Dec. 22, 1953 B. JOHNSTON ET AL 2,663,285

LIFTING APPARATUS

Filed April 23, 1949 5 Sheets-Sheet 1

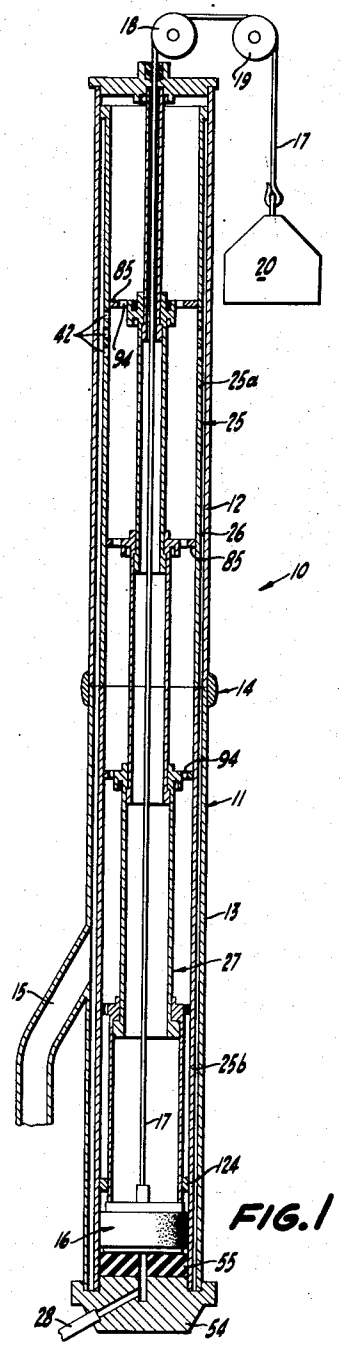


FIG. 1

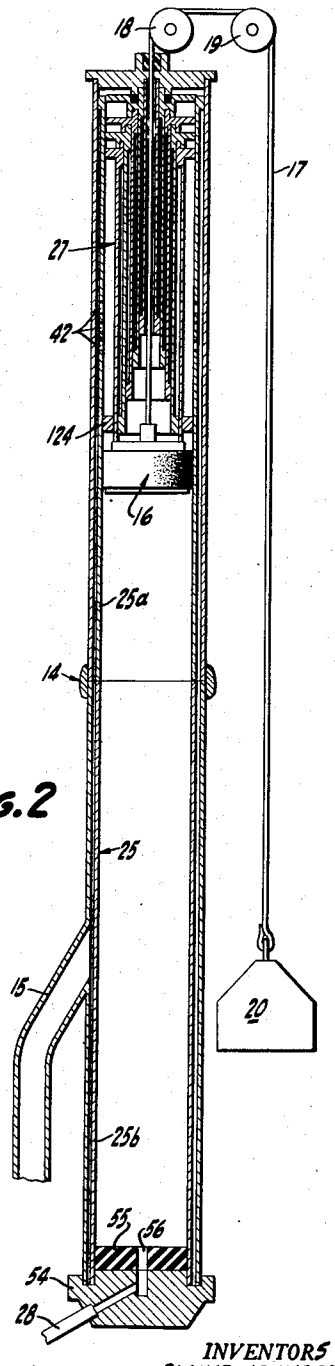


FIG. 2

INVENTORS
BLAINE JOHNSTON
JOHN C. MASON

BY

Mellin + Hanscom

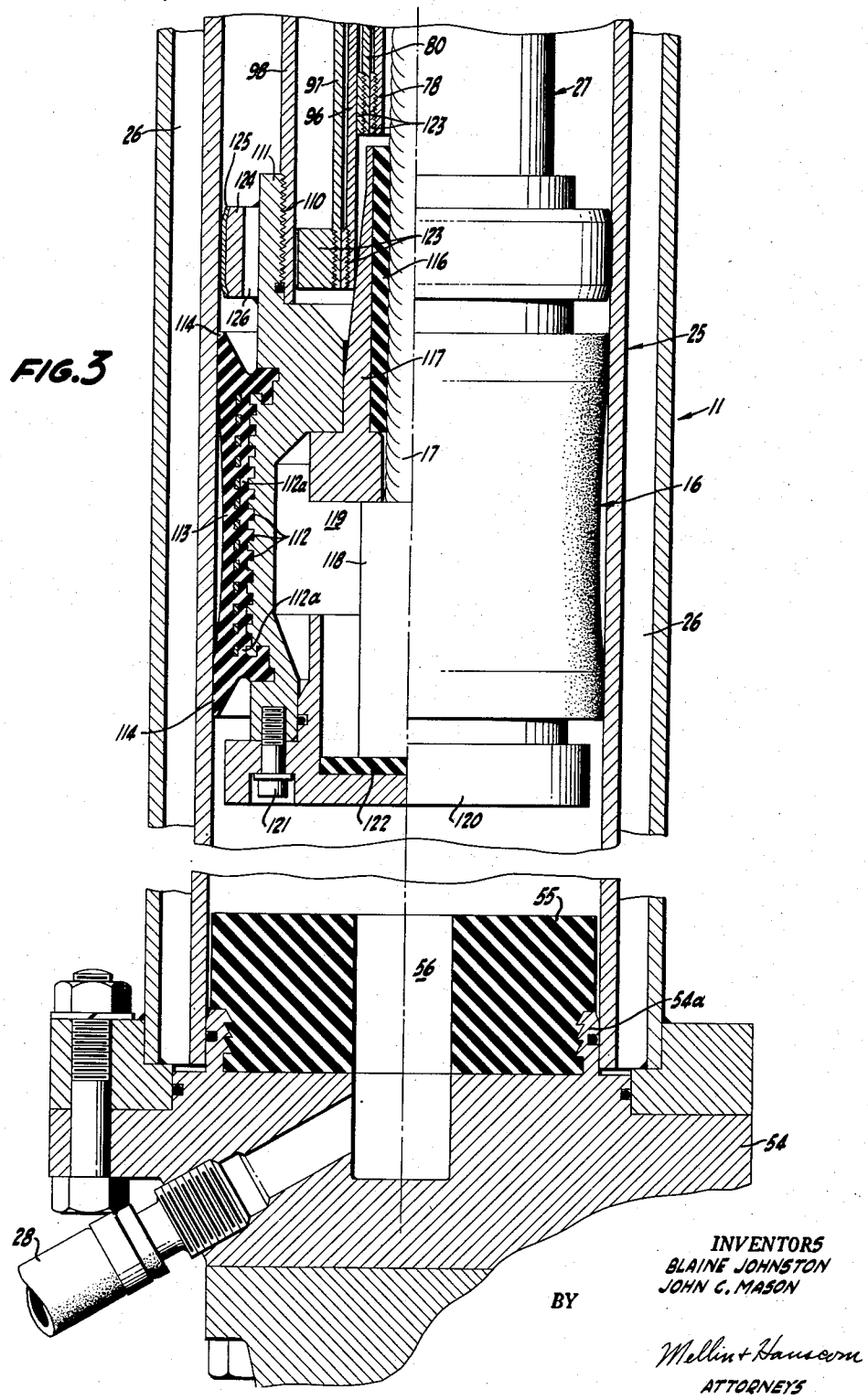
ATTORNEYS

Dec. 22, 1953 B. JOHNSTON ET AL 2,663,285

LIFTING APPARATUS

Filed April 23, 1949 5 Sheets-Sheet 2

FIG. 3



INVENTORS
BLAINE JOHNSTON
JOHN C. MASON

BY

Mellin + Hanscom

ATTORNEYS

Dec. 22, 1953 B. JOHNSTON ET AL 2,663,285

LIFTING APPARATUS

Filed April 23, 1949 5 Sheets-Sheet 3

FIG. 6

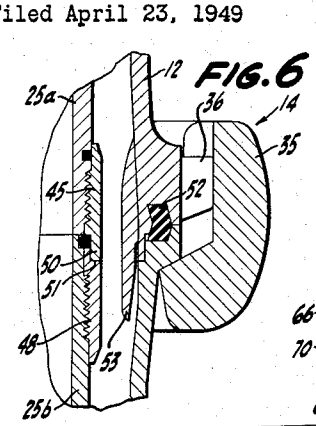


