

July 14, 1931.

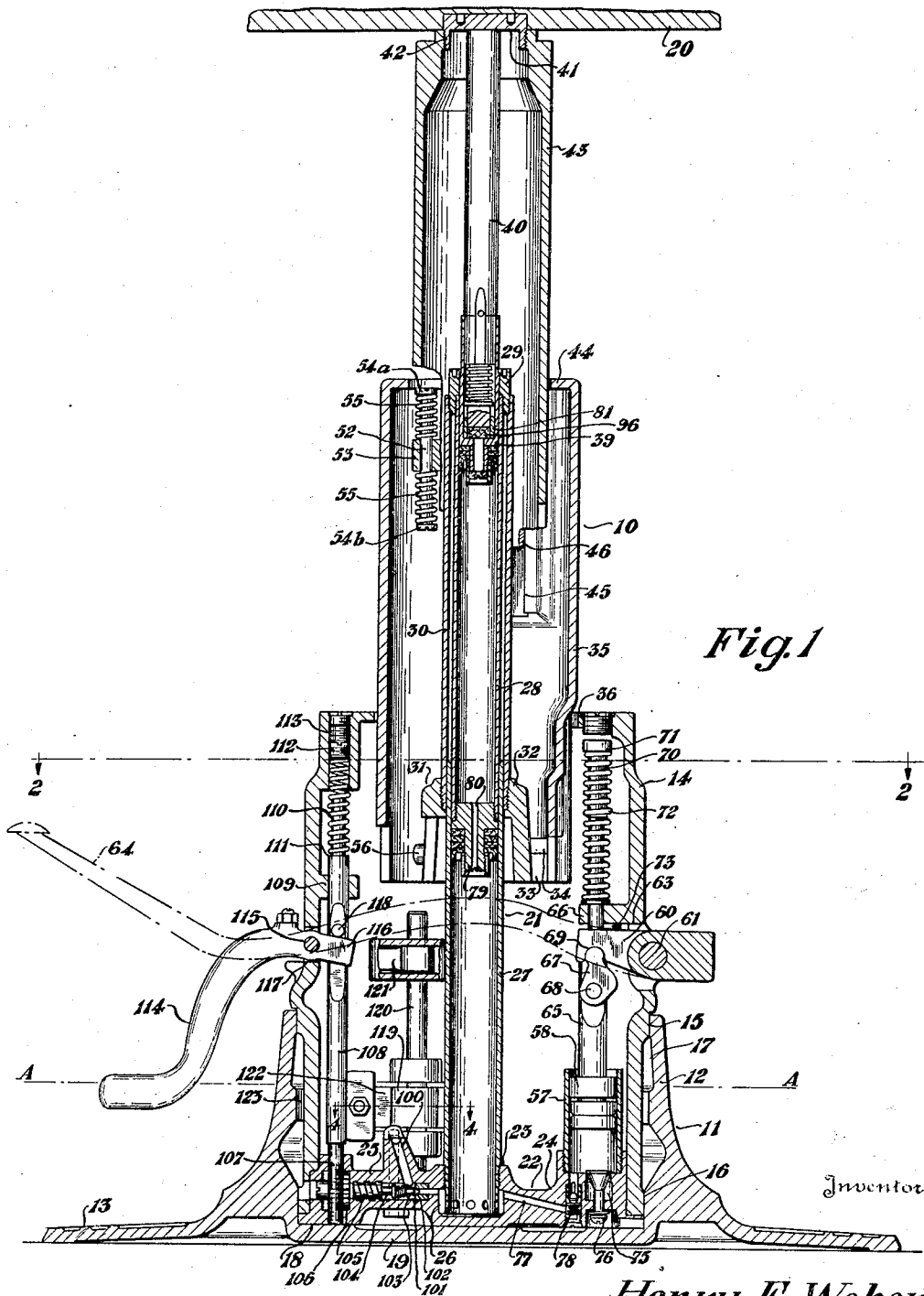
H. E. WEBER

1,814,874

DENTAL CHAIR ELEVATOR

Filed Nov. 3, 1928

3 Sheets-Sheet 1



Inventor

Henry E. Weber

By

Harry Trease

Attorney

July 14, 1931.

