

G. HOLTZ.
DENTAL OR SURGICAL CHAIR.
APPLICATION FILED FEB. 29, 1908.

936,131.

Patented Oct. 5, 1909.

2 SHEETS—SHEET 1.

Fig. 1.

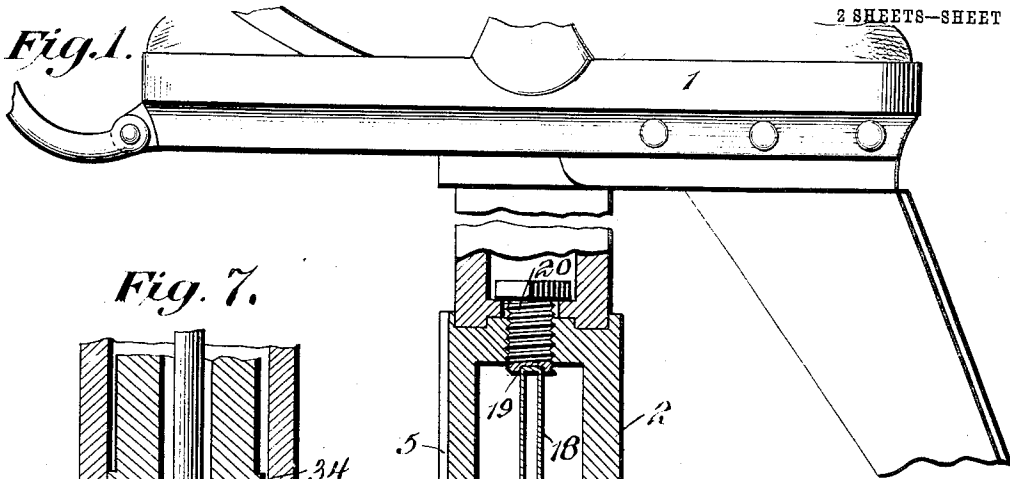


Fig. 7.

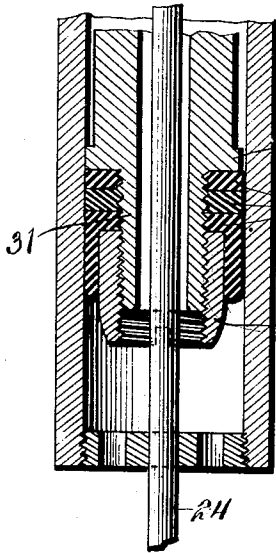
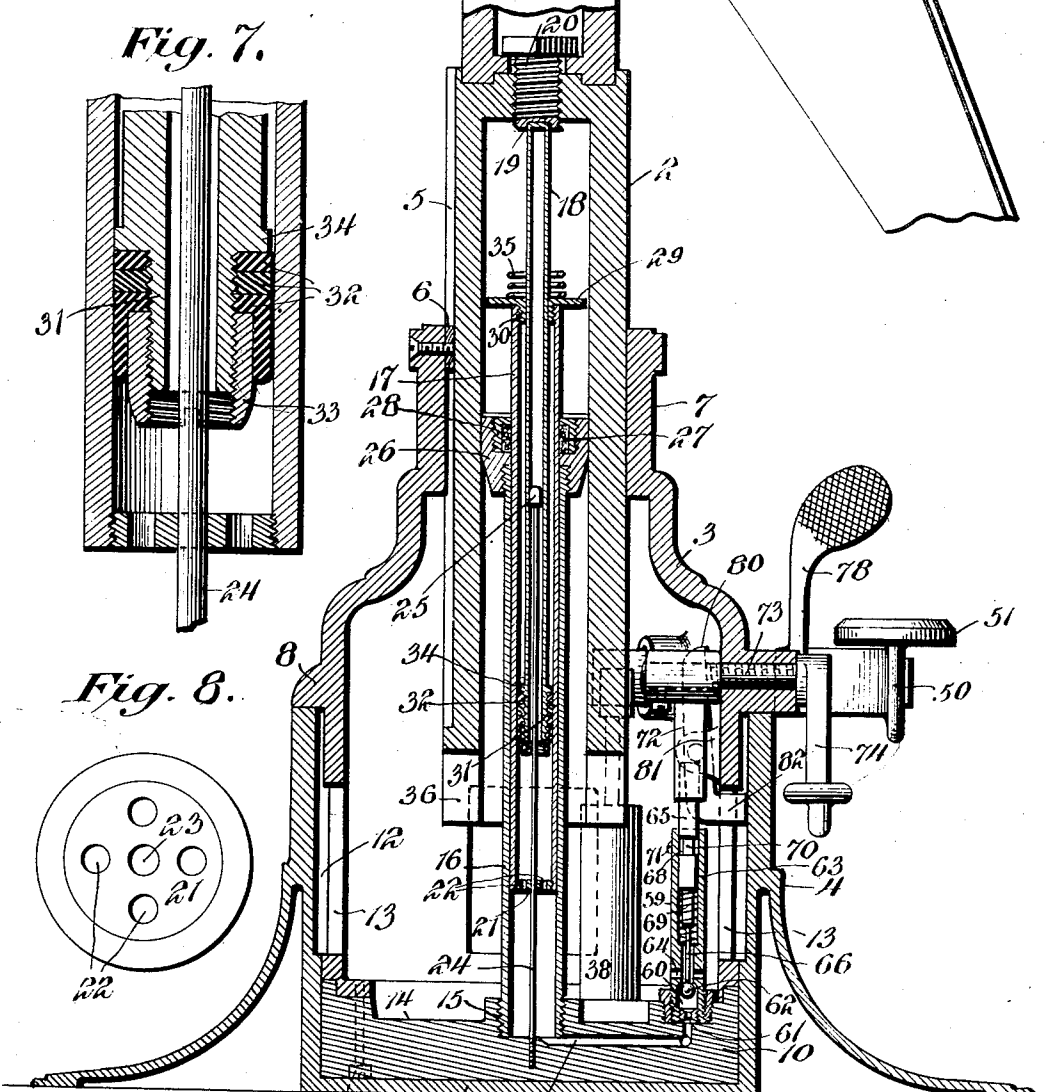
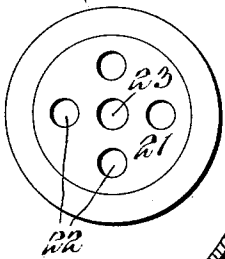


