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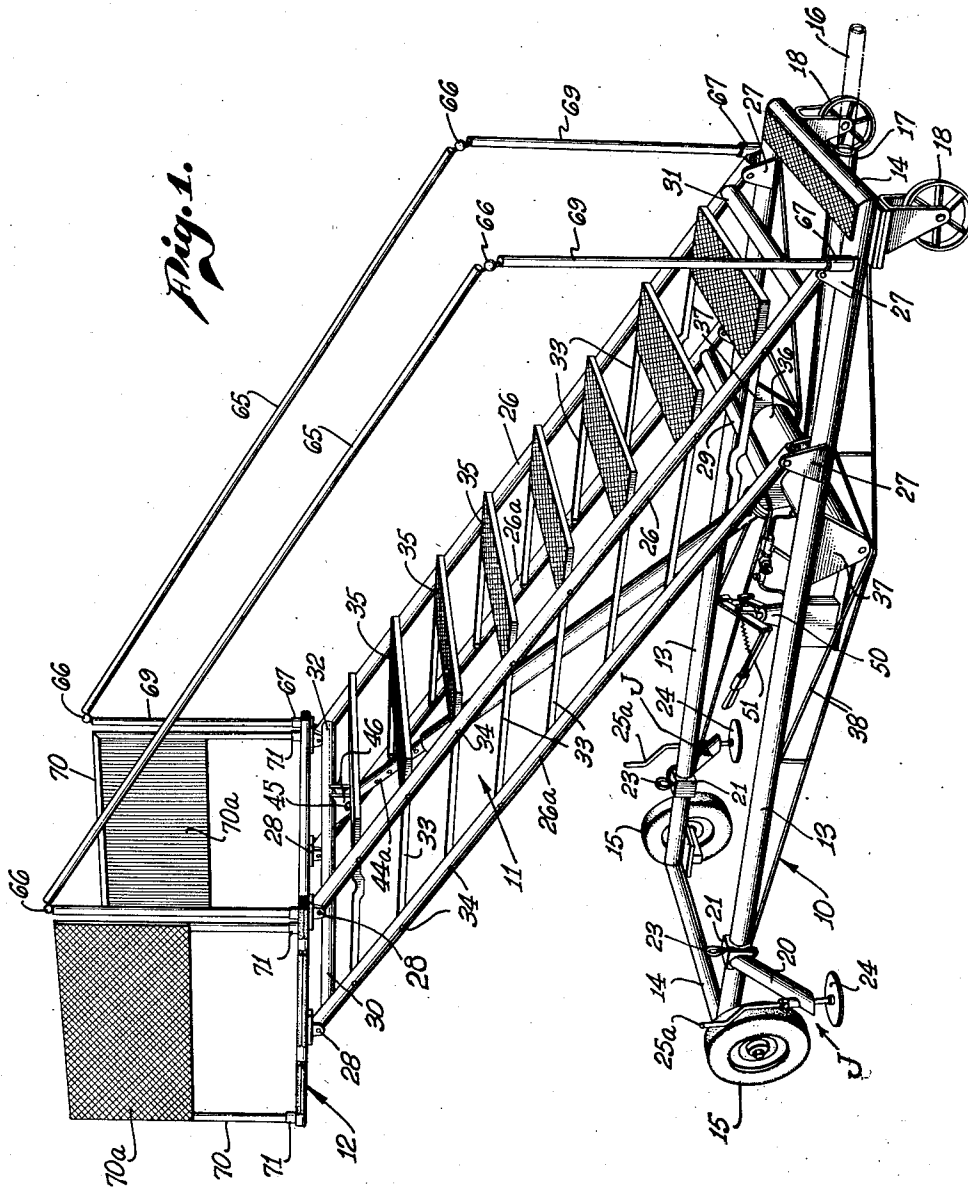
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2,362,170