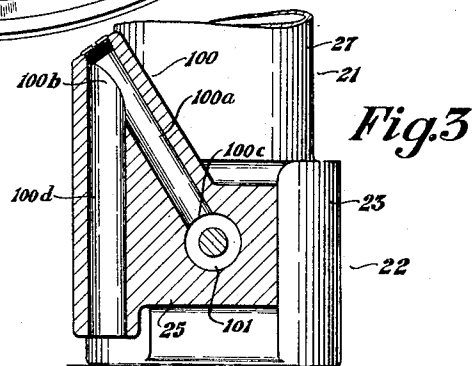
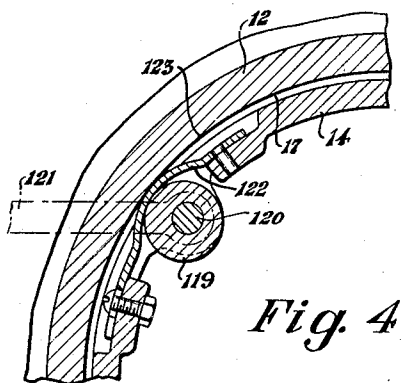
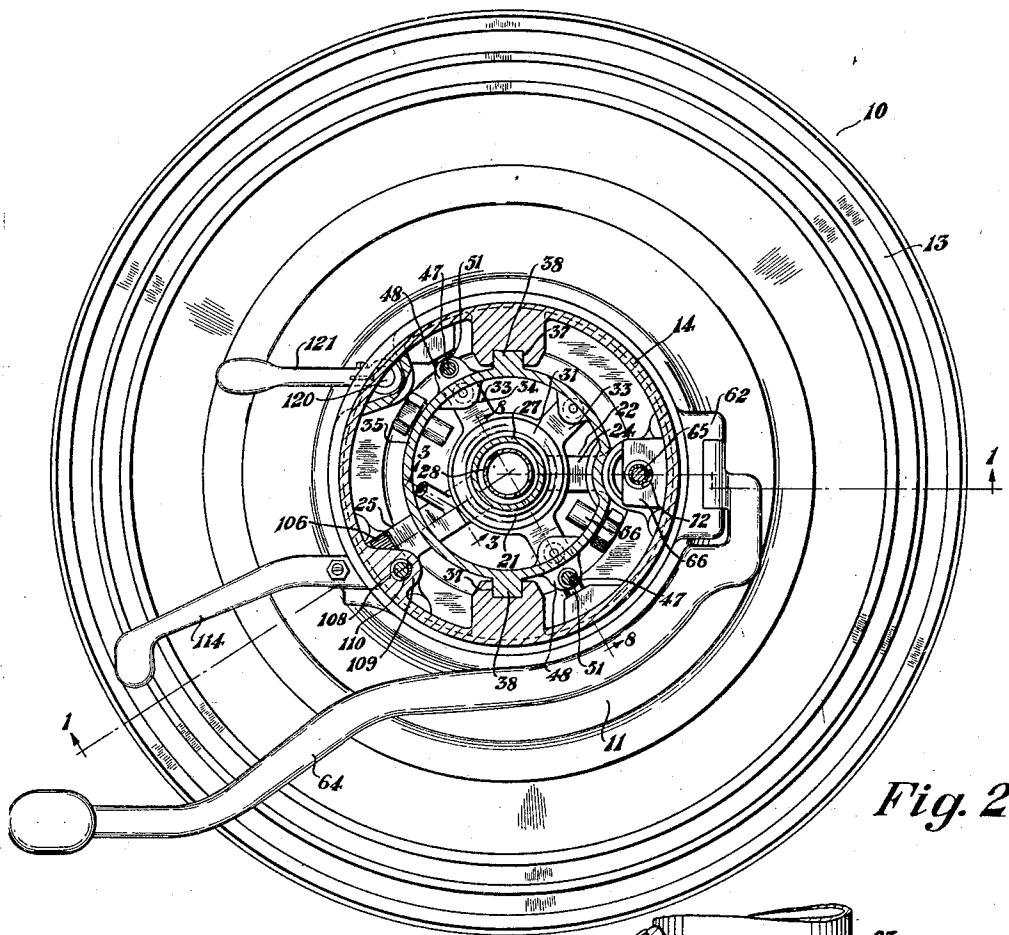
H. E. WEBER

1,814,874

DENTAL CHAIR ELEVATOR

Filed Nov. 3, 1928

3 Sheets-Sheet 2



Inventor

Henry E. Weber

By Harry Freese Attorney

July 14, 1931.