Fig. 8.



Gustav Holtz, Inventor

Witnesses:
Jas. E. McLaughlin
Klaus Gulikn

331

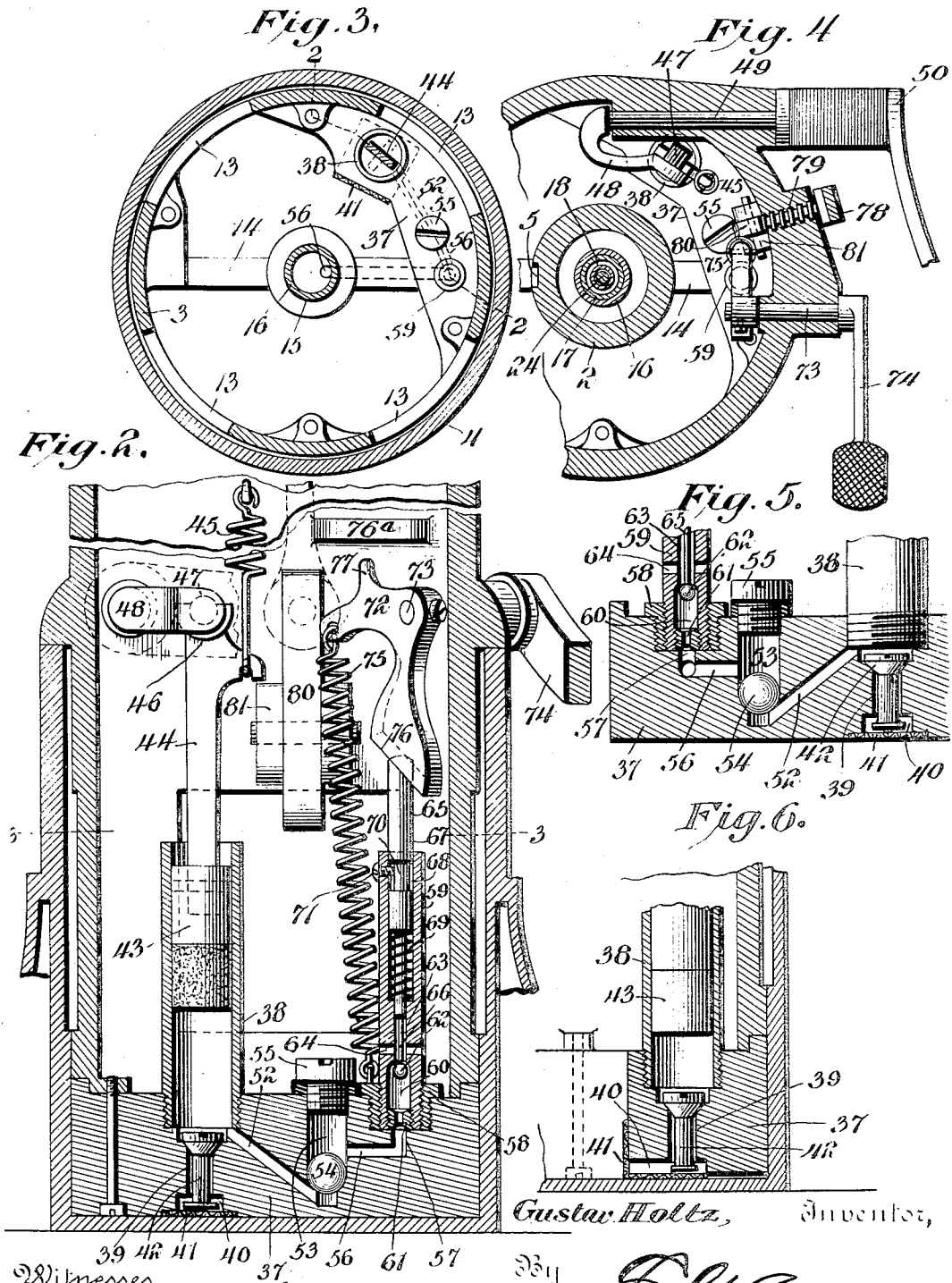
E. J. Siggers
Attorney

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2 SHEETS—SHEET 2.



Witnesses
Jas. E. McEachran
David L. Julihn

Gustav Holtz, Inventor,

B. G. Figgess

Attorney

UNITED STATES PATENT OFFICE.

GUSTAV HOLTZ, OF GOULDSBORO, PENNSYLVANIA.

DENTAL OR SURGICAL CHAIR.

936,131.

Specification of Letters Patent.

Patented Oct. 5, 1909.

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To all whom it may concern:

Be it known that I, GUSTAV HOLTZ, a citizen of the United States, residing at Gouldsboro, in the county of Wayne and State of Pennsylvania, have invented a new and useful Dental or Surgical Chair, of which the following is a specification.

My present invention relates to a novel dental or surgical chair of that class characterized by hydraulic or other motive fluid lifting mechanism by means of which the seat or chair proper may be raised or lowered, and thus properly positioned to accommodate the patient and the operator.

One object of the invention is to simplify and render more compact the chair supporting and lifting structure without sacrificing any of the advantages which characterize chairs of more complicated and cumbersome form.

A further object of the invention is to construct the lifting mechanism in a manner which will permit it, together with its various appurtenant devices, to rotate with the chair so that the controlling means, as for instance the pump-operating and the fluid-releasing devices, as well as the locking mechanism for securely holding the chair after its adjustment has been effected, will always remain in the same relative positions with respect to the chair seat to facilitate their actuation by the operator irrespective of the position to which the chair may have been turned.

