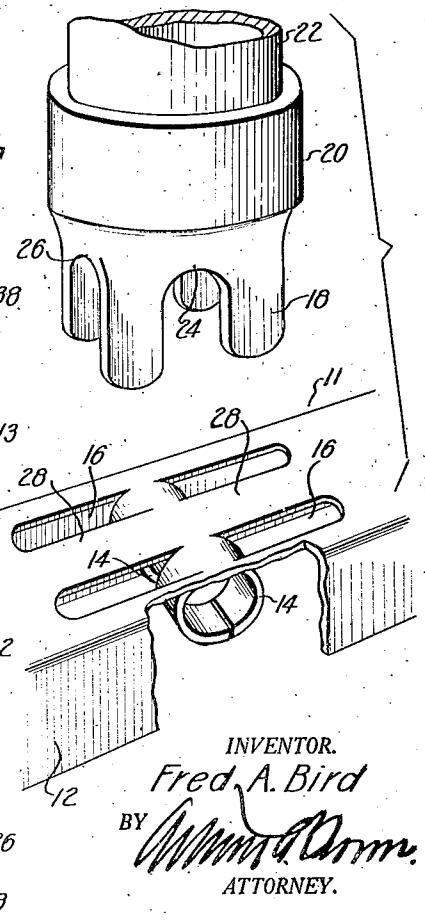


Fig. 5.



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Fig. 6.

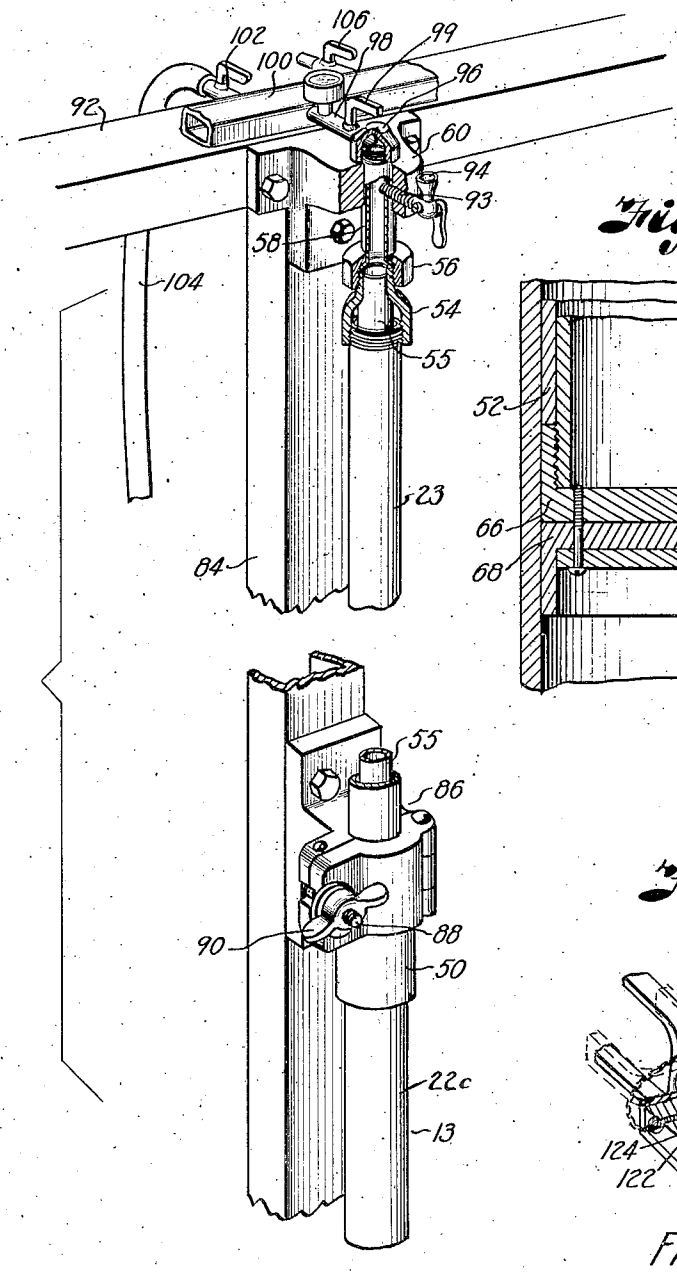


Fig. 7.