H. E. WEBER

1,814,874

DENTAL CHAIR ELEVATOR

Filed Nov. 3, 1928

3 Sheets-Sheet 3

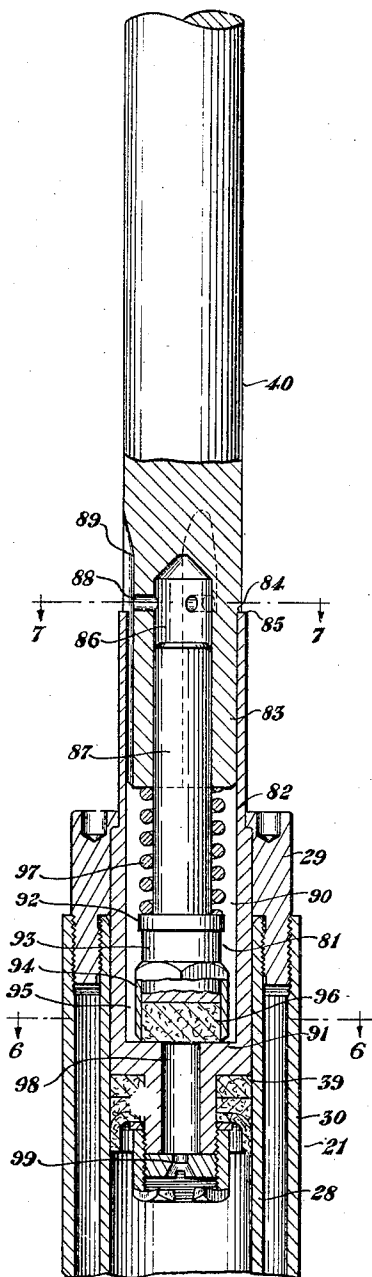


Fig. 5

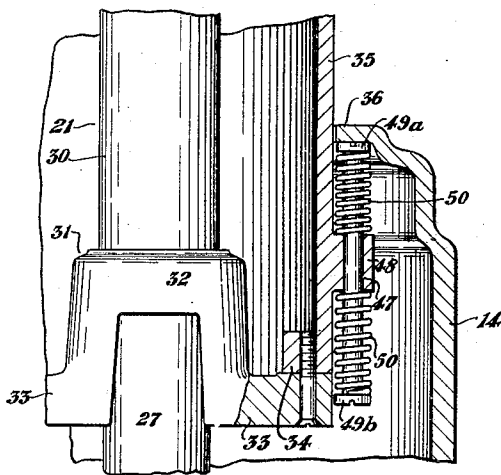


Fig. 8

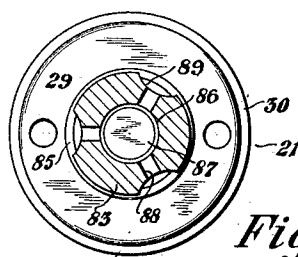


Fig. 7

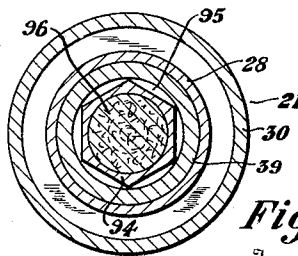


Fig. 6

Inventor

Henry E. Weber

By *Harry Freese*
Attorney

UNITED STATES PATENT OFFICE

HENRY E. WEBER, OF CANTON, OHIO, ASSIGNOR TO THE WEBER DENTAL MANUFACTURING COMPANY, OF CANTON, OHIO, A CORPORATION OF OHIO

DENTAL CHAIR ELEVATOR

Application filed November 3, 1928. Serial No. 316,969.