FIG. 4

INVENTORS
BLAINE JOHNSTON
JOHN C. MASON

BY

Mellin + Hanscom
ATTORNEYS

Dec. 22, 1953 B. JOHNSTON ET AL 2,663,285

LIFTING APPARATUS

Filed April 23, 1949 5 Sheets-Sheet 4

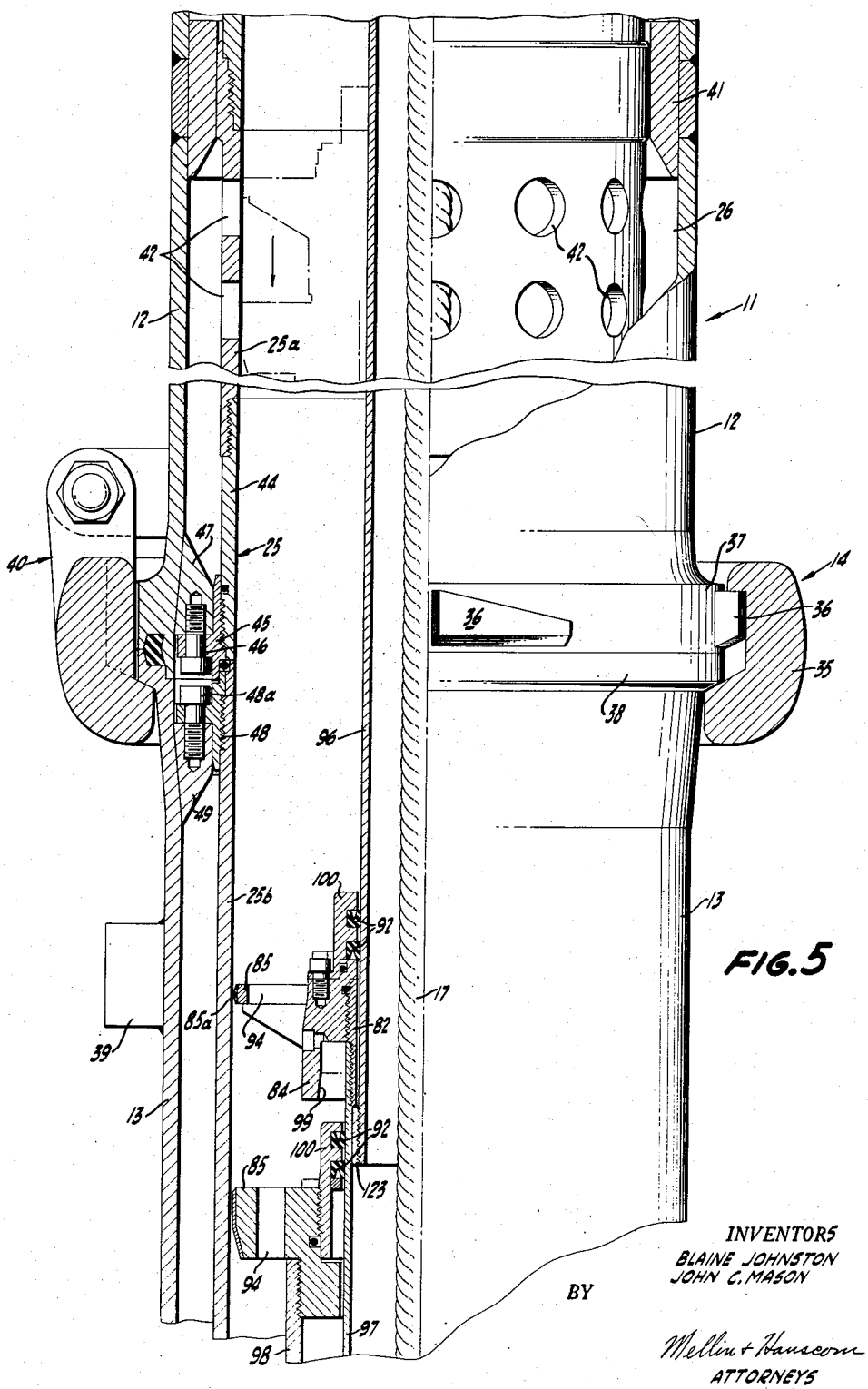


FIG. 5

INVENTORS
BLAINE JOHNSTON
JOHN C. MASON

BY

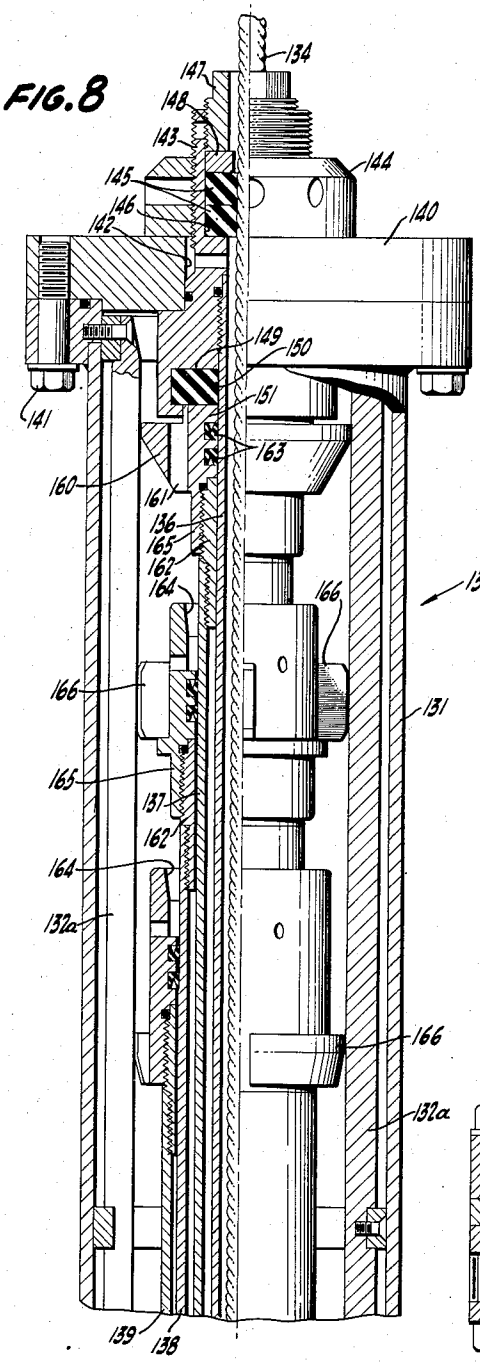
Mellin + Hanscom
ATTORNEYS

Dec. 22, 1953 B. JOHNSTON ET AL 2,663,285

LIFTING APPARATUS

Filed April 23, 1949 5 Sheets-Sheet 5

FIG. 8



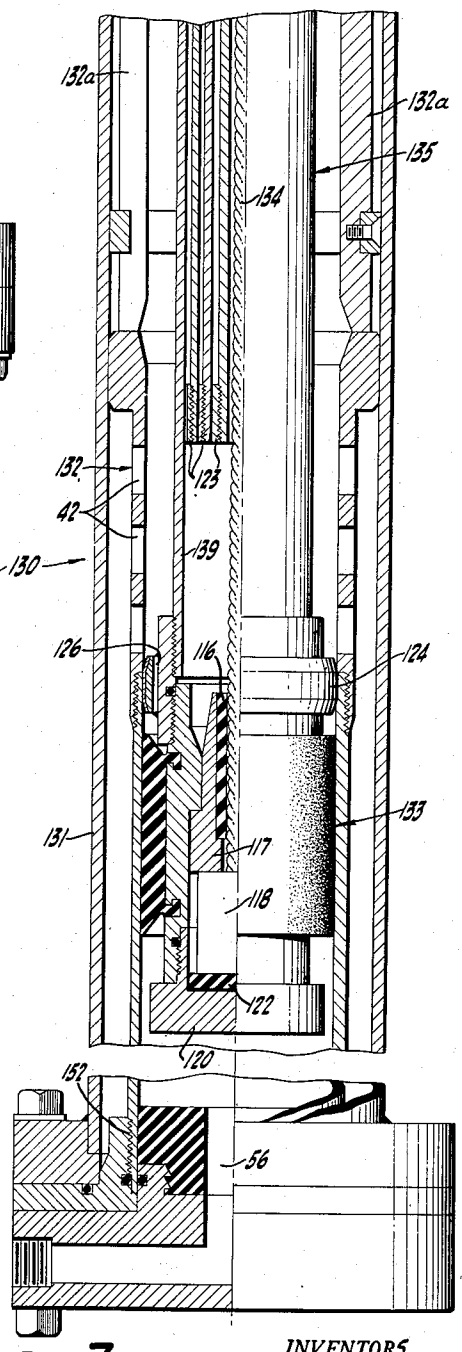


FIG. 7

INVENTORS
BLAINE JOHNSTON
JOHN C. MASON

BY

Mellin + Hanscom

ATTORNEYS

Patented Dec. 22, 1953

2,663,285

UNITED STATES PATENT OFFICE

2,663,285

LIFTING APPARATUS

Blaine Johnston, Pasadena, and John C. Mason, Bellflower, Calif.; said Johnston assignor, by mesne assignments, to said Mason

Application April 23, 1949, Serial No. 89,327

12 Claims. (Cl. 121—46)

1

This invention relates to an hydraulic device of the type including a cylinder, a piston reciprocable therein, and a wire line or cable operated by the piston. More particularly, it relates to an hydraulic device of the character described having improved means for sheathing the wire line and for supplying hydraulic pressure to and bleeding hydraulic pressure from the piston.

As set forth in Mason U. S. Patent No. 2,240,794, entitled "Drilling Lift," granted May 6, 1941, well drilling rig operations may be carried out by means of hydraulically operable cylinders and pistons. As there set forth, the wire line or cable operated by the piston is sealed by means of a plurality of nestable or telescoping tubes, one of which is fixed to one end of the cylinder and another to the piston, there being any desired number of intermediate tubes and the several tubes being slidably engageable one within another so as to provide an effective seal for the cable and at the same time to allow a long stroke of the piston.