PORTABLE FOLDING SCAFFOLD

Filed Aug. 10, 1942

3 Sheets-Sheet 1



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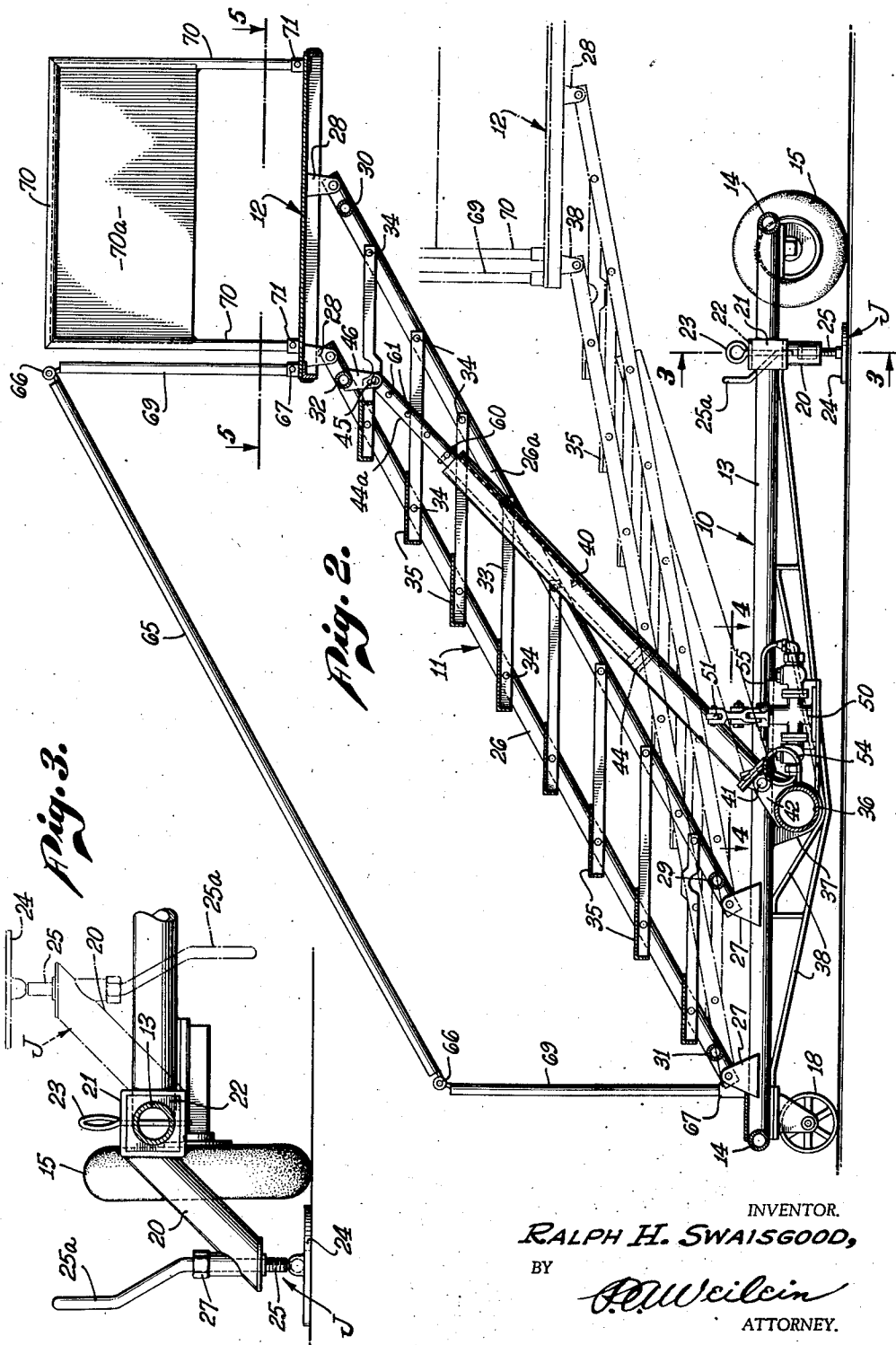
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3 Sheets-Sheet 3