The invention relates to elevators for raising and lowering the seat and attached parts of a dental chair.

Elevators for this purpose as heretofore constructed have included chain lifts and fluid dynamic jack lifts.

It is essential that a dental chair elevator be maintained constantly in the desired elevated position, without being lowered gradually or by jerks, due to the weight of the patient seated on the chair.

It has heretofore been found practically impossible to construct dental chair elevators, which would not lower gradually or by jerks from any particular elevated position, thereby necessitating frequent reelevations of the same.

Accordingly the principal objects of the present improvements include the provision of an improved dental chair elevator adapted for positively and continuously maintaining the chair seat and attached parts at any desired position of elevation.

Further objects of the improvements include the provision of an elevator operated solely by an improved fluid dynamic jack, without requiring any chain lifts in conjunction therewith.

Further objects of the improvements include the provision of a simplified and more compact arrangement of the various parts of the elevator, and improvements in the detail construction and operation of the various parts.

These and ancillary objects are attained in the present invention, a preferred embodiment of which is hereinafter set forth in detail, and is illustrated in the accompanying drawings forming part hereof, in which

Figure 1 is a longitudinal sectional view of a preferred embodiment of the improved dental chair elevator hereof, as on line 1—1, Fig. 2;

Fig. 2, a transverse sectional view thereof as on line 2—2, Fig. 1;

Fig. 3, an enlarged fragmentary sectional view as on line 3—3, Fig. 2, illustrating the improved outlet duct for the fluid dynamic jack for the elevator;

Fig. 4, an enlarged fragmentary sectional

view as on line 4—4, Fig. 1, illustrating the means for adjustably locking the chair seat at any desired position of rotation about its vertical axis;

Fig. 5, an enlarged fragmentary view similar to Fig. 1, distant parts being removed, and portions being broken away for more clearly illustrating the detail construction of the improved relief valve for the fluid dynamic jack, and its arrangement with respect to other parts of the elevator;

Fig. 6, a transverse sectional view thereof as on line 6—6, Fig. 5;

Fig. 7, another transverse sectional view thereof as on line 7—7, Fig. 5; and

Fig. 8, a fragmentary sectional view of the elevator as on line 8—8, Fig. 2, illustrating one of the yielding stops between two of the elevators sections.

Similar numerals refer to similar parts throughout the several views.

The improved dental chair elevator indicated generally at 10, includes a base 11 which is preferably in the form of an upwardly opening cup-shaped reservoir 12 having a base flange 13 extending outwardly from its lower end.

A lower tubular elevator housing section 14 is mounted for rotation about its vertical axis in the cup reservoir. Upper and lower cylindric bearing abutments are provided at 15 and 16, respectively, between the outer surface of the lower tubular housing section 14 and the inner surface of the tubular side wall 17 of the cup reservoir 12, and thrust bearing abutment is provided at 18 between the lower end of the housing section 14 and the upper surface of the bottom wall 19 of the cup reservoir.

As will hereinafter be set forth in detail, the lower tubular housing section 14, encloses the operating mechanism of the elevator, and provides a support for all the control levers and pedals, so that the chair seat and other usual parts attached thereto, indicated fragmentarily at 20, and which are supported through parts hereinafter to be described in detail from the lower tubular housing section 14, are freely rotatable about the vertical axis of the elevator, to any desired position with

relation to the stationary supporting base 11 which rests upon the floor.

Preferably vertically coaxial with the lower tubular housing section 14, an improved fluid dynamic jack indicated generally at 21 is mounted within the housing section 14 for rotation therewith.

The jack 21 includes a housing and mounting base indicated generally at 22, and the base 22 includes a hub 23 from which radiate preferably in opposite directions, an inlet arm 24 having formed therein and mounting the several parts of the fluid inlet means, and an outlet arm 25 having formed therein and mounting the various parts of the fluid outlet means, as will be hereinafter set forth in detail.