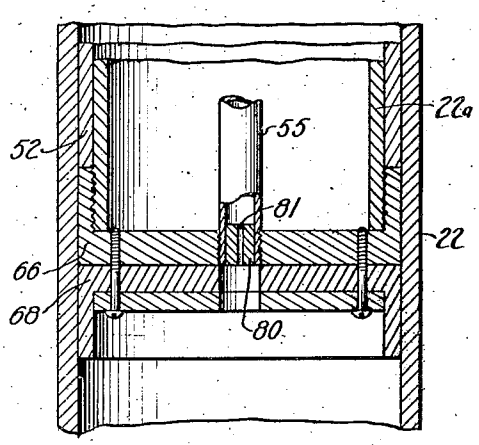
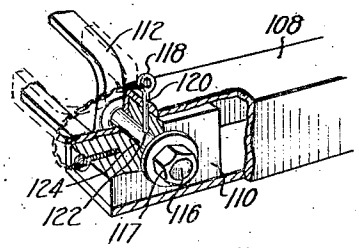


Fig. 8.



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UNITED STATES PATENT OFFICE

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TELESCOPING STAGE

Application filed July 6, 1931. Serial No. 548,853.

This invention relates to elevators and more particularly to extensible supports such as telescoping tubes operable by a fluid pressure medium for elevating and lowering a platform.

The principal objects of the invention are to equalize the movements of telescoping tubes, and to distribute effects of a pressure agent substantially coincidentally to all sections of an extensible support in proportion to the force required to equalize the movements of the sections.

Other objects of the invention will appear in the course of the following description of one form of apparatus embodying the invention, and illustrated in the accompanying drawings, wherein:

Fig. 1 is a perspective view of an extensible support and stage constructed in accordance with the invention.

Fig. 2 is an enlarged fragmentary longitudinal section through the tubular mast showing a conduit in the mast.

Fig. 3 is a further enlarged fragmentary section through the mast illustrating the structure of adjoining portions of telescoping sections and particularly the lower ends of the two lower sections.

Fig. 4 is a detail sectional view on the line 4—4, Fig. 2, of adjacent end portions of telescoping conduit sections on an enlarged scale.

Fig. 5 is a perspective view of the lower end of the lowest section of the mast and a portion of a base on which the mast is mounted, shown in spaced relation and on a scale between those used in Figs. 3 and 4.

Fig. 6 is a fragmentary perspective view of the upper end of the mast and adjacent portions of the platform shown partly in section and partly broken away, and illustrating means for controlling flow of a pressure medium.

Fig. 7 is a fragmentary section on a large scale on the line 7—7, Fig. 3, showing the piston on the next to the lowest mast tube and the apertured plug in the end of the lowest conduit section.

Fig. 8 is a fragmentary perspective view partly in section of a hollow transverse platform frame member and a wheel supporting bracket adjustably mounted thereon, the frame member and a plug therein being partly broken away.

Fig. 9 is a bottom plan view of a base wheel support and wheel shown fragmentarily, illustrating the mountings of a wheel braking clamp and a tilting screw, portions of wheel bracket arms being broken away to show screw mountings in the arms.

Fig. 10 is a section on the line 10—10, Fig. 9.

Fig. 11 is a similar section enlarged and illustrating a ball and socket mounting for the screw.

Fig. 12 is a plan view of the socket member.

Referring more in detail to the drawings:

11 designates a base including a channel-like body having a web 12, and adapted to support a mast 13 to lean against a wall as later described.

Portions 14 of the web are instruck and arcuately bent substantially into end abutment as shown in Fig. 5 to leave laterally spaced pairs of longitudinally aligned slots 16, and side pairs of tongues 18 on a cap 20 threaded on the lower end of the lower tubular section 22 of the mast may enter the slots to seat the mast on the web. Arcuate seats 24 forming bridges between the tongues of each side pair are shaped to engage the circularly curved webs between the slots of each pair for tiltably supporting the mast, whereby the mast may tilt longitudinally of the base and in a path parallel with the wall.

Seats 26 connecting laterally spaced tongues 18 are spaced a greater distance from the ends of the tongues than the seats 24 to permit the mast to tilt to substantial angles from the perpendicular before the seats 26 engage web portions 28 between the pairs of slots.