It is an object of the present invention to provide an improved hydraulically operable device of the character described.

It is a particular object of the invention to provide an hydraulically operable device of the character described, including a cylinder, a piston reciprocable therein and a plurality of nestable or telescoping tubes for sealing the wire line operated by the piston.

It is a particular object of the invention to provide improved sealing means for wire cables operated by pistons in the manner described.

It is a further particular object of the invention to provide improved means for supplying fluid pressure to an hydraulic device of the character described.

These and other objects of the invention will be apparent from the ensuing description and the appended claims.

Certain forms which the invention may assume are exemplified in the following description and illustrated by way of example in the accompanying drawings in which:

Figs. 1 and 2 are diagrammatic, vertical sectional views of one form of hydraulic device of the invention, Fig. 1 showing the piston at the end of its down stroke and the nestable sealing tubes in their extended position, and Fig. 2 showing the piston at the end of its upstroke and the nestable tubes in collapsed or telescoped position.

Figs. 3 and 4 are fragmentary, vertical sectional views, Fig. 3 being taken through the lower

2

portion and the intermediate portion of the hydraulic device, and Fig. 4 being taken through the upper portion of the device.

Fig. 5 is a view, partly in elevation and partly in section, of the coupling means employed to couple the upper and lower sections of the main cylinders.

Fig. 6 is a fragmentary view in vertical section through the coupling means of Fig. 5, illustrating certain details thereof.

Figs. 7 and 8 are views similar to Figs. 3 and 4, respectively, but illustrating a different embodiment of the invention.

Referring now to the drawings, and more particularly to Figs. 1 and 2, the hydraulic device is generally designated as **10** and it comprises an upright cylinder **11**, including upper and lower sections **12** and **13** coupled at **14**. A supply conduit **15** is provided for supplying hydraulic pressure to and bleeding hydraulic pressure from the cylinder and a piston **16** is reciprocable within the cylinder for the purpose of operating a wire line or cable **17** which is led over sheaves **18** and **19** and supports a load **20** at its other end. A liner **25** is disposed within the cylinder **11** and is spaced therefrom to provide an annular passage **26**, and a plurality of collapsible or nestable tubes **27** and an air inlet **28** are also provided.

Referring now more particularly to Fig. 5, the coupling means **14**, comprises a grooved ring or nut **35** which engages threads or cam members **36** formed on a flange **37** at the bottom of the upper section **12** of the cylinder. The ring **35** bears against a conical flange **38** formed on the lower section **13**, and lugs **39** formed on the lower section are provided for limiting downward movement of the ring when the sections are uncoupled. Clamping means **40** are provided for securely clamping the upper and lower sections together. It will be apparent, of course, that other coupling means may be employed, e. g. an ordinary flange and bolt construction (not shown).

As illustrated in Fig. 5 the liner **25** is also sectional in construction, comprising upper and lower sections **25***a* and **25***b*, respectively. The upper section **25***a* is guided and centered intermediate its ends by means of an annular guide member **41** which also seals off the annular passage **26**. Therebelow a plurality of holes **42** are formed in the liner for passage of hydraulic fluid. At its upper end the liner is guided and centered by means of radially spaced lugs or pilot members **43** bolted to the cylinder, as shown in Fig. 4. At its lower end the upper liner section **25***a* is

threaded to a tubular connecting member 44 which is threaded at its lower end to a flange 45 which is fixed by means of cap screws 46 to lugs 47, which are spaced radially about and are welded to the inner surface of the upper cylinder section 12. The lower liner section 25b is directly threaded on a flange 48 which is fixed by means of cap screws 48a to radially spaced lugs 49, which are welded to the lower cylinder section 13.

As best shown in Fig. 6, pilot means comprising a tongue 50 and a companion recess 51 formed in the flanges 45 and 48, respectively, are provided for bringing the upper and lower liner sections 25a and 25b into precise alignment. A sealing member 52 is provided for effecting a pressure-tight seal between the upper and lower cylinder sections 12 and 13. As also illustrated, pilot means for the upper and lower cylinder sections is provided in the form of machined lugs 53 welded to and spaced radially about the lower end of the upper section 12 of the cylinder.

As shown in Fig. 3, the liner 25 rests upon a base member 54 and is centered and guided by means of an annulus 54a formed as an integral part of the base. A rubber bumper 55 is fixed to the annulus 54a, as shown, and is formed with a central passage 56 which communicates with the air pressure line 26. It will be apparent that the liner 25, although guided and supported at top and bottom is free to move axially relatively to the cylinder 11, thus allowing for different coefficients of expansion of these members.