Another object of the invention is to improve the connections between the elements of the lifting mechanism in order to insure fluid-tight joints and to reduce the incidental friction to a minimum.

A still further object is to increase the stability of the structure by mounting the various parts of the lifting mechanism, including the controlling valves, upon a single casting arranged for free rotation without the possibility of vibration and capable of being easily and quickly displaced or replaced to facilitate the adjustment or repair of any part of the lifting mechanism or its appurtenant controlling devices.

Another object of the invention is to arrange the standard or base and lifting mechanism in such interfitting relation as will preclude the possibility of lateral vibration or lost motion, and to provide novel means for limiting the elevation of the chair and for equalizing the pressure areas of the pis-

ton or plunger elements to insure uniform movement of the chair during the raising and lowering thereof.

Subordinate to the several objects stated are various others which will appear during the course of the succeeding description of the illustrated structure.

In the accompanying drawings:—Figure 1 is a vertical sectional view of the chair supporting and lifting mechanism, a portion of the chair being shown in elevation. Fig. 2 is a sectional view on the line 2—2 of Fig. 3. Fig. 3 is a horizontal sectional view on the line 3—3 of Fig. 2. Fig. 4 is a sectional view designed to show particularly the construction and mounting of the operating devices for the release valve, pump and lock. Fig. 5 is a detail sectional view showing the relation of the pump, the release valve, the intermediate check valve and the connecting fluid passage. Fig. 6 is a detail sectional view showing the manner in which the pump is mounted in the head, and the fluid inlet. Fig. 7 is a sectional view illustrating the fluid tight joint between the plunger and the extension tube; and Fig. 8 is an end view of the extension tube.