The hub 23 has an upwardly opening cup recess 26 formed therein, and the upper end of the cup recess is internally threaded to receive and secure the externally threaded lower end of a lower jack cylinder 27. The jack cylinder 27 and the lower housing section 14 are vertically coaxial.

A tubular lower piston 28 is slidably mounted for being raised and lowered in the lower jack cylinder 27, and is externally threaded at its upper end for carrying an internally threaded collar 29.

The collar 29 is externally threaded, and has screwed thereon the upper internally threaded end of a middle elevator housing section suspending tube 30, the lower end of which is secured to a middle elevator housing section supporting bracket, indicated generally at 31.

The bracket 31 includes a central hub 32 from which radiate a plurality of supporting arms 33 upon the outer end of each of which is supported a lug 34 extending inwardly from a middle elevator tubular housing section 35.

The upper end of the lower elevator housing section 14 is preferably provided with an inwardly extending flange 36 through which the middle elevator housing section 35 is raised and lowered.

Radial movement with respect to each other of the middle and lower housing sections 35 and 14 is prevented by providing one or more vertically extending guide slots 37 in the one, in each of which slots is arranged to vertically slide a guide key 38 extending from the other.

The inner surface of the tubular lower piston 28 forms a cylinder in which is arranged to be slidably raised and lowered by the operation of the jack, an upper piston 39, of improved construction and arrangement as will be hereinafter set forth in detail, and which mounts at its upper end an upwardly extending upper elevator housing section supporting strut 40, upon the upper end of which is carried a seat and upper elevator housing mounting disk 41, the seat 20 being

provided with a suitable recess for fitting upon the upper surface of the disk 41, and the disk 41 being preferably provided with a downwardly extending tubular flange 42, which is externally threaded, and which is screwed in the internally threaded end of an upper elevator housing section 43.

The upper end of the middle housing section 35 is provided with an inwardly directed peripheral flange 44, through which the upper housing section 43 is raised and lowered.

Radial movement of the middle and upper housing sections with respect to each other is prevented by providing one or more vertically extending guide slots 45 in the one, in each of which slots a guide key 46 extending from the other, is arranged to vertically slide.

Yielding stop means for limiting the upward and downward movement of the middle housing section 35 with respect to the lower housing section 14, is provided by one or more rods 47 each vertically slidable in an aperture in a lug 48 extending outwardly from the middle housing section 35, and each rod 47 extends above and below the upper and lower surfaces of the lug, and there are preferably removable upper and lower screw heads 49a and 49b, respectively, on the upper and lower ends of each rod, and a compression spring 50 is interposed between each screw head and the opposite lug surface.

The upper head 49a of each rod 47 yieldingly impinges against the inwardly directed flange 36 of the lower housing section 14, for yieldingly limiting the upward movement of the middle housing section.

The lower head 49b yieldingly impinges against a stop pin 51 extending inwardly from the inner surface of the lower housing section 14, for yieldingly limiting the downward movement of the middle housing section 35.

Similarly, yielding stop means for limiting the upward and downward movement of the upper housing section 43 with respect to the middle housing section 35, is provided by one or more rods 52 each vertically slidable in an aperture in a lug 53 extending outwardly from the upper housing section 43, and each rod 52 extends above and below the upper and lower surfaces of the lug, and there are preferably removable upper and lower screw heads 54a and 54b, respectively, on the upper and lower ends of each rod, and a compression spring 55 is interposed between each screw head and the opposite lug surface.

The upper head 54a of each rod 52 yieldingly impinges against the inwardly directed flange 44 of the middle housing section 35, for yieldingly limiting the upward movement of the upper housing section 43.

The lower head 54b yieldingly impinges

against a stop pin 56 extending inwardly from the inner surface of the middle housing section 35, for yieldingly limiting the downward movement of the upper housing section 43.

At the outer end of the jack inlet arm 24, a pump cylinder 57 is mounted, and a pump piston 58 is arranged to be reciprocated in the pump cylinder 57 by oscillation of a pump actuating crank 60 pivotally mounted on a horizontal stub shaft 61 which is secured in a bracket 62 extending outwardly from the lower housing section 14.