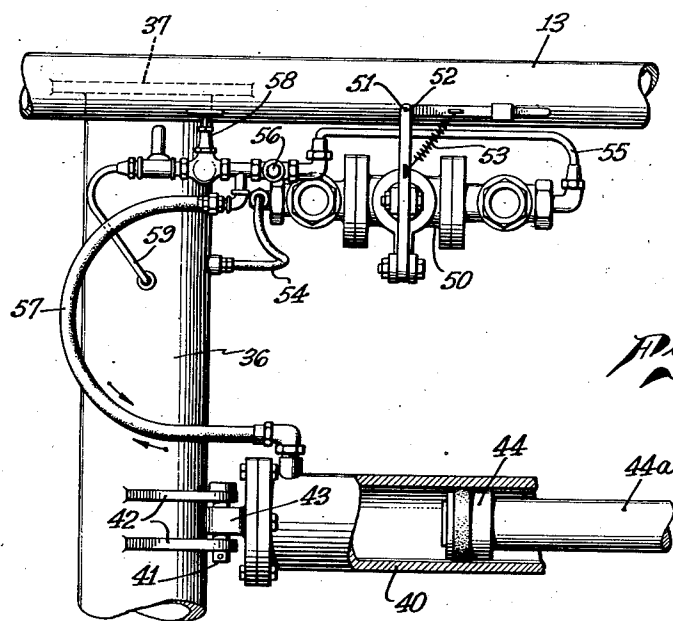


Fig. 4.

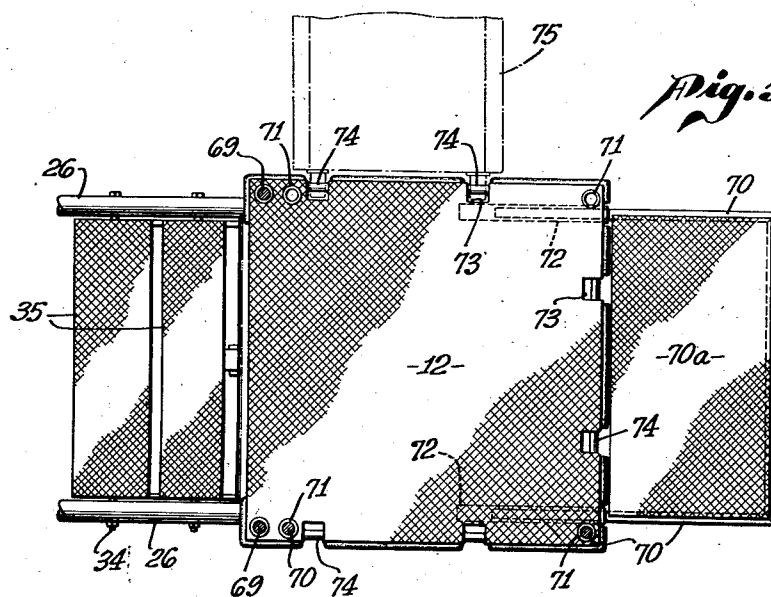


Fig. 5.

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PORTABLE FOLDING SCAFFOLD

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14 Claims. (Cl. 304-29)

This invention relates to adjustable wheeled staging, and particularly to the type intended for use in the servicing of airplanes and similar equipment.

The variation in height of various parts of airplanes requiring servicing necessitates the use of some sort of platform for the personnel adjusting and repairing the planes. The numerous tasks performed around an airdrome, especially in military operations, require that a staging be provided which can be adjusted to different heights rapidly. At the same time mobility of the staging is a primary requirement, as it is necessary to keep the field clear at all times. In addition to this, the staging must be adjustable not only in height but also to alter the shape of the platform upon which the personnel work.

It is therefore an object of the present invention to provide a staging for use in the servicing of airplanes which can be readily adjusted in height.

