

Jan. 14, 1958

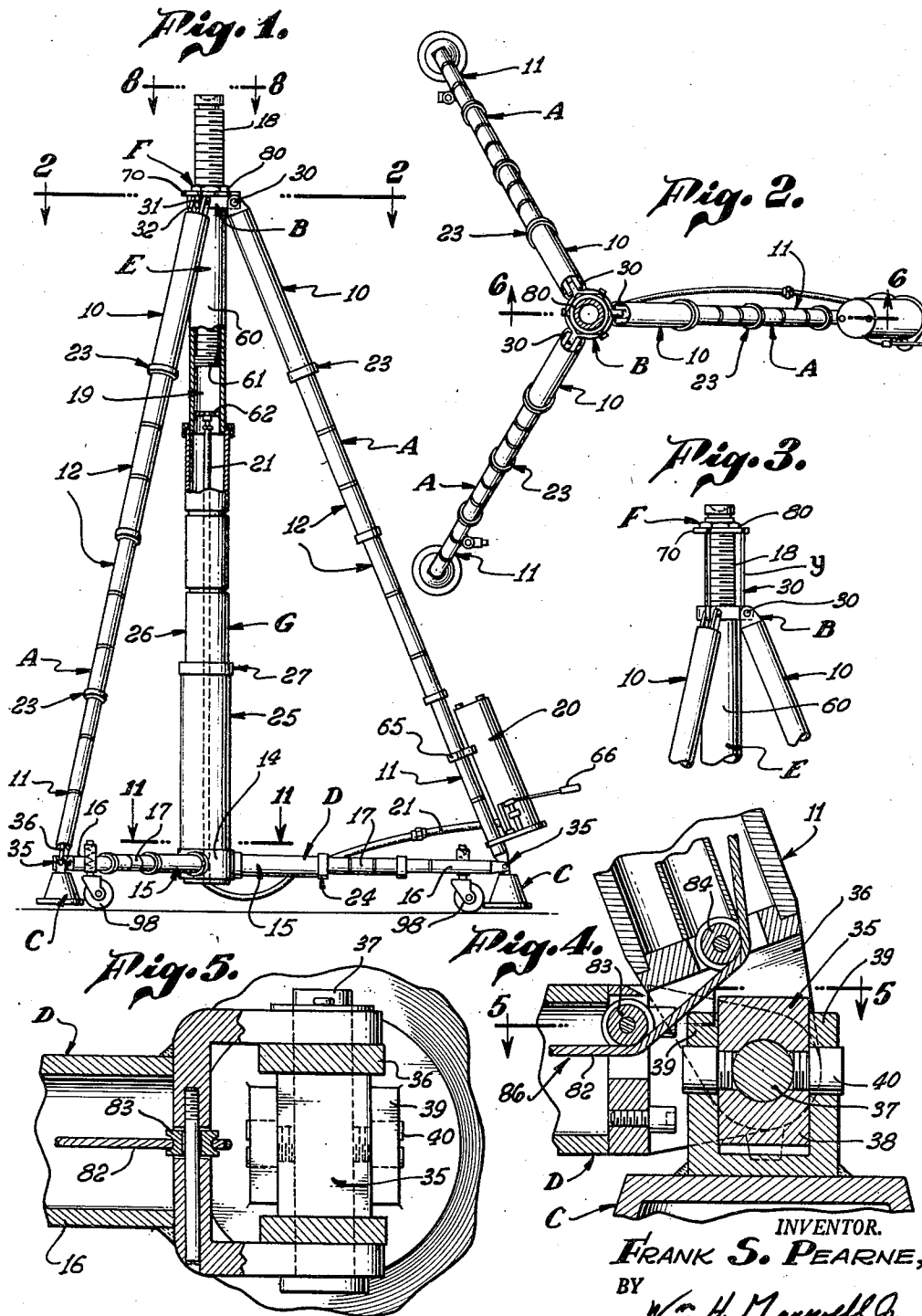
F. S. PEARNE

2,819,873

LOAD HANDLING APPARATUS

Filed Aug. 17, 1953

2 Sheets-Sheet 1



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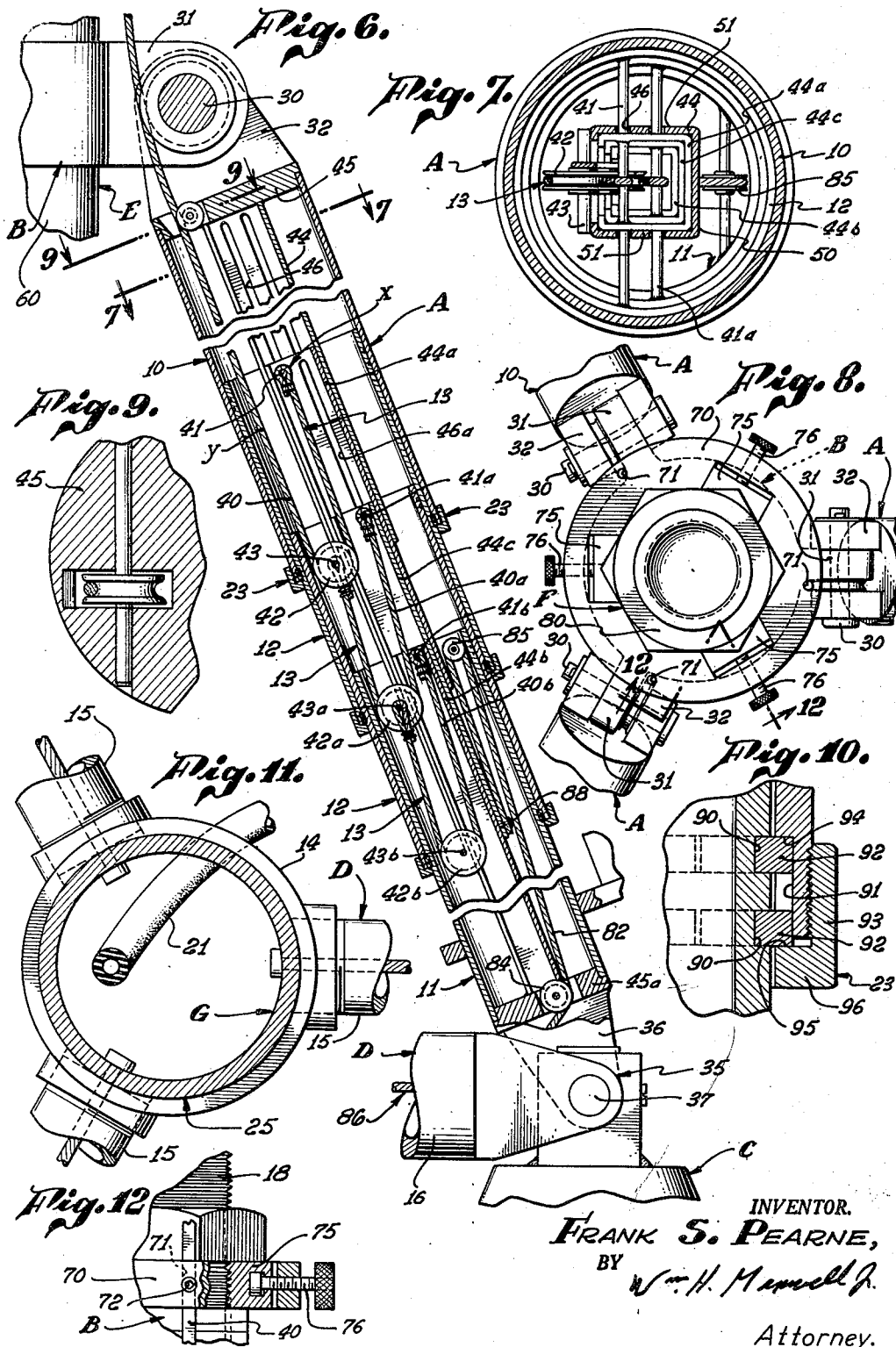
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2 Sheets-Sheet 2



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LOAD HANDLING APPARATUS

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Application August 17, 1953, Serial No. 374,543

3 Claims. (Cl. 254—148)

This invention has to do with load handling apparatus, and it is a general object of the invention to provide apparatus including an extensible support and means carried by the support adapted to operate the support and engageable with work or with a load to either move and/or support it.