The crank 60 extends from the shaft 61 through an aperture 63 into the interior of the lower housing section 14, and on the outside of the housing section 14 and connected with the crank 60, an elevating pedal lever 64 is provided.

A piston rod 65 extends vertically upwardly from the piston 58 through a bearing aperture in a piston rod bearing lug 66 extending inwardly from the tubular wall of the lower housing section, and a compensating connection between the pump actuating crank 60 and the pump piston rod 65 is provided by a stub link 67 pivotally secured at one end by a pivot pin 68 to the piston rod 65. The stub link extends upwardly from the pivot pin 68 and has its outer upper end curved for fitting in a downwardly opening pivot notch 69 formed in the outer end of the pump actuating crank 60.

The upper end of the piston rod 65 has screwed thereon a sleeve 70 upon the upper end of which is provided a shoulder 71, and a compression spring 72 is interposed between the lower face of the shoulder 71 and the upper face of the lug 66, thereby normally urging the piston rod and attached piston upwardly. One or more compression springs 73 may be interposed between the upper face of the actuating crank 60 and the lower face of the lug 66 for absorbing the shocks of the upward movements of the crank 60.

An inlet duct 75 provides a communication between the cup reservoir 12 and the interior of the pump cylinder 57.

A check valve 76 is provided in the inlet duct and permits oil or other fluid medium to pass from the reservoir into the pump cylinder but prevents reverse movement therefrom, and the action of the spring 72 as aforesaid is such as to normally maintain the piston 58 in its uppermost position, thereby keeping a charge of fluid always in the pump cylinder.

The interior of the pump cylinder 57 is connected with the interior of the lower jack cylinder 27 by a communicating duct 77 formed in the inlet arm 24, and a check valve 78 is provided in the communicating duct 77 and permits the passage of fluid from the pump cylinder to the jack cylinder, but prevents reverse movement thereof.

At the lower end of the tubular lower piston 28, a piston plug 79 is secured, and has formed therein an aperture 80 of relatively small diameter which provides a communication between the interior of the jack cylinder 21 and the interior of the tubular lower piston 28.

As aforesaid an upper piston 39 is slidably mounted in the tubular lower piston 28, and mounts at its upper end, as will now be set forth in detail, the upper housing section supporting strut 40.

In the mounting for the supporting strut 40 is embodied an improved relief valve 81 for the jack.

The upper piston 39 has formed therein an upwardly opening elongated cylindric socket 82, and the lower end 83 of the strut 40 is reduced in diameter, and between the end portion 83 of reduced diameter and the main body portion, an outwardly extending shoulder 84 is formed on the strut.

The reduced end 83 of the strut 40 extends into the upwardly opening cup socket 82, and the shoulder 84 on the strut 40 is seated on the outer end 85 of the socket.

The lower end 83 of the strut 40 has formed therein a relief valve bore 86, and the upper end of a relief valve stem 87 is arranged to slide upwardly and downwardly in the bore 86.

Above the upper extremity of the stem 87, one or more laterally extending apertures 88 in the strut 40 provide outlets from the bore 86, so that any fluid which may be trapped between the extremity of the stem 87 and the inner end of the bore, may escape through the outlets 88.

Longitudinally extending outlet grooves 89 are provided in the outer surface of the strut end 83 and extend upwardly into the main body of the strut for forming with the inner surface of the socket 82, outlet passages for fluid which is introduced into the relief valve chamber 90, which is formed by the inner tubular surface of the socket, the upper surface of the socket bottom wall 91, and the lower annular extremity of the strut end 83.

The valve stem 87 extends from the strut end 83 towards the socket bottom wall 91, and a shoulder 92 is formed thereon adjacent the lower end thereof.

Below the shoulder 92, the stem 87 is provided with an enlarged sliding cylindric seat 93 for a sleeve 94 which is preferably provided with hexagonal outer surfaces which form fluid passageways 95 between the outer plane surfaces thereof and the inner tubular surface of the socket 82.