It is a further object of the present invention to provide a staging which in lowered position has a low center of gravity, permitting it to be towed over rough terrain without danger of overturning.

It is a further object of the present invention to provide a staging which can be readily moved about both when in an operative and inoperative position.

It is a further object of the present invention to provide a staging with a platform which can be readily adjusted to different sizes.

It is a further object of the present invention to provide an adjustable staging which is stable in all positions of adjustment.

It is a further object of the present invention to provide a staging employing steps, the treads of which will always remain in proper position regardless of the height at which the staging is set.

This invention possesses many other advantages and has other objects which may be made more easily apparent from a consideration of one embodiment of the invention. For this purpose there is shown a form in the drawings accompanying and forming part of the present specification. This form will now be described in detail, illustrating the general principles of the invention; but it is to be understood that this detailed description is not to be taken in a limiting sense, since the scope of the invention is best defined by the appended claims.

Referring now to the drawings:

Figure 1 is a general perspective view of a device embodying the present invention;

Figure 2 is a longitudinal vertical section through the device shown in Figure 1;

Figure 3 is an enlarged fragmentary section taken along line 3-3 of Figure 2;

Figure 4 is an enlarged fragmentary view taken on line 4-4 of Figure 2; and,

Figure 5 is a fragmentary plan view of the device, taken on line 5-5 of Figure 2.

In general, the device comprises a wheeled base 10, pivotally supporting a ladder or step structure 11, carrying a working platform 12. The platform 12 can be raised and lowered by swinging the ladder structure about its pivotal mounting, which is accomplished through telescopic elevating means connecting the base and the step structure.

The base 10 comprises a pair of longitudinal tubular members 13, which are welded or otherwise secured to transverse tubular members 14, thus forming a rigid supporting frame for the ladder structure and operating means therefor. The base 10 is supported on wheels, the pair of wheels 15 on one end of the base being preferably pneumatically tired, in order that the entire structure may be rapidly moved by lifting the other end of the base and towing from a vehicle. This towing may be done by means of a tow bar 16 telescopically mounted within a tube 17 secured to the base 10. The other pair of wheels are in the form of casters 18, which serve to permit the structure to be moved around manually until it is in the desired position with reference to the machine undergoing repair.

When the device is in position and the workmen are on the platform 12, it is necessary to assure that the device does not sway under their weight. For this reason the main weight of the device is removed from the pneumatically tired wheels 15 by means of the jacks J. For convenience and ready adjustment these jacks are made a part of the entire structure and comprise struts 20 having collars 21 secured to their inner ends. The collars may be of square or any other suitable non-circular cross sectional configuration, as shown most clearly in Figure 3. The frame members 13 of the base have formed thereon corresponding non-circular portions 22 for receiving the collars 21, so that when the collars 21 surround the portions 22 the struts 20 are rigidly held in place against rotation about the frame members 13. Thus, as shown most clearly in Figure 3, the jacks can be held in the dotted line or inactive position or in the ground engag-

ing or active position, when the collars are over the non-circular portions of the frame members 13. By sliding the entire jack structures longitudinally of the frame members, the collars can be moved from the non-circular portions onto the round portions of the tubular frame members 13, and freely rotated or swung from one position to the other, after which the jacks can be again moved over the non-circular portions of the frame. The collars 21 are normally held on the non-circular portions 22 by means of pins 23 passing through aligned openings in the collars 21 and the tubes 13.

The struts 20 are provided on their outer ends with plates 24 for engaging the ground. These plates are made adjustable with respect to the struts 20 by screws 25 passing through threaded openings in the members 27 secured to the struts 20. The connections between the screws 25 and the plates 24 are preferably in the form of ball and socket joints to permit the plates 24 to adjust themselves to the unevenness of the ground. The screws 25 may be rotated by means of cranks 25a formed on the upper ends thereof.