The end portions 30 of the channel are upturned as shown in Fig. 1, and chains 32 attached to the upper ends of said portions have links engaged with hooks 34 on turnbuckles 36 having pivotal connection with ears 38 on a collar at the upper end of the lower mast tube 22.

Brackets 40 having spaced arms 41 pivotally mounted on the ends of the rectilinear body portions of the base channel support wheels 42, and are pivotal vertically. The brackets preferably comprise channel members having webs cut out at their outer ends to form slots in which the wheels are located, and cut out at their inner ends to form arms which are bent and offset laterally to permit the ends to engage the outer faces of the base channel flanges.

Screws 44 are threaded in bars 46 rotatively mounted in flanges of the outer recessed ends of upturned channel portions 30. The screws have lower ends extending through openings in the webs of the brackets 40 into blocks 47 rotatively supported by pins 48 mounted in the flanges of the brackets. The ends of the screws are rotatively retained in engagement with the blocks by nuts 49 as shown in Fig. 9.

The screws may be manually operated by crank handles or the like, for adjusting the angular positions of the brackets relative to the channel and retaining the brackets in adjusted position.

The brackets may be adjusted to permit the channel to engage a supporting surface or to cause the wheels to support the channel above the surface in level or inclined position at a variety of elevations.

The mast comprises a plurality of telescoping tubes preferably cylindrical and decreasing in diameter from the lower tube 22 to the topmost tube, the inner tubes being shown and designated respectively 22*a*, 22*b*, 22*c* and 23. The tubes 22, 22*a*, 22*b* and 22*c* are outer tubes with respect to mast tubes 22*a*, 22*b*, 22*c* and 23 that respectively slide in them.

Collars 50 threaded on the upper ends of the mast tubes, except the topmost tube, have flanges 51 surrounding the next higher tubes and retaining packing glands or bushings 52 preferably formed of metal and sealingly engaging the sliding surfaces of inner tubes of each telescoping pair.

Referring to Figs. 2 and 6, the topmost tube 23 is provided with a coupling 54 having an externally threaded upper end and a lower end portion expanded and tapered to form a loose fit for the upper end of a conduit 55 that extends downwardly into the mast for supplying a pressure medium to the mast.

The nut 56 is slidable on a nipple 58 into and out of threaded engagement with the coupling, and the nipple is keyed as later described, to a bracket 60 on a platform 62 mounted on the upper end of the mast, whereby a pressure medium may be passed through the nipple into the conduit for distribution to the mast.

Threaded on the lower end of each mast tube except the base tube 22 is a piston-like end wall or head comprising a metal cup 66 and a reversely arranged cup 68 formed of flexible material such as leather fixed to the metal cup.

The pistons or heads thus seal telescopingly related tubes from each other and form independent chambers or cylinders to receive a pressure medium for acting against the heads to move the telescoping tubes relatively to each other.

The coupling 54 forms a cap on the upper end of the mast and retains the conduit concentrically in the topmost mast tube. The coupling cap fits the conduit loosely enough to be rotated thereover when the coupling is moved threadedly on the mast tube.

In order to supply a pressure medium to the several chambers coincidently, the conduit 55 is located in the mast and comprises a plurality of preferably cylindrical pipes or conduit sections in telescoping relation with each other. Each conduit section has a lower end threadedly fixed in an aperture in the metal cup of one of the mast tube pistons, and each conduit section, except the topmost one, passes through the piston of the next upper mast section into the next upper conduit section, as most clearly shown in Fig. 3.

As shown in Figs. 2 and 4, each inner conduit section of a pair of telescoping sections, is provided with reversely arranged cups 71 and 72 on the upper end thereof slidingly sealingly engaging the inner surface of the outer conduit section of the pair to sealingly separate the conduit sections into independent chambers. Plugs 73 tightly fitted into said upper ends of inner conduit sections have flanges 74 overlying the upper end edges of the sections and projecting outwardly to form seats for the downwardly directed flanges of lower cups 72. Hollow screws 75 secure the cups to the plugs.

A channel 76 is formed in each plug 73 in alignment with the bore of the screw therein to provide communication between the independent chambers.

Ports 78, Fig. 2 are formed in the conduit sections adjacent the upper ends thereof to permit the pressure medium to pass into mast tube sections as presently described.