Referring to Fig. 4, there is clamped to the upper end of the cylinder by means of cap screws 60, a crown block 61 having a central opening 62. An air bleed passage 63 is formed at the upper end of the cylinder for communicating with air bleed lines 64, as illustrated. A coupling member 65 is clamped in the opening 62 by means of a spanner nut 66 and a lock nut 67. A plurality of stacked, annular rubber cable wipers 68 are disposed in a cylindrical liner 70 and are clamped tightly in place between washers 71 and 72 by means of a nut 73. The coupling member 65 is formed at its lower end with a flange 74 having a recess 75, a radial passage 76 communicating with the recess 75, and a depending lug 77. The innermost member 78 of the nestable tubes 27 is threaded at 79 to the coupling member 65. The next or adjacent nestable tube 80 is threaded at 81 to a coupling member 82 which is threaded at 83 to a flange or head member 84. The head member 84 is formed with a flange 85 having a facing 85a of relatively soft, machined alloy, such as soft brass, the radius of which is such as to form a close, sliding fit within the liner 25. The head member 84 is also formed with a lug 90 received within the recess 75 of the coupling member 65, and it is provided with a rubber bumper 91 disposed in alignment with the depending lug 77 of the coupling member 65. The head member 84 is also provided with a pair of oppositely disposed lip seals 92, seated in annular grooves 93, said sealing members being in sealing engagement with the outer surface of the innermost nestable tube 78. Vertical passages 94 are formed in the flange 85.

Each of the outer nestable tubes 96, 97, and 98 is similarly provided with a head member 84. However, each adjacent pair of these head members is provided with a dash pot arrangement, as illustrated, comprising a recess 99 formed in one of the head members and a companion lug or plunger 100 formed in the underlying head member. The outermost nestable tube 98 is threaded at 110 to the body or main casting 111 of the piston 16. (See Fig. 3.) The casting 111 is formed with annular grooves 112 and with vertical passages 112a. A rubber sealing member 113 having lip seals 114 is vulcanized thereto. The cable or wire line 17 passes through a rubber vibration dampener 116 and a coupling member or retainer 117, and a button 118 is fixed to the bottom of the cable for retaining the same within a hollow chamber 119 formed in the casting 111. A bottom closure 120 is provided for the piston, being secured thereto as by means of cap screws 121 and, as illustrated, a rubber clamping pad 122 is seated at the bottom of the closure member 120. Each of the nestable tubes 78, 80, 96 and 97 is provided at its lower end with a flange 123 for a reason explained hereinafter. As also shown in Fig. 3, an annular member 124 is fixed to the piston 16. Such member is provided with a soft alloy facing 125 and with vertical passages 126. The annular member 124 serves to take the weight of the piston and lower end of the nestable tubes when the cylinder is in horizontal position, thus preventing deformation of the rubber sealing member 113.

The structure thus described operates as follows: To lift a load, hydraulic pressure is admitted to the cylinder through conduit 15. The fluid passes upwardly through the annular space 26 between cylinder 11 and liner 25, thence through openings 42 into the liner and through passages 94 in the flanges 85 to the piston 16. The piston is thus forced down. The innermost nestable tube 78, being fixed to the upper end of the cylinder, remains stationary. The other or outer nestable tubes 80, 96, 97 and 98 move downwardly as a unit until the head member 84 of the tube 80 strikes bottom flange 123 on the innermost tube 78, thus arresting further downward movement of tube 80. Then tubes 96, 97 and 98 continue their downward movement as a unit until tube 96 bottoms on the flange 123 of tube 80, etc. until the tubes are extended as shown in Fig. 1. Meanwhile, the cable 17 will be pulled, thus lifting the load 20, and the cable will be effectively sealed against loss of pressure. The wipers 68 effectively prevent entry of dust. It will be noted that the tubes 27 are not in actual sliding contact with each other except at the annular sealing members 92. Thus, undue friction is avoided, but because of the multiplicity of and overlapping relation of the tubes and their sealing members, loss of pressure is effectively avoided.

The dash pot arrangement is effective to prevent shock, and resultant noise and damage, when the tubes are telescoped. The employment of a liner, and of an annular passage for flow of fluid, is advantageous because it simplifies hydraulic connections and strengthens the structure. Thus, fluid can be admitted and drained from a point near the bottom, thus obviating the necessity of piping fluid to the top of the cylinder. This is of considerable importance in practice, wherein a 100 foot or longer cylinder may be used. A great advantage is derived from the use of a liner in that it obviates the necessity of machining the cylinder. The structure described may be of great height and diameter and may be used as a major structural, load supporting element of a portable derrick. Obviously, in such a case the cylinder must be of rugged construction, and machining the interior of the cylinder to form a sliding, sealing fit with the piston would be ex-

ceedingly expensive. Also, in such event, damage to the cylinder would be likely to hamper or make impossible further operation of the piston, until the damage is repaired. Employment of a liner obviates these difficulties, and since the liner bears no structural load, it may be made of relatively light section and of a light alloy such as an alloy of aluminum.