As was said before, the ladder structure 11 is pivoted to the base 10, and the working platform 12 is supported on the ladder structure. The ladder structure comprises two pairs of upright members 26 and 26a, suitably connected to each other and to the base and platform to form a support for the platform and for the ladder steps. These four uprights are pivoted at their lower ends to lugs 27 welded to the side frames 13 of the base. They are similarly pivotally connected at their upper ends to lugs 28 depending from the lower side of the platform 12. Cross members 29 and 30 are welded to the top and bottom of the uprights 26a and similar cross members 31 and 32 are welded to the uprights 26, thereby forming a pair of rigid rectangular frames which prevent sideways swaying of the platform under the weight of those working on it. The position of the pivots on the base and on the platform assures that the frames so formed remain parallel throughout the entire path of movement of the platform 12. The platform thus always remains parallel to the base 10.

The parallel frames formed by the members 26 and 26a conveniently support a plurality of steps. These steps are formed by U-shaped bars 33, having their sides extending from one frame to another and pivoted thereto as at 34. Treads 35 may be formed by means of sheet metal members welded or otherwise secured to the bars 33.

In order to raise and lower the platform, any suitable means may be utilized. For convenience of operation however, applicant has selected a hydraulic system. This hydraulic system comprises a cylinder 40 and a cooperating plunger 44. The cylinder is pivoted at its lower end to a cross member 36 on the base frame 10, by means of a pin 41 passing through lugs 42 and 43 on the cross member 36 and the cylinder 40 respectively. Similarly, the outer end of the piston rod 44a is pivotally connected to the cross member 32 of the ladder structure by a pin 45 passing through lugs 46 secured to the member 32 and through the end of the plunger rod 44a. Thus, upon relative longitudinal movement between the piston and cylinder, the ladder structure 11 is swung about its pivotal connections with the base 10 to alter the elevation of the platform 12.

An important feature of the present invention is the choice of the location of the pivotal mounting of the cylinder 40 with respect to the mount-

ing of members 26 and 26a. By placing this point of attachment 41 to base 10 quite close to the points of attachment of the members 26 and 26a, the angular movement of the cylinder and plunger assembly 40, 44 about pivot 41 is large while the relative movement between the plunger 44 and cylinder 40 and the resulting displacement is small, for a given angular movement of members 26 and 26a. In this way a simple jack comprising a cylinder and piston suffices to swing members 26 and 26a between the lowered or folded position shown by broken lines in Figure 2 and a fully raised or substantially vertical position without the use of connecting multiplying mechanism or the need of a piston formed of telescoping sections. Also the small displacement insures rapid action of the jack. Further, the clear space provided between the base 10 and the members 26, 26a by attaching the cylinder close to the members permits the end of the base 10 to extend under an overhanging part of a structure whereby the platform 12 may be positioned closely adjacent to or overhanging an upper part of such structure. When the device is folded as shown its center of gravity is such as to enable it to be towed rapidly over rough terrain without danger of its overturning.

The cross member 36 is tubular and is adapted to serve as a reservoir for the fluid operating the plunger. The ends of the tube 36 are welded to brackets 37 depending from the tubular frame members 13. Tension members 38 passing under the brackets 37 serve to prevent bending of the tubular frame members 13.

The mechanism for forcing fluid from the reservoir 36 into the cylinder 40 to elevate the platform, comprises a force pump 50 which is actuated by means of a lever 51. This lever or handle has been shown as having a joint 52 and a spring 53 holding it normally in a position shown in Figure 4. In operation, the lever 51 is simply straightened out and operated by vertical reciprocating movement. The force pump 50 is connected by a tube 54 to the reservoir 36, and a line 55 passes from the high pressure side of the pump to a one-way valve 56. From this one-way valve a tube 57 is connected to the interior of the cylinder 40. A hand operated valve 58 is connected to this tube 57 and to a tube 59 which is in turn connected to the reservoir 36.