The lowermost conduit section shown in the middle portion of Fig. 3, which has a lower end fixed to the piston on the second mast tube, is provided with a plug 80 as shown in Fig. 7 having a channel 81 for delivering the pressure medium to the lowermost mast tube, since no inner conduit extends through a piston into the lowermost mast tube.

Attention is particularly called to the relative dimensions of the channels 76 and 81, and ports 78, and to the fact that the diameters of the conduit sections decrease downwardly. The channels 76 have relatively large effective areas to permit fluid entering

the upper end of the conduit to pass relatively freely to the opposite end of the conduit. The ports 78, and the channel 81 in the plug 80 of the lowermost conduit section, are smaller than the channels 76, whereby movement of fluid from the conduit into the tubes is relatively restricted.

It is apparent also that fluid passing from the ports 78 of sections below the topmost conduit section must move between conduit section walls downwardly to the lower end of surrounding conduit sections and emerge beneath the pistons to reach the chambers formed by the mast tubes.

The conduit sections therefore have diameters adapting them to facilitate movement of the fluid, the outer diameters of inner conduit sections being sufficiently less than the inner diameters of the next surrounding sections to form annular spaces 82 to permit relatively free movement of the fluid. Telescoping conduit sections are held in concentric relation by the cups 72 and the threading of lower ends of the sections centrally in the mast tube pistons.

An important result occurs because of the reversed directions in which the diameters of mast and conduit sections are reduced, and the relations of port sizes, in that the pressure medium in a lower mast chamber will act against a greater area of piston head than the medium in the next higher mast chamber, thus overcoming the discrepancy in work required of the medium in the several chambers to move the mast sections equally.

The channel in the conduit plug at the outlet end of the lowermost conduit section has the same effective area as the ports 78, since the duty of said channel is the same as the duty of the ports, namely to deliver the pressure medium from the conduit to a mast tube chamber.

The platform 62, shown in Fig. 1, includes a vertical post 84 provided with a hinged clamp 86 adapted to embrace the mast, as best shown in Fig. 6, and slotted to admit a latching bolt 88 on which a lock thumb nut 90 is threaded for retaining the clamp in closed position to lock the platform to the mast.

The bracket 60 above referred to is a collar-like yoke fixed to a transverse platform frame member 92, and has an opening to receive the nipple 58. A tube 93 extending through openings in the bracket and nipple, keys the nipple to the bracket, and also affords means whereby lubricant supplied to a cup 94 may pass into the nipple and be carried by the pressure medium downwardly into and through the conduit for lubricating surfaces and joints of the conduit and mast.

The upper end of the nipple is closed by a cap 96 into which a fluid pressure medium is delivered through a conduit 98 and valve 99 from a manifold 100 mounted on the frame member 92 having a valved inlet 102 from a supply line 104, and valved outlets 106 to which various devices such as spraying nozzles may be connected.

The frame member 92 is hollow and preferably rectangular in cross section, to slidably support hollow bars 108 provided with reinforcing blocks 110 in their outer ends. Brackets 112 comprising yokes for supporting wheels 114 are provided with stub shafts 116 rotatively adjustable in registering openings in the bars and blocks as best shown in Fig. 8, and nuts 117 are threaded on the shafts to retain the brackets on the frame. Pins 118 mounted in vertically arranged holes 120 in the bars and blocks may be inserted selectively in angularly related apertures 122 and 124 in the shafts for latching the brackets in rotatively adjusted position, as indicated in solid and dotted lines in Fig. 8.

The wheel brackets may thus be locked in suitable position to roll vertically over the face of a wall when the platform moves vertically, and may be adjusted to enable the wheels to roll horizontally over the face of the wall when the base is moved over the ground alongside the wall.

The stub shafts may be provided with any desired number of angularly related apertures for effecting adjustment of the wheel brackets to cause the wheels to roll over paths at any desired angles in correspondence with the arc described by tilting movement of the mast.

Referring again to the base and Figs. 9 and 10, brakes are provided including clamping fingers 126 and 128 arranged beneath the webs of the wheel brackets and between the flanges thereof, and movable laterally toward and from opposite sides of the tires on the wheels. The rear ends of the fingers are supported by and slide laterally on strips or brackets 130, and are spaced by blocks 132. The bracket strips 130 are supported by pins 134 extending upwardly through the bracket strips 130 and blocks 132 into the webs of the wheel brackets 40. The blocks 132 are slightly thicker than the vertical width of the rear ends of the fingers to permit the fingers to slide freely on the strips.