A valve closure plug 96 preferably of fibre, leather, or the like, is fitted in the lower end of the sleeve 94 between the lower circular extremity of the cylindric seat 93 and the upper surface of the socket bottom wall 91; and the closure plug 96, the seat 93, and the sleeve

94 slidable over the continuing cylindric surfaces of the seat 93 and the plug 96, provide automatic means for taking up wear on the lower circular end of the plug.

5 A compression relief valve spring 97 is interposed between the annular extremity of the strut end 83 and the opposite end of the shoulder 92, whereby the closure plug 96 is normally urged towards the upper surface
10 of the socket bottom wall 91, for normally closing communication between the valve chamber 90, and a tubular aperture 98 formed in the bottom wall 91.

The aperture 98 provides a communication
15 between the chamber 90, through an orifice 99 of relatively small diameter, with the interior of the tubular lower piston 28, when the valve stem 87 is raised by upward fluid pressure which exceeds the downward pressure
20 of the spring 97 reacting against the strut end 83.

The strength of the spring 97 is such as will prevent the relief valve from operating as aforesaid until the jack has been extended
25 upwardly to its full height.

After the jack has been extended upwardly to its full height the valve stem 87 is raised by continued fluid pressure, permitting all the air and excess fluid to be exhausted
30 from the interior of the jack cylinder 21 and the interior of the tubular piston 28.

In the jack outlet arm 25, is formed an improved outlet duct 100, which includes an upwardly directed inner portion 100a communicating at 100b, at a substantial level
35 above the lower end 100c of the inner duct portion 100a, with a downwardly extending outer portion 100d.

The lower end 100c of the inner duct portion 100a communicates with a radially extending communicating duct 101, the inner
40 end of which communicates with the interior of the jack cylinder 21.

A removable apertured valve seat 102 is preferably provided in the duct 101 for co-operation with a self-centering conical head
45 103 on a valve stem 104, the head 103 being adapted for opening and closing a passageway between the outlet duct 100 and the interior of the jack cylinder 21 by rotations in
50 opposite directions of a valve screw 105 to which the stem 104 is secured, the valve screw 105 being mounted in an internally threaded extension of the duct 101.

55 A pinion 106 is secured to the screw 105 for rotating the same, and the pinion 106 is meshed with an upwardly extending rack 107, which is carried at the lower end of a rack mounting rod 108, which extends upwardly through a suitable bearing aperture
60 in a rack rod bearing lug 109 which extends inwardly from the tubular wall of the lower housing section, and the rack rod 109 is normally urged downwardly by a compression
65 spring 110 interposed between a shoulder 111

at the upper end of the rack rod 109 and an adjustable screw plug 112 which is screwed in an internally threaded aperture 113 in the upper end of the lower housing section 14.

The screw 105 has threads of such inclination that when the rack rod 108 is pressed
70 downwardly, the self-centering valve head 103 will be advanced into its seat 102, closing the passageway between the interior of the pump cylinder 21 and the angled outlet
75 duct 100.

For lowering the jack, a lowering pedal lever 114 is pivotally mounted on a pin 115 secured in the lower housing section 14, and an inner valve opening crank 116 secured to
80 the pedal lever 114 extends through an aperture 117 into the interior of the housing section 14, where the upper face of the valve opening crank 116 abuts against a pin 118 laterally extending from the rack rod 108.
85

For adjustably locking the chair seat at any desired position of rotation about its vertical axis, an eccentric 119 is secured at the lower end of a vertically extending counter-
90 shaft 120 which is journaled within the housing section 14, and which is connected at its upper end with a clamping lever 121 which extends outwardly through an aperture in the housing section 14. The eccentric
95 119 preferably is rotatable by the clamping lever 121 in opposite directions to clamp or release a flexible strip 122 against an inner cylindric clamping surface 123 formed on the interior tubular portion of the tubular
100 side wall 17 of the cup reservoir 12.

In operating the improved dental chair elevator, constructed and arranged as aforesaid, fluid, preferably oil, is placed in the cup reservoir 12, preferably so that it fills
105 the same to the level of the line A—A.