Like numerals designate corresponding parts in the several views of the drawings.

The chair proper or seat, indicated by 1, is supported by a standard 2, slidably received within a rotary head 3 carried by a fixed base 4, which latter rests upon the floor or other suitable support, and is of sufficient weight to provide a solid foundation for the chair. The standard 2 is hollow and may be of any desired form according to the range of movement required. That is to say, the standard 2 may be composed of a series of telescoping sections, or as shown in the illustrated form of the invention, it may be composed of a single cylinder of sufficient diameter to insure the necessary stability of the structure.

At one side of the standard 2 is formed a longitudinal groove or way 5 for the reception of a projection or key 6 extended inwardly from the constricted upper end of the head 3, which forms a cylindrical bearing 7 surrounding and closely fitting the standard. The standard 2 is thus free to move vertically, independently of the head but necessarily effects the rotation of the head upon a vertical axis when the chair is turned. Below the bearing 7 the diameter of the head 3 is considerably increased to ac-

commodate certain internal mechanism to be described, and at a sufficiently elevated point is formed with an annular bearing flange 8 resting upon the upper edge of the base 4. The base is in the form of a cylinder surrounding the lower portion of the head and having its lower end closed by a wall 9 upon which rests the lower end of the head 3, said end being preferably in the form of an annular casting 10 secured by suitable means, as for instance bolts 11, to the other or upper member of the head. The upper portion of the base 4 from a point a short distance above the casting 10, is internally enlarged to define an oil space 12 in communication with the interior of the head through openings 13, as shown in Fig. 1. The head and base thus combine to form a large internal chamber or reservoir for the reception of the oil or other motive fluid designed to be employed for the operation of the chair lifting mechanism. The annular casting 10 constituting the lower end of the head and fitting closely in the bottom of the base is provided with a diametrical web 14, see Fig. 3, formed at its center with an internal screw-threaded socket 15 for the reception of the lower threaded end of a vertically disposed tube 16 constituting one of the telescoping members of the chair lifting mechanism. The tube 16, rigidly carried by and designed to revolve with the head, constitutes in effect a cylinder within which is designed to reciprocate a duplex piston comprising two telescoping members, the outer of which, indicated by 17, fits closely within the tube or cylinder 16, and the inner of which, indicated by 18, fits within the tube or member 17, as shown in Fig. 1. For the purpose of properly distinguishing these several features of the chair lifting mechanism, the tube or cylinder 16 will be referred to hereinafter as the outer tube, the member 17 as the extension tube, and the member 18 as the plunger.

The upper end of the plunger 18 is closed as shown, and is received within a socket 19 preferably formed in the lower end of a screw 20 provided at the upper end of the standard tube for the attachment of the chair thereto. Motive fluid admitted to the lower end of the cylinder or outer tube 16 in the manner to be described, is designed to effect, first, the elevation of the plunger 18 to lift the chair and to subsequently effect the elevation of the plunger and extension tube in unison if the desired vertical adjustment of the chair exceeds the range of movement of the plunger.

The lower end of the extension tube 17 is closed by a disk 21 provided with a series of openings 22 for the free passage of the motive fluid and with an axial opening 23 which accommodates a vertical rod 24 rigidly secured at its lower end to the web 14,

and provided at its upper extremity with an enlargement 25 fitting within the hollow inner tube or plunger 18. This rod 24 performs several important functions. In the first place it constitutes a centering device which assists in stiffening the structure and in retaining the parts in their proper working positions. The enlargement 25 at the upper end of this rod constitutes a stop engaged by the disk 21 at the lower end of the extension tube 17 to limit the upward movement of the latter. The third, and perhaps the most important function of the rod 24, is to equalize the pressure areas of the extension tube 17 and plunger 18 in order to insure the perfectly uniform movement of the chair irrespective of the particular element or elements of the lifting mechanism moved under the impulse of the motive fluid.