A screw 136 has free rotative mounting in the flanges of each wheel bracket 40, and has oppositely threaded portions 138 and 140 engaged in suitably threaded apertures in the respective fingers. Rotation of the screw in opposite directions by a handle 142 may move the fingers toward or from the sides of the wheel tire, to engage the front ends of the fingers with the tire and frictionally latch the wheel against rotation, or release the fingers from the wheel.

A modified form of base-adjusting screw and screw mounting is shown in Figs. 11 and 12, to provide the pivotal and rotative connection of the lower end of the screws 44

with the wheel brackets 40. In this form, spherical-like knobs 144 on reduced necks 146 at the lower ends of the screws engage in inverted semi-spherical-like sockets or cages 148 fixed to the upper faces of the webs of the wheel brackets 40 as presently described.

Each socket member 148 includes a relatively thick base or plate 150 having portions extending diametrically oppositely from a central circular opening 152 to form flanges 154 having apertures 156 through which bolts may be inserted to fasten the socket members to the wheel brackets. The socket is provided with a laterally directed, vertical slot 160 opening through the base, as at 158, and terminating in a curved end wall 162 offset from the center of the opening 152 to allow centering of the screw in the socket member.

To assemble the screw and socket member, the neck is passed through the base slot portion 158 and the knob 144 thus moved through the opening 152 into the socket. The socket member is then pivoted on the knob to cause the neck to pass along the slot to the stop wall 162.

The lower end of the knob is then spaced from the base, and a longitudinal bearing case 164 fitting snugly in the circular base opening 152 is inserted therein, and is stopped by a shoulder 166. The case has inwardly projecting flanges 168 retaining annular ball races 170 for ball bearings 172.

The socket member thus connected with the screw and holding the bearings is then fixed to the wheel bracket 40, with the slot in a plane parallel with the axis of the mast base 12. The bearing case rests on the bracket web and the bearings support the screw. The screw thus has rotative connection with the base, and may pivot due to the fact that the neck 146 may move in the slot portion 160. The ball bearings thus act on the knob of the screw in both rotative and pivotal movements of the screw.

In using the invention in the form above described, the mast and conduit may be collapsed to form a compact unit having only slightly greater length than the outer mast tube. For assembling at a place of work, the mast may be mounted in the base by causing the tongues 18 to enter the slots 16. The mast may then be braced in desired position, for example in substantially perpendicular relation with the base, by connecting the chains 32 to the hooks 34 on the turnbuckles 36.

Attention is called to the fact that the chains are connected to the base ends 30 at points substantially above the upper face of the base, and thus tend to prevent sidewise tipping of the mast.

The platform is then mounted by fastening the clamp around the topmost mast section, and screwing the nut 56 on the coupling 54.

The device may be set up adjacent a wall to lean against the same.

A pressure medium such as air may be admitted to the conduit through the cap 96 and nipple 58, and is distributed to all the conduit sections through the channeled plugs, and passes from each section through small ports 78 and channel 81 into the several mast chambers.

All of the mast sections will thus be operated on coincidently by the pressure medium.

The different resistances offered by the several movable mast sections will be overcome by forces of the separate portions of the medium acting in chambers of different capacity and against pistons of different diameters.

The result will be equal movement of all the movable mast sections.

The operator may close the valve to retain the pressure medium at any desired elevation of the platform, and may manipulate the valve to lower or further raise the platform. The wheels will be adjusted to roll vertically over the wall while the platform is being lowered or elevated. When the base is rolled along the supporting surface, the wheels may be repositioned to roll along the wall.

The brackets 40 which support the base wheels may be adjusted on their pivots to level the base or to cause the base to seat on the supporting surface.

Attention is called to the fact that the several chambers in the mast are sealed from each other and communicate separately with the several sealed chambers in the distributing conduit. Should any mast section be punctured and allow air to escape therefrom, the mast could retract suddenly only to the extent of movement of the mast section that telescopes into the punctured section and even then the movement is dependent upon the rate of escape of air through the fracture. Sufficient air pressure would be maintained in the conduit and in the other mast sections to prevent their rapid descent due to the fact that the air can escape from the other sections only as fast as it can escape through the ports 78 and 81. Further delay in the retraction of the mast may be obtained by admitting additional air through the supply line 104.