There are various situations where work or objects require support and may require movement or lifting to a position where they are to be supported. An example of such a situation is present in the aircraft industry where, for example, an element of a heavier than air craft, such as a wing, may, while the craft is on the ground, require support, either merely a stabilizing support or possibly a complete bearing of the member, and in such a case, it is sometimes necessary to move or elevate the wing somewhat.

It is, of course, recognized that jacks are commonly used with the general class or type of service referred to; however, the ordinary jack construction, unless exceedingly large, cumbersome and expensive, is not practical for the service mentioned, and the ordinary jack construction is, for this type of service, impracticable as its travel or range of operation is ordinarily very little.

It is a general object of this invention to provide a load handling apparatus serviceable wherever a load is to be supported or moved and characterized by an extensible support carrying an operating means by which the support is operated and serviceable to engage the load to either load it or to move it relative to the support following extension of the support.

Another object of this invention is to provide a load handling apparatus of the general character referred to wherein there is an extensible support in the nature of a tripod which support includes drive means by which it is operable from a collapsed to an extended position and includes lock means whereby it can be set in an extended position.

Another object of the invention is to provide a leg construction for apparatus of the general character referred to characterized by relatively movable sections and mechanical drive means serviceable to operate the sections relative to each other, the construction as a whole being simple and inexpensive for manufacture and practical and dependable in operation.

Another object of the present invention is to provide apparatus of the general character referred to characterized by various improved, practical and effective combinations and arrangements of parts which serve to provide a mechanism effective in service and simple and convenient to operate.

The various objects and features of my invention will be fully understood from the following detailed description of a typical preferred form and application of my invention, throughout which description reference is made to the accompanying drawings, in which:

Fig. 1 is a side elevation of the apparatus provided by the present invention showing the support in an ex-

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tended position and located ready for service and showing the shiftable member provided by the operating means in an extended position where it is engageable with the work or load to move it relative to the support. A portion of the parts shown in this figure are broken away and shown in sections. Fig. 2 is a view of the structure shown in Fig. 1, being a view taken substantially as indicated by line 2—2 on Fig. 1. Fig. 3 is a view of a portion of the structure shown in Fig. 1 showing the connecting means between the shiftable member of the operating means and the drive means in the legs engaged and operating. Fig. 4 is an enlarged, detailed, vertical, sectional view taken at the lower end of the leg included in the apparatus at the outer end of an arm related to that leg showing details of construction employed to connect the arm and the leg. Fig. 5 is a view taken substantially as indicated by line 5—5 on Fig. 4. Fig. 6 is an enlarged, longitudinal, sectional view of the leg of the structure showing its upper end connected to the head of the structure and its lower end connected to an arm and support, the leg being shown in a retracted or collapsed position. Fig. 7 is an enlarged, detailed, transverse, sectional view taken substantially as indicated by line 7—7 on Fig. 6. Fig. 8 is an enlarged, detailed view of the apparatus, being a view taken substantially as indicated by line 8—8 on Fig. 1. Fig. 9 is a sectional view of a portion of the construction that I provide and taken substantially as indicated by line 9—9 on Fig. 6. Fig. 10 is an enlarged, detailed, sectional view illustrating one of the lock means included in the structure. Fig. 11 is an enlarged view taken substantially as indicated by line 11—11 on Fig. 1, and Fig. 12 is an enlarged side elevation of a portion of the structure shown in Fig. 8, being a view taken substantially as indicated by line 12—12 on Fig. 8 and showing certain parts broken away to show in sections.