At the upper end of the outer tube 16 is screwed a stuffing box 26 having suitable packing 27 urged against the outer face of the tube 17 by a gland 28. This packing serves to effect a fluid-tight joint between the outer tube 16 and the extension tube 17 without the considerable incidental friction which has heretofore resulted from the provision of packing at the lower end of the extension tube. The upper end of the tube 17 is provided with a cap 29 in the form of a metal disk of considerable diameter apertured to accommodate the plunger 18 and having a threaded nipple 30 screwed into the tube 17, as shown. There is no necessity for a fluid-tight connection at this point, however, for the reason that the inner tube or plunger 18 is provided with an externally threaded reduced lower end 31 surrounded by packing 32 expanded against the interior surface of the tube 17 by a gland 33 screwed upon the reduced end of the plunger, as shown in Fig. 7.

The major diameter of the plunger 18 is somewhat less than the minor diameter of the extension tube 17, the plunger being provided adjacent to its lower end with an annular shoulder 34 arranged to contact with the cap 29 to compel the movement of the plunger and extension tube in unison after a given movement of the plunger has been completed.

It will, of course, be understood by those skilled in the art that since the depression of the chair is effected by the release of the motive fluid, very little, if any, jar is likely to be occasioned by the complete depression of the chair. In order, however, to avoid the possibility of shock when the chair reaches its completely depressed position, I prefer to mount a buffer spring 35 of any suitable form upon the cap 29 and preferably encircling the plunger. When the chair comes to rest the cap 29 will have a solid backing upon the stuffing box 26 at the upper end of the rigid outer tube or cylinder 16 and before

the chair reaches its completely depressed position, the upper end of the standard 2 will contact with the spring 35 and will be cushioned by the latter in an obvious manner. It may also be observed that this spring 35 assists somewhat in starting the chair when the latter is elevated from its lowest position and while this assistance is perhaps inconsiderable, it is undoubtedly of some use in overcoming the inertia of the parts.

The standard 2, when entirely depressed, is designed to rest solidly upon the bottom wall 9 of the base, and in order that this may be accomplished its lower end is notched or bifurcated, as indicated at 36, to accommodate the web 14 of the head.

I have now completed the description of the chair supporting and lifting mechanism whereby the chair is permitted to turn or rotate upon a vertical axis and is raised or lowered through the medium of a properly controlled motive fluid. It now remains to describe those appurtenant controlling devices whereby the motive fluid is forced into the lower end of the outer tube or cylinder 16 under pressure to lift the chair and is permitted to escape when the lowering of the chair is desired, and also the locking device by means of which the rotary part of the chair supporting structure is securely retained after the chair has been turned to the desired position.

The casting 10, constituting the bottom of the head 3, while of general annular shape, is formed at one side with an enlargement 37 (see Fig. 3) to provide a metal body which supports the several valve mechanisms, and in which the fluid passages are bored. Screwed into the upper side of this enlargement and preferably adjacent to one end thereof is a pump cylinder 38 in communication with the oil chamber through an inlet passage or port 39. The passage 39 is enlarged at its lower end by a recess 40 in the bottom of the enlargement 37 and opening through the bottom and inner sides thereof, as shown in Fig. 6, said recess being guarded by a wire fabric netting constituting a strainer 41 which prevents the passage of debris to the pump with the motive fluid. The upper end of the passage 39 is flared to form a valve seat for the reception of a gravity-seated pump valve 42, which operates in the usual manner to permit the motive fluid to pass through the inlet port to the pump and to prevent back flow of the fluid through said port. Within the pump is mounted to reciprocate a pump piston 43 having an upwardly extending piston rod 44 connected to a retracting spring 45, the opposite end of which is suitably secured to a hook or other projection extending inwardly from the wall of the head 3 (see Fig. 2).

At the upper end of the piston rod 44 is formed a socket 46 for the reception of a stud 47 projecting from a crank arm 48 located at one end of a rock shaft 49 provided with a bearing in and extending entirely through the wall of the head 3 (see Fig. 4). To the outer end of the rock shaft 49 is secured in any suitable manner a pump lever 50 formed with a foot-piece or pedal 51 to facilitate the depression of the pump lever by foot power. When the lever 50 is depressed the crank arm 48 is swung to depress the pump piston and the latter is then retracted by the spring 45 as the foot of the operator is raised to repeat the operation. From the lower end of the pump cylinder 38, the motive fluid is forced through a passage 52 to a check valve chamber 53 within which is loosely retained a spherical check valve 54, which prevents the fluid from passing back to the pump after it has once entered the valve chamber. The chamber 53 is preferably bored from the top of the enlargement 37 and is closed at its upper end by a screw cap 55, which may be easily removed to permit access to the check valve. The passage 53 opens into the bottom of the chamber 52 at a point below the valve seat, and at a point somewhat above the valve the chamber 53 is in communication with an angular passage 56 formed conjointly in the enlargement 37, and in the web 14 of the casting 10 (see Fig. 3). The passage 56 opens into the outer tube or cylinder 16 through the bottom wall of the socket and thus completes the communication between the pump cylinder and the outer tube or cylinder of the chair lifting mechanism. By the continued operation of the pump in the manner described, the motive fluid is drawn into the pump cylinder and is forced under pressure to the chair lifting mechanism causing the elevation of the plunger 18 and the extension tube 17 in a manner well understood by those skilled in the art, for the purpose of effecting the vertical adjustment of the chair.