The hydraulic operation should be clear from the above description. When it is desired to raise the platform, the valve 58 is closed and the pump operated by reciprocation of the lever 51. This draws fluid from the cylinder 36 through the tube 54, and forces it through the tube 55, through the one-way valve 56, and through the tube 57 to the interior of the cylinder 40 behind the plunger 44. When it is desired to lower the platform the valve 58 is opened, which permits fluid to flow back through the tube 57, valve 58, and tube 59 to the reservoir.

Safety means is employed for preventing the platform from lowering in the event of leakage in the hydraulic system. A pin 60 is passed through one of the openings 61 in the piston rod 44a. This pin engaging the uppermost end of the cylinder 40 prevents the piston rod from being forced into the cylinder under the weight imposed on the platform, even though the piston leaks.

In order to safeguard those working on structures of this kind, guard rails 65 are provided on opposite sides of the steps. The ends of these guard rails are hingedly connected at 66 to up-

rights 69 secured at 67 to the base frame 10 and the platform 12. The pivotal connections between the guard rails and uprights permit movement of the platform and ladder assembly while maintaining the guard rails 65 in substantial parallelism with the side members of the ladder.

The platform itself may be similarly protected by side guards 70, which may be removably secured to the platform in sockets 71. In addition to being removable, the guards 70 are also provided with a solid panel 70a, whereby they can be made to form a supplemental part of the platform 12. As shown in Figure 5, one of the guards 70 is inserted into sockets 72 which are secured to the underside of the platform in substantially parallelism with the working surface of the platform 12. After such insertion the guard panel 70a serves as an extension to the platform 12. It will also be noted in Figure 5 that cut-out portions 73 of the platform leave exposed small tubular sections 74 of the platform frame. The purpose of this is to allow an additional platform 75 to be hooked thereover, as indicated in dotted lines, Figure 5.

I claim:

1. A stand for use in the servicing of airplanes and the like comprising, a base member, a pair of parallel elongated members pivoted thereto, a platform pivoted to said elongated members, a plurality of steps pivoted on one of said parallel members, means raising and lowering said platform member, and means maintaining said step members parallel to said platform during movement thereof, said means comprising an extension on each step pivotally connected to the other parallel member.

2. A stand for use in the servicing of airplanes and the like comprising, a base member, a pair of frames pivoted to the base member, a platform pivoted to said frames, said platform, said base and said frames forming a parallelogram, a hydraulic plunger and cylinder assembly pivoted to said base member and to one of said frame members, the point of attachment between said assembly and the base being closely spaced to the point of attachment of said frames to the base, whereby operation of said plunger and cylinder moves said platform through a distance greater than the relative movement between said plunger and said cylinder.

3. A stand for use in the servicing of airplanes and the like comprising, a base frame, a platform, means mounting said platform for movement to different elevations with respect to said base frame, a hydraulic reservoir extending from one side to another of said base frame, a hydraulic plunger and cylinder assembly supported by said reservoir and operatively connected to said platform, whereby operation of said cylinder and plunger assembly changes the elevation of said platform.

4. In a stand for servicing airplanes, a horizontal platform member, a guard having a pair of post members extending therefrom and adapted for mounting to support said guard in a substantially vertical position, and a pair of sockets on said platform member for optionally receiving said post members and supporting said guard in a substantially horizontal position to form an extension of the platform.

5. A wheeled platform for use in the servicing of airplanes comprising a base member having ground engaging wheels thereon, a platform mounted for elevation with respect to said base member, and supporting means respectively ad-

jacent to at least some of said wheels and swingably mounted on said base member for movement between active and inactive positions, each of said means including a member optionally movable into ground engaging position when said means is in active position, for supporting the base in lieu of the adjacent wheel, said means when in inactive position supporting said member a substantial distance from the ground.

6. A jack for use in supporting a wheeled vehicle comprising a non-circular portion on the frame of said vehicle, a corresponding non-circular sleeve surrounding said non-circular portion, a ground engaging element operatively connected to said sleeve, said sleeve being movable axially of said frame to clear said non-circular portion, whereby said support may be rotated out of or into ground engaging position.