The structure as provided by the present invention may, in practice, be employed or used in service as a mere support or a rest or it may be employed as a jack or as a combined jack and support. It is preferred in carrying out the invention to embody it in a leg type structure characterized by an adjustable or extensible leg construction. In a preferred embodiment of the invention a plurality of legs are provided, say for example, three of these legs are cooperatively related to form a structure which is in the nature of a tripod. In the embodiment of the invention illustrated in the drawings, there is a tripod construction characterized by like legs A connected to a common head B and each connected to a ground engaging support C. Each leg includes a plurality of relatively movable sections, for instance, they are telescopically related. In the case illustrated, each leg is shown as including, an upper end section 10, a lower end section 11, and a plurality of intermediate sections 12. Each leg, including the sections just named, includes drive means 13 between and connecting adjacent sections to effect relative movement thereon and therebetween.

The general construction further includes a base D characterized by a central hub 14 and a plurality of radially projecting arms, each of which has its outer end connected to the lower end portion of the leg. In the particular case illustrated, each arm includes an inner section 15, an outer section 16, and an intermediate section 17, the sections being relatively movable or telescopically related so that the arm construction is subject to being extended or adjusted.

The present invention provides an operating means E characterized by a member 18 adapted to move relative to the legs or to the head to which the legs are connected, and in the preferred form of the invention, a fluid pres-

sure actuated means 19 is provided to operate the member 18 and a pressure generator or pump 20 is related to the means 19 and is connected thereto by means of a fluid handling duct 21.

The present invention provides a releasable means F adapted to connect the shiftable member 18 of the operating means E with the drive means 13 of the legs to effect simultaneously operation of the drive means 13 and consequent simultaneous operation of the several legs of the structure.

The invention provides a column G between and connecting the base D and the means E. Further, each leg preferably includes lock means 23 adapted to lock the leg sections against relative movement, and the arms 17 of the base D include lock means 24 adapted to lock the arm sections against relative movement. In the preferred construction, the column G includes relatively movable sections, for instance, a lower section 25 and an upper section 26, and a lock means 27 is provided to lock the sections 25 and 26 against relative movement and to lock the column against movement relative to the means E.

Considering the construction more specifically, each leg is a straight, rigid mechanism made up of the sections 10, 11, and 12 of the drive means 12, and of the lock means 23. In the construction illustrated, a pivot pin 30 is provided to connect the upper end of the upper end section 10 of each leg to the head B. In the particular construction illustrated, engaged or over-lapping lugs 31 and 32 project from the head B and leg section 10, respectively, and the pin 30 extends between and connects the lugs. The head B may be an independent element carrying the means E or it may be formed as a part of the means E, it being, in effect, a part of the structure by which the upper ends of the legs are connected to the means E. When the structure includes three legs, it is preferable that they be connected to the head B so that they are equally spaced above the vertical axis of the structure or, in other words, so that they are spaced 120° apart.

In a preferred form of the invention, a universal joint mechanism 35 serves to connect the lower end of the lower leg section to the ground engaging support C. In the particular case illustrated, lugs 36 project from the lower end of the end section 11 and carry a pivot pin 37 that supports a block 38 between the lugs 36. Lugs 39 project up from the support C and receive the block 38, and pivot members 40 pivotally connect the lugs 39 and the block 38. The members 40 are on an axis at right angles to that of the pivot 37 with the result that the construction just described provides a universal connection between the support C and the lower end of the leg related thereto.

In the form of the invention illustrated, the leg sections vary in size from one end to the other so that they will fit one into the next, and in the case illustrated, the largest leg section is at the upper end of the leg and the smallest at the lower end of the leg. The leg sections are preferably straight, simple, tubular elements, round in cross section, and they are telescopically related so that adjacent leg sections are movable or shiftable relative to each other to effect variation of the leg between a retracted position where it is of limited length and in an extended position where it is of substantial length.

In carrying out the invention, should a leg construction be employed where there are but two relatively movable leg sections, there needs to be but one drive means to effect relative movement by the leg sections. Where the leg involves an elongate series of leg sections as shown in the drawings, a plurality of drive means are employed, one in each portion of the leg where sections adjoin. In the particular case illustrated, there is a drive means 13 acting between the upper end section 10 and the adjacent intermediate section 12, there is another drive means acting between adjoining intermediate sections, and there is another drive means 13 acting between the lowermost intermediate section and the lower end section 11. The several drive means 13 employed in the construction are

all substantially alike as will be apparent from a consideration of Fig. 6 of the drawings.