A further advantage results from use of the flanges 84 and their facings 85*a*. Thus, it is only these members which are in sliding contact with the liner 25, and as stated the facings 85*a* are constructed of soft brass and are accurately machined. Thus, a snug fit is ensured, yet the machined surface is of very small area, and because of the soft alloy, wear on the liner is minimized.

Further operation of the structure described will be apparent. Thus, to hold a load the pressure in the cylinder is held constant, and to lower a load pressure is bled from the cylinder. As the tubes 27 telescope, the dash pot arrangement will effectively prevent shock.

The structure thus described is specially adapted for cylinders of large diameter and considerable height.

In Figs. 7 and 8, there is illustrated a somewhat simpler but generally similar hydraulic device which is better adapted to cylinders of smaller diameter and length.

Referring to these figures, the structure is generally designated as 130, and it comprises a cylinder 131, a liner 132, a piston 133 reciprocable in the liner 132 for operating a wire line 134 and a plurality of nestable tubes generally designated as 135.

It will be noted that the liner 132 does not extend to the top of the cylinder. Instead, guides 132*a* are provided which are spaced radially about and are bolted to and centered in the cylinder as shown. It will also be noted that the liner 132 is fixed to the bottom of the cylinder at 152. The nestable tubes 135 comprise an innermost tube 136 fixed to the upper end of the cylinder, intermediate nestable tubes 137, 138, and an outermost nestable tube 139 fixed to the piston. The upper end of the cylinder 131 is closed by means of a cover 140 fixed thereto as by means of cap screws 141 and having a central opening 142 in which a coupling member 143 is received. The coupling member 143 is clamped to the cylinder by means of a spanner nut 144. Annular rubber cable wipers 145 are provided, being received in a retainer 146 and clamped in place by a nut 147 and washer 148. The coupling member 143 is formed with a recess 149 in which a rubber bumper 150 is received and which also forms a dash pot for receiving a plunger 151 formed on the head member or top flange 160 of the adjacent nestable tube 137. The flange 160 is formed with a vertical passage 161 and it is threaded to the upper end of a coupling member 162 which is threaded, at its lower end, to the tube itself. Lip seals 163 are provided, as illustrated.

The other nestable tubes 138 and 139 are similarly constructed and equipped. However, each adjacent pair of movable tubes is provided with a dash pot 164 and/or a plunger 165 and, instead of having a continuous flange, the tubes 138 and 139 are provided with spaced, radial lugs 166 which are machined and are of a radius, to form a close, sliding fit with the liner 132. The construction of piston 132 is generally similar to that of Fig. 3 and requires no further description here. Similar parts are numbered as in Fig. 3.

Operation of the structure of Figs. 5 and 6 will be apparent from the above description and the operation of the apparatus of Figs. 3 and 4.

It is thus apparent that a form of hydraulic apparatus has been provided, including a cylinder, a piston reciprocable therein, a cable operated by the piston and means for sealing the cable. Such apparatus effectively seals and operates the cable, and it embodies numerous improvements as detailed hereinabove.

While we have shown the preferred forms of our invention, it is to be understood that various changes may be made in its construction by those skilled in the art without departing from the spirit of the invention as defined in the appended claims.

Having thus described our invention, what we claim and desire to secure by Letters Patent is:

1. An hydraulic device of the character described comprising a cylinder, a piston reciprocable therein, a cable fixed at one end to and operated by said piston, said cable passing through one end of said cylinder, and a plurality of telescoping tubes for sheathing said cable including a fixed tube fixed to said one end of the cylinder and another tube fixed to said piston, said tubes other than said fixed tube being each provided with annular guide means at one end to guide the same in said cylinder.

2. An hydraulic device of the character described comprising a cylinder, a piston reciprocable therein, a cable fixed at one end to said piston and operated thereby and passing through one end of said cylinder and a plurality of telescoping tubes for sheathing said cable including a tube fixed to said cylinder and another tube fixed to said piston, said tubes including head members for abutment when the tubes are telescoped, and dash pot means for operation between adjacent tubes during telescoping of said tubes to prevent shock thereto.