Oscillation of the elevating pedal lever 64 will then pump the fluid first into the interior of the jack cylinder 27 where it will immediately elevate the lower piston 28, until the middle housing section 35 has been raised to
110 its extreme height.

The fluid will then be forced through the aperture 80 into the interior of the tubular lower piston 28, where the upper piston 39
115 will be elevated until the upper housing section 43 has been raised to its extreme height.

Further oscillations of the pedal lever 64 will only operate the relief valve closure plug 96, as aforesaid, to pass the excess fluid out through the passageways formed by the outlet
120 grooves 89 of the strut end 83 and the inner surfaces of the socket 82, from which passageways the excess fluid will drop back into the cup reservoir.

Obviously any entrapped air will also be exhausted from the several cylinders.

The chair seat 20 is positively maintained at its extreme height, or any intermediate position, if the oscillations of the pedal lever
125

64 are stopped before the jack has been elevated to its extreme height.

In order to lower the chair seat 20 all that is necessary is to push down on the lowering pedal lever 114 whereby the self-centering valve head 103 will be withdrawn from its seat 102, whereby the fluid will pass out from the several cylinders through the communicating duct 101 and into the angled outlet duct 100 from which it will re-enter the cup reservoir 12.

By forming the outlet duct 100 with the upper end of the inner portion 100a, at a substantial level above the lower end thereof, and the communicating duct 101, fluid is always maintained within the lower cylinder 27 to the level of the upper end of the duct portion 100a, and as aforesaid the pump cylinder 57 is always charged with fluid, whereby the jack will immediately start to elevate with the first downward pressure of the pedal lever 64.

The chair seat 20, as aforesaid, may be maintained at any desired position of rotation about its vertical axis by operation of the clamping lever 121.

I claim:

1. A jack for a dental chair elevator and the like, including a cylinder, a load supporting and lifting piston operatively mounted in the cylinder and adapted to be elevated by the introduction of fluid into the cylinder, means for introducing fluid into the cylinder, and the piston having a bottom wall and an upper tubular portion forming a relief chamber therein, a load carrying strut having a lower tubular portion supported within the tubular portion of the piston, an outlet passageway communicating between the chamber and fluid introducing means, the bottom wall of the piston having an inlet aperture formed therein, a closure member slidably mounted in the lower tubular portion of the strut for movement towards and from closing position across the inlet aperture, and yielding means normally maintaining the closure member in closing position.

2. A jack for a dental chair elevator and the like, including a cylinder, a load supporting and lifting piston operatively mounted in the cylinder and adapted to be elevated by the introduction of fluid into the cylinder, means for introducing fluid into the cylinder, and the piston having a bottom wall and an upper tubular portion forming a relief valve chamber therein, a load carrying strut having a lower tubular portion supported within the tubular portion of the piston and forming a passageway located between the piston and the strut and communicating between the valve chamber and the fluid introducing means, the bottom wall of the piston having an inlet aperture formed therein, a closure member provided with a shoulder portion and slidably mounted in

the lower tubular portion of the strut for movement toward and from closing position across the inlet aperture, and spring means interposed between the shoulder portion of the closure member and the strut for normally maintaining the closure member in closing position.

3. A jack for a dental chair elevator and the like, including a cylinder, a load supporting and lifting piston operatively mounted in the cylinder and adapted to be elevated by the introduction of fluid into the cylinder, means for introducing fluid into the cylinder, and the piston having a bottom wall and an upper tubular portion forming a relief valve chamber therein, a load carrying strut having at its lower portion tubular walls forming an inner chamber and supported within the tubular portion of the piston, the tubular walls of the strut forming a passage-way located between the piston and the strut and communicating between the valve chamber and the fluid introducing means, the tubular walls of the strut being provided with apertures communicating between the strut inner chamber and the fluid introducing means, the bottom wall of the piston having an inlet aperture formed therein, a closure member provided with a shoulder portion and slidably mounted in the inner chamber of the strut for movement toward and from closing position across the inlet aperture, and spring means interposed between the shoulder portion of the closure member and the strut for normally maintaining the closure member in closing position.

In testimony that I claim the above, I have hereunto subscribed my name.

HENRY E. WEBER.