The drive means 13, as provided by the present invention, to effect relative movement between adjoining leg sections, is a mechanical means. Referring at first to the drive means 13 related to or connecting the upper end leg section 10 and the adjacent intermediate leg section 12, this means includes a single, flexible line 40 having a portion x anchored to the section 12 at the upper end portion thereof as, for instance, by means of a pin 41 and extending downward from that point to a part 42 at the lower end portion of section 10 and having a portion y extending up from the part 42 through the section 10 and from the upper end thereof for connection to collar 70 (Fig. 3). In the construction provided by the invention, the part 42 is a pulley on a pivot pin 43, which pivot pin is supported by a carrier 44 that depends downwardly in the leg section 10 from the upper end portion thereof where it is held by a member 45 in the form of a plate fixed to the upper end of the leg section 10.

The pivot pin 41 is carried by the upper end portion of leg section 12, that is, by the portion of the leg section 12 located within the section 10. The pin 41 extends transversely of the section 12 and through a longitudinal slot 46 in the carrier 44 so that the pin extends through the carrier 44, the line section x being anchored to the pin 41 within the carrier 44. The slot 46 is of substantial length, and the operation of the pin 41 in the slot 46 limits the relative movement that can occur between the sections 10 and 12.

In the preferred form of construction, the carrier 44 is substantially U-shaped in cross sectional configuration as shown in Fig. 7 of the drawings, so that it has a back 50 and sides 51 projecting from the back and spaced apart. The pivot pin 43 that carries the part or pulley 42 is carried by and extends between the projecting edge portions of the sides 51.

With the construction just described, when the sections 10 and 12 are together or in a collapsed position, the pin 41 is at the upper end portion of slot 46. When the line 40 is operated as by the means E acting through the means F, the portion y thereof is moved upwardly or pulled out of the upper end of leg section 10 with consequent downward movement of the anchored end of the line held by the pin 41. This results in downward movement of the leg section 12 relative to leg section 10.

The drive means E, connecting or related to the two intermediate leg sections 12, is substantially the same as the means 13 just described except that the carrier 44^a supporting the pulley 42^a, instead of being held by a member in the form of a plate, is held by the pin 41^a above described, and this carrier 44^a is locked within and slides relative to the carrier 44 above described. The pin 41^a, to which the line 40^a is anchored, extends through a slot 46^a in carrier 44^a and operates in a slot 46^a in carrier 44, and is supported by the upper end portion of the lowermost intermediate section 12. The portion of line 40^a, extending up from the pulley 42^a, extends up and is connected to or anchored at the pin 43 carrying the pulley 42 to be thus anchored at a point which is at or above the upper end portion of the lowermost intermediate section 12.

Since the carrier 44^a is connected to the uppermost intermediate section 12 by the pin 41, when the uppermost section 12 moves down relative to section 10, the pulley 42^a carried by the carrier 44^a moves downwardly. As pulley 42^a is thus moved downward relative to pulley 40 where line 40^a is anchored, the line 40^a effects downward movement of the lower section 12 as it moves the pin 41^a downward, and this pin is anchored to the upper end portion of the lower section 12. It is to be observed that the carrier 44^a is of the same shape as the carrier 44 but is smaller and fits in carrier 44 to operate longitudinally therein.

In the case of drive means 13 between or connecting

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the lowermost intermediate section 12 and the lower end section 11, the line 40^b thereof is anchored to pin 41^b, extends down and around a pulley 42^b and is anchored to the pin 43^a carrying pulley 42^a above described. In this case a carrier 44^b is supported by or in the lower section 11 as by means of a plate member 45^a at the lower end of section 11, while the pin 43^b carrying pulley 42^b is supported by a carrier 44^c around carrier 44^b and within the carrier 44^a and secured against movement relative to the lowermost intermediate section 12 by the pin 44^a.