7. A jack for a wheeled vehicle comprising a non-circular portion on the frame of said vehicle, a corresponding non-circular sleeve engageable with said non-circular portion, a strut extending from said sleeve, a ground engaging element adjustably mounted on said strut, said sleeve being movable to clear said non-circular portion of said frame whereby said strut can be rotated from a position in which the ground engaging element engages the ground to a position in which said element clears the ground.

8. A stand for use in servicing airplanes and the like comprising, a structure including a base member, a platform, and means for mounting said platform on said base for raising and lowering said platform with respect to the base, including an elongated member pivotally secured at its opposite ends respectively to the base and to the platform, and means for raising and lowering said platform including a pair of relatively movable telescopic elements pivotally secured respectively to the base and to the upper end of said structure, said point of attachment between the base and the element secured thereto being so spaced with respect to the point of attachment between said member and the base as to give a large angular movement of said elements with respect to the base and a small relative movement between the elements for a given angular movement of said member.

9. A stand for use in servicing airplanes and the like comprising, a structure including a base member, a platform, and means for mounting said platform on said base for raising and lowering said platform with respect to the base, including an elongated member pivotally secured at its opposite ends respectively to the base and to the platform, and means for raising and lowering said platform, comprising a cylinder and plunger assembly forming relatively movable elements, the plunger being movable between limits in the cylinder, said elements being pivotally secured respectively to the base and to the upper end of said structure, said point of attachment between the base and the element secured thereto being so spaced with respect to the point of attachment between said member and the base that at one extremity of relative movement between said elements, said member is substantially vertical with respect to the base and at the other extremity of movement between the elements, said member makes a small angle with the base.

10. A stand for use in servicing airplanes and the like comprising, a structure including a base member, a platform, and means for mounting said platform on said base for raising and lowering said platform with respect to the base, in-

cluding an elongated member pivotally secured at its opposite ends respectively to the base and to the platform, and means for raising and lowering said platform, comprising a cylinder and plunger assembly forming relatively movable elements, the plunger being movable between limits in the cylinder, said elements being pivotally secured respectively to the base and to the upper end of said structure, said point of attachment between the base and the element secured thereto being so spaced with respect to the point of attachment between said member and the base that at one extremity of movement between said elements, said member is substantially vertical with respect to the base and at the other extremity of movement between the elements, said member makes a small angle with said assembly.

11. A stand for use in servicing airplanes and the like comprising, a structure including a base member, a platform, and means for mounting said platform on said base for raising and lowering said platform with respect to the base, including an elongated member pivotally secured at its opposite ends respectively to the base and to the platform, and means for raising and lowering said platform including a pair of relatively movable telescopic elements pivotally secured respectively to the base and to the upper end of said structure, said point of attachment between the base and the element secured thereto being so spaced with respect to the point of attachment between said structure and the base that said platform is adapted to overhang the base and

provide a clear space open at one side between the platform and the base.

12. Apparatus for use in servicing airplanes including a pair of stands, each stand comprising a base, a pair of frames pivoted to the base, a platform pivoted to said frames, means for adjusting the height of said platform with respect to said base, said base, said frames and said platform forming a parallelogram in all adjusted positions of the platform, a plurality of steps pivoted to one of said frames, means maintaining said steps parallel with the platform, an additional platform extending between said first mentioned platforms, and means detachably supporting said additional platform on said first mentioned platforms.

13. In a hydraulic cylinder and plunger assembly for adjustably supporting a platform, packing means carried by the plunger for sealing against the wall of the cylinder, and means adjustably carried by the plunger and adapted to engage the end of the cylinder for limiting movement of the plunger into the cylinder.

14. In a hydraulic cylinder and plunger assembly for adjustably supporting a platform, packing means carried by the plunger for sealing against the wall of the cylinder, there being a series of transverse openings through the plunger, and means optionally engageable with any one of said openings for cooperating with the end of the cylinder to limit inward movement of the plunger with respect to said cylinder.

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