The invention has for convenience and clarity been described as embodied in a device adapted to lean against a wall. A mast having a tube provided with any suitable devices for a particular service, may be tiltably mounted on a base adapted for the service. for adjusting the angular relation of the mast to the base, or to a supporting surface, or assuring vertical position of a mast whatever the angular relation of the base to a supporting surface may be. When the angular relation of the base to a supporting surface is also adjustable, as shown, the base itself may

be adjusted to vary the inclination of the mast in one or more directions or to cause a mast that extends perpendicularly to the base to assume a truly vertical position.

The mast may thus be caused to extend vertically or at any desired angle to a support, whatever the relation of the base to the support may be, and whether the base is mounted on a supporting surface such as the ground for upward extension of the mast or on an intermediate supporting frame such as the chassis of a motor truck.

What I claim and desire to secure by Letters Patent is:

1. A device of the character described including a plurality of telescoping outer and inner tubes, pistons on said inner tubes having registering apertures, and a series of telescoping pipes extending through said apertures and having ports for delivering a pressure medium to the respective outer tubes.

2. In a device of the character described including telescoping tubes, a conduit including telescoping sections having outlet ports into the tubes, pistons closing communication between said tubes and sections except through said ports, and means for delivering a pressure medium to act on the pistons.

3. A device of the character described including a series of telescoping outer and inner tubes, pistons on said inner tubes sealingly engaging said outer tubes, a series of outer and inner telescoping conduit sections fixed to the respective pistons and having ports for delivering a pressure medium to the outer tubes, and pistons on said conduit sections having openings affording communication between the conduit sections.

4. In a mast of the character described, a series of telescoping tubes, a series of telescoping conduit sections associated with the telescoping tubes and each having communication with a corresponding telescoping tube for distributing a pressure medium to the telescoping tubes, and means for delivering a pressure medium to the telescoping conduit sections.

5. In a device of the character described including a series of telescoping fluid-retaining tubes decreasing in diameter in one direction and a series of telescoping conduits communicating with the fluid retaining tubes and decreasing in diameter in the opposite direction to the corresponding fluid retaining tubes for delivering fluid to said fluid retaining tubes.

6. In a device of the character described including an extensible member comprising a plurality of hollow sections, a series of telescoping conduit sections provided with ports communicating with the respective hollow sections, and having apertures having greater effective area than said ports for affording communication between said conduit sections.

7. In a device of the character described, an extensible member including a plurality of hollow sections, pistons on selected sections, a series of telescoping conduit sections associated with the hollow sections and having ports communicating with the respective hollow sections, plugs in similar ends of said conduit sections and provided with apertures having greater effective area than said ports, and means for supplying a pressure medium to the conduit sections for distribution through said apertures for discharge through said ports to effect extension of said member.

8. In a mast of the character described, a series of telescoping tubes, a second series of telescoping tubes mounted within the first series and having ports communicating with the respective tubes in the first series, means for supporting the inner tubes from the corresponding outer tubes to form individual fluid receiving chambers in each of the outer tubes, and means for admitting a fluid under pressure to one of the series of tubes for flow through said ports to said chambers in the other series of tubes to effect extension of the mast.

9. In a mast of the character described, an outer series of telescoping members, an inner series of telescoping members arranged within and having communication with the outer series of telescoping members, and means for admitting a pressure medium to one of said series of telescoping members to effect extension of the mast.

10. A mast of the character described including a series of telescoping outer and inner tubes, sealing means on said inner tubes sealingly engaging said outer tubes, a series of outer and inner telescoping conduit sections supported by said series of telescoping tubes and having ports for delivering a pressure medium to the telescoping tubes, sealing means on said inner conduit sections for sealingly engaging the outer conduit sections, and means for delivering a pressure medium to the series of telescoping conduit sections for distribution through said ports to effect extension of said tubes.

11. A mast of the character described including a series of telescoping outer and inner tubes, sealing means on said inner tubes sealingly engaging said outer tubes, a series of outer and inner telescoping conduit sections arranged reversely with relation to said series of telescoping tubes and having ports for delivering a pressure medium to the telescoping tubes, sealing means on said inner conduit sections for sealingly engaging the outer conduit sections, and means for delivering a pressure medium to the series of telescoping conduit sections for distribution through said ports to effect extension of said tubes.

In testimony whereof I affix my signature.

FRED A. BIRD.