From the foregoing description and from a consideration of Fig. 6 of the drawings, it will be immediately apparent that each of the means 13 in the leg are substantially alike both in construction and action except that the portion y of the line of the uppermost means 13 extends out of the leg at the upper end thereof instead of being anchored within the leg as is the case of the means 13 below the uppermost part. It will be observed from the drawings, particularly from Figs. 6 and 7 of the drawings, that the carriers supporting the pulleys within the leg are telescopically related and shiftable relative to each other, and being U-shaped in cross section, they accommodate the lines and handle the pulleys so that there is no interference between these parts. Through the construction provided, each section of the leg has a pulley carrier therein and connected or anchored thereto against movement lengthwise relative thereto.

The operating means E characterized by the member 13, which is adapted to shift relative to the legs A, is serviceable as a means effective to operate the means 13 incorporated in the legs and is also operable to handle a load or an object relative to the tripod type support formed by the legs. The means E is preferably an elongate structure located centrally of the tripod formed by the legs A, and it is vertically disposed as shown in the drawings. In the case illustrated the shiftable member 18 is in the form of a rod vertically disposed and adapted to be operated through the head B to which the legs A are pivotally connected, and the fluid pressure actuated means 19 is carried by and depends from the head B and operates the rod 18. The means E, in the case illustrated, includes a cylinder 60 fixed to and depending from head B and a piston 61 operating in cylinder 60 and having the rod or member 18 connected thereto. An end or cap 62 closes the lower end of the cylinder 60, and the fluid handling duct 21 is connected with the cylinder through the end 62. In practice, the construction just described may be of any suitable length and may be such as to make possible the described movement or stroke of the member 18 relative to the head B to which the legs A are connected.

The pump 20 may, in practice, be located at any suitable point where it is accessible and convenient for operation. In the preferred construction, the pump 20 is located at or carried by the lower end portion of one of the legs A as by means of releasable brackets 65, and the pump includes a reservoir carrying a suitable supply of fluid and includes an operating member 66, such as a pedal or lever and, in practice, includes suitable valves and controls such as are common to structures of this type. The duct 21 is preferably a flexible member adapted to carry fluid and extends from the pump 20 to the hub 14 of base D and then up through the column G to the means 19.

With the construction just described the pump 20 can be operated to force fluid therefrom to the cylinder 60 so that piston 61 is forced upwardly causing upward movement of member 18 relative to head B. The pump is operated or released to allow return of fluid from the cylinder to the pump, then the piston 61 can lower in the cylinder resulting in the lowering of member 18 relative to head B.

The means F provides a releasable connection between

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the lines 40 of the uppermost means 13 of the legs and the member 18. In the particular case illustrated, the means F includes a collar 70 surrounding the member 18 and having the lines 40 from the legs adjustably anchored thereto. In the case illustrated, the collar has openings 71 passing the lines and screw clamps 72 are provided to set the lines against movement in the openings 71. The collar 70 is slidable on or shiftable longitudinally relative to member 18 and a means is provided for setting the collar in a selected position on the member 18. In the case illustrated, grippers or shoes 75 are carried by the collar and are adapted to be operated by screws 76 so that they can be moved into or out of engagement with the member 18. When the several grippers 75 are engaged with the member 18, the collar is locked on the member with the result that as the member 18 is moved relative to head B, the lines from the legs are moved.

Assuming, for example, that the several legs are collapsed and the member 18 is in a retracted or down position, the means F may be engaged so that the collar is set on the member 18 to move therewith, and the lines from the legs may be set or anchored to the collar. As the means 19 is then operated to force the member 18 upwardly relative to head B, the collar 70 carrying the lines from the legs will move upwardly with consequent operation of the leg sections so that the legs are extended. This operation results in an elevation of the means E relative to the support or at the lower ends of the legs. The construction may be such that a single operation of means 19 will effect the desired extension of the legs or it may be such that to gain the desired full extension of the legs, the means F is released after a full operation of means 19 and the lines are adjusted relative to the collar 70 following which a subsequent operation of the means 19 will cause further extension of the legs. In this case it may be necessary, as the step by step action is carried out, to lock the leg sections against relative movement whenever the means F is released.