3. Lifting apparatus, comprising: a rigid vertically extending cylinder; a piston reciprocally disposed in said cylinder; an elongated force-transfer element secured to said piston, said element extending through one end of said cylinder so as to be securable to a load; and, telescoping tube means for sheathing said element, including a fixed tube rigidly secured to said one end of said cylinder and another tube rigidly secured to said piston, said tube means each being provided with annular guide means engaged with the inner surface of said cylinder.

4. Lifting apparatus as set forth in claim 3 wherein said cylinder is formed with means permitting ingress and egress of fluid into said cylinder, ingress of said fluid forcing said piston toward said one end of said cylinder so as to raise said load, and egress of said fluid permitting said piston to be moved away from said one end of said cylinder.

5. Lifting apparatus, comprising: a rigid vertically extending cylinder; a tubular liner concentrically positioned within said cylinder; a piston reciprocally disposed in said liner; an elongated force-transfer element secured to said piston, said element extending through one end of said cylinder so as to be securable to a load; and, telescoping tube means for sheathing said element, including a fixed tube rigidly secured to said one of said cylinder and another tube rigidly secured to said piston, said tube means each being provided with annular guide

means engaged with the inner surface of said liner.

6. Lifting apparatus as set forth in claim 5 wherein said cylinder and liner are formed with means permitting ingress and egress of fluid into said liner, ingress of said fluid forcing said piston toward said one end of said liner so as to raise said load, and egress of said fluid permitting said piston to be moved away from said one end of said liner.

7. Lifting apparatus, comprising: a rigid vertically extending cylinder; a piston reciprocally disposed in said cylinder; an elongated force-transfer element secured to said piston, said element extending through one end of said cylinder so as to be securable to a load; a plurality of telescoping tube means for sheathing said flexible element, including a fixed tube rigidly secured to said one end of said cylinder and another tube rigidly secured to said piston; annular guide means formed on said tube means having a sliding engagement with the inner surface of said cylinder; and, dash pot means interposed between adjacent tube means to prevent shock thereto when said tube means are telescoped together.

8. Lifting apparatus as set forth in claim 7 wherein said cylinder is formed with means permitting ingress and egress of fluid into said cylinder, ingress of said fluid forcing said piston toward said one end of said cylinder so as to raise said load, and egress of said fluid permitting said piston to be moved away from said one end of said cylinder, said tube means being telescoped together as said piston is so moved.

9. Lifting apparatus, comprising: a rigid vertically extending cylinder; a tubular liner concentrically positioned within said cylinder; a piston reciprocally disposed in said liner; an elongated force-transfer element secured to said piston, said element extending through one end of said cylinder so as to be securable to a load; a plurality of telescoping tube means for sheathing said flexible element, including a fixed tube rigidly secured to said one end of said cylinder and another tube rigidly secured to said piston; annular guide means formed on said tube means having a sliding engagement with the inner surface of said liner; and, a dash pot means interposed between adjacent tube means to prevent shock thereto when said tube means are telescoped together.

10. Lifting apparatus as set forth in claim 9 wherein said cylinder and liner are formed with means permitting ingress and egress of fluid into said liner, ingress of said fluid forcing said piston away from said one end of said cylinder so as to raise said load, and egress of said fluid permitting said piston to be moved away from said one end of said cylinder within said liner, said tube means being telescoped together as said piston is so moved.

11. Lifting apparatus as set forth in claim 7 wherein said dash pot means includes an axially extending coaxial annular projection formed on the end of one tube and a coaxial annular cavity formed on the proximate end of the tube adjacent said one tube for receiving said projection, said cavity being of reduced diameter at its end remote from said one tube.

12. Lifting apparatus as set forth in claim 9 wherein said dash pot means includes an axially extending coaxial annular projection formed on the end of one tube and a coaxial annular cavity formed on the proximate end of the tube adjacent said one tube for receiving said projection, said cavity being of reduced diameter at its end remote from said one tube.

BLAINE JOHNSTON.
JOHN C. MASON.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,585,175	Steele	May 18, 1926
1,612,226	Sheldon	Dec. 28, 1926
1,756,910	Fuller	Apr. 29, 1930
2,172,117	Beaufort et al.	Sept. 5, 1939
2,220,068	Eckardt	Nov. 5, 1940
2,240,794	Mason	May 6, 1941
2,246,535	Playfair	June 24, 1941
2,259,432	Failing et al.	Oct. 14, 1941
2,285,742	Miller	June 9, 1942
2,308,761	Komph	Jan. 19, 1943
2,366,121	Hurst	Dec. 26, 1944
2,432,799	Rappl	Dec. 16, 1947
2,451,089	Hunter	Oct. 12, 1948
2,487,920	Celenza	Nov. 15, 1949