In practice, the setting of the means F on or relative to member 18 may be supplemented by a lock means, for instance, a lock nut 80 which may be threaded on the member 18 and engageable with the collar whenever desired.

The base D serves, in effect, to couple or connect the lower end portions of the several legs A, and in the preferred construction it includes the central hub 14 and the several arms 15 that extend radially from the hub. Where the construction includes three legs, the base D includes three corresponding arms 15. In the particular case illustrated, each arm 15 is tubular in form and includes an inner section fixed to and projecting from the hub, an intermediate section 17 slidably engaged with and carried by the inner end section and an outer end section 16 slidably engaged with and carried by the intermediate section. Through this construction each arm can be varied as to length or extended as between a collapsed or retracted position where it holds the lower end of its related leg relatively close to the center of the structure and an extended position where the end of the leg is spaced a suitable and substantial distance from the center of the structure.

The invention provides a control means 86 in connection with each arm of the base and its related leg. In the construction illustrated, the control means 86 includes a control line 82 having one end anchored to the central portion of the base as, for instance, to the hub 14. The line 82 extends through the arm of the base over guide pulleys 83 and 84, the outer end of the arm and the lower end of the leg, respectively, and then up in the lower end section 11 of the leg to the upper end portion thereof where it is engaged over a guide pulley 85 from which it extends down to the lower end of the carrier 44^c at which point it is anchored as at 88. This construction is shown in the drawings, particularly in Figs. 4, 5 and 6 of the drawings, from which it will be apparent that as the leg

varies in length or is operated, the effective length of the line 82 varies. When the leg is retracted, the effective length of line 82 is shortened causing the arm related to the leg to be retracted whereas when the leg is extended, the arm is free to be extended as clearly shown in Fig. 1 of the drawings.

The column G provided in the structure is located centrally thereof and is an elongate, vertically disposed structure extending up from the hub 14 of base D to the means E. In the case illustrated, the means G includes a lower section fixed to or carried by the hub 14 to project upward therefrom, and it has an upper section 26 slidably related to the section 25 and also slidably related to the cylinder 60 of means 19, which is an element of means E. Through this construction, as the legs are adjusted or varied in length, the column G can and will vary in length while at the same time effectively guiding and supporting the means E so that it is maintained in a central vertical position.

In carrying out the invention it is preferable that lock means 23 be included in each leg as, for instance, between adjacent leg sections, that lock means 24 be included in the arms of the base D as between adjacent sections and that lock means 27 be included in the column G as between the section thereof and as between the upper section thereof and the cylinder 60. In practice, these several lock means may vary in construction or design as circumstances require, and in accordance with the broader aspects of the invention, any suitable lock construction can be employed in carrying out the invention. In the case illustrated, the several lock means included in the structure are alike and each includes longitudinally spaced channels 90 in the exterior of the innermost of two adjacent sections; a recess or counterbore 91 in the end portion of the other or outer section; split rings 92 in the channels 90 and extending into the counterbore 91; and a retainer or clamp ring 93 threaded on the outer section and retaining the structure assembled as clearly illustrated in Fig. 10. With the construction just described the clamp collar 93 can be operated to clamp the split rings 92 between the shoulder 94 at the inner end of the counterbore and the shoulder 95 formed by the head 96 of the clamp ring. To engage the lock means illustrated, the sections are moved relative to each other to a point where the grooves 90 are exposed whereupon the rings 92 are inserted in the grooves 90 following which the sections are moved so that the parts are related as shown in Fig. 10, whereupon the clamp collar 93 is threaded into place to clamp the construction with the elements assembled tightly as shown in Fig. 10.

In carrying out the present invention, various accessories or modifications can be included, for instance, if desired, suitable spring supported wheels 98 may be included or in connection with, say, the arms or base D so that the structure is free to be rolled from place to place except when loaded.

With the construction provided by the invention, when the apparatus is not in use, for instance, when it is to be stored or transported, the legs A may be collapsed or retracted, in which event the column G is likewise retracted and the arms of the base are retracted, all with the result that the structure as a whole is compact and takes but a limited space. When the construction is desired for use, the means F is set or engaged, connecting the lines from the legs with the member 18 of means E. Means E can then be operated with the result that the legs are extended, all of which results in extension of the column G and the arms of the base may be extended. In carrying out the invention, grooves or channels 90 can be provided at various points along the sections included in the structure so that, if desired, the structure can be locked in various degrees of extension as will be apparent from a consideration of the drawings. Assuming the legs had been operated by the means E acting through the means F as by one or more actions

as may be necessary, the lock means included throughout the structure are preferably set or engaged thus establishing the legs, the head and the base as a rigid fixed support carrying the means E. In this case the support may be used in the form thus established without any further operation; however, if desired or if necessary, with the structure thus set up in fixed form, the means E can be operated whenever desired so that the member 18 operates vertically thus serving to act as a jack or lift.

With the construction provided by the present invention, a load carrier support is provided which may, in practice, be of substantial size while at the same time being of simple, inexpensive construction and being such that, when not in service, it can be collapsed into a limited space.

Having described only a typical preferred form and application of my invention, I do not wish to be limited or restricted to the specific details herein set forth, but wish to reserve to myself any variations or modifications that may appear to those skilled in the art and fall within the scope of the following claims.

Having described my invention, I claim:

1. A support including, a head, a plurality of legs connected to and projecting from the head, each leg having a plurality of telescopically related sections movable relative to each other longitudinally of the leg, a flexible line anchored to the upper end portion of each section below the two uppermost sections and having a first portion extending down to and around a part at the lower end portion of the next higher section and a second portion extending up from said part and anchored to the section above said next higher section, a line anchored to the upper end portion of the section adjacent the uppermost section and extending around a part at the lower end portion of the uppermost section and then from the upper end of the uppermost section, a fluid pressure actuated means carried by the head and adapted to operate the lines extending from the upper ends of the uppermost leg sections, and a base having radially projecting arms each connected to a leg and including a plurality of relatively movable sections, and lines anchored to the base and connected to the legs to be operated thereby and being adapted to operate the arms of the base.

2. A support including, a head, a plurality of legs connected to and projecting from the head, each leg having a plurality of telescopically related sections movable relative to each other longitudinally of the leg, a flexible line anchored to the upper end portion of each section below the two uppermost sections and having a first portion extending down to and around a part at the lower end portion of the next higher section and a second portion extending up from said part and anchored to the section above said next higher section, a line anchored to the upper end portion of the section adjacent the uppermost section and extending around a part at the lower end portion of the uppermost section and then from the upper end of the uppermost section, a fluid pressure actuated means carried by the head and adapted to operate the lines extending from the upper ends of the uppermost leg sections, and a base having a hub, arms including a plurality of telescopically related sections carried by and projecting radially from the hub and connected to the legs, and control lines anchored at the hub and extending longitudinally of the arms and connected to the legs and operated thereby.

3. A support including, a head, a plurality of legs connected to and projecting from the head, each leg having a plurality of telescopically related sections movable relative to each other longitudinally of the leg, a flexible line anchored to the upper end portion of each section below the two uppermost sections and having a first portion extending down to and around a part at the lower end portion of the next higher section and a second portion extending up from said part and anchored to the section above said next higher section, a line anchored to

the upper end portion of the section adjacent the uppermost section and extending around a part at the lower end portion of the uppermost section and then from the upper end of the uppermost section, a fluid pressure actuated means carried by the head and adapted to operate the lines extending from the upper ends of the uppermost leg sections, a base having a hub, longitudinally adjustable arms carried by and projecting radially from the hub and connected to the legs, and control lines anchored at the hub and extending longitudinally of the arms and connected to the legs and operated thereby, and a verti-

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cally adjustable column carried by the hub and extending therefrom to the fluid pressure actuated means.

References Cited in the file of this patent

UNITED STATES PATENTS

1,234,510	Trautwein	July 24, 1917
2,240,724	Stoer	May 6, 1941
2,351,611	Hammond	June 20, 1944
2,416,848	Rothery	Mar. 4, 1947
2,671,638	Allen	Mar. 9, 1954