It is evident that when it is desired to lower the chair, the fluid must be permitted to escape from the cylinder 16. For this reason I provide fluid-releasing mechanism which may be readily operated to establish communication between the passage 56 and the fluid reservoir. At the juncture of its angularly related branches, the passage 56 is in communication with the short escape port 57 extending upwardly and opening through the bottom of an annular recess formed in the upper side of the enlargement 37, and having its walls threaded to receive a collar 58 screwed upon the lower end of the release valve casing 59 formed at its lower end with a valve chamber 60 into the lower extremity of which is screwed a detachable axially apertured annulus 61. The annulus

61 serves as a valve seat and also as means for confining a spherical release valve 62 within the chamber 60 so that the entire release valve mechanism may be easily removed from the head to facilitate cleaning or repair.

Extending upwardly from the chamber 60 is an axial bore 63 placed in communication with the fluid reservoir through one or more discharge ports 64, the bore 63 being of such dimensions as will insure the proper closing of its lower end by the release valve 62 when the latter is in the position indicated in Fig. 2 of the drawings. Within the casing 59 above the valve 62 is mounted to reciprocate a valve stem 65 having a reduced lower extremity 66 and an enlarged upper end 67, the latter being accommodated in an enlargement 68 of the bore 63. The stem 65 is normally urged upwardly by a helical spring 69 encircling the stem and bearing at one end against the enlargement 67 and at its opposite end against the end wall of the bore enlargement 68. The enlarged upper end of the stem is provided with an annular recess 70 into which extends a stop screw 71 designed to limit the movement of the stem, and arranged to permit the removal thereof from the casing with facility. Normally the release valve and its stem will occupy the positions shown in Fig. 2, and the valve will thus prevent the escape of motive fluid through the discharge ports 64. If, however, it is desired to lower the chair, the depression of the stem 65 against the resistance of the fluid and of the spring 69 will move the release valve away from the lower end of the bore 63 and the fluid passing around the valve and into the bore will escape through the exhaust ports 64 and thus permit the chair to gravitate to a partially or wholly depressed position, it being obvious that the downward movement of the chair may be arrested at any point by releasing the valve stem 65 and permitting the latter and the release valve to resume their normal positions to stop the further escape of the motive fluid from the cylinder 16.

Since it is designed to have the various elements of the valve mechanism inclosed within the supporting structure of the chair, the stem 65 of the release valve is not exposed but is arranged to be depressed by a rocker 72 disposed to engage the upper end of the stem 65 and secured to the inner end of a rock shaft 73 extended through the wall of the head, as shown in Fig. 4, and having at its outer end a foot-operated release valve lever 74. The rocker 72 is of angular form and to one arm thereof is secured one extremity of a retracting spring 75 secured at its lower end to the casting 10 (see Figs. 2 and 4). The end of the rocker 72, which engages the valve stem, is provided with an

inclined or cam face 76 which, when the lever 74 is depressed, rides upon the end of the stem 65 and forces the latter down to open the release valve, the depression of the lever being limited by a stop 76^a in the form of an internal projection on the head 3 disposed to be engaged by the projection 77 on the rocker. As long as the foot of the operator remains on the lever 74, the release valve will be held open and the chair will continue to descend. When the chair has reached its proper position, the lever 74 is released, the spring 75 retracts the rocker, and the release valve and its stem are permitted to return to their normal positions to terminate the escape of the motive fluid and to stop the descent of the chair.

Beside the pump lever 50 and the release valve lever 74, the head is equipped with a third lever designed to be actuated by the foot of the operator. This third lever is a lock lever 78 which normally stands in a substantially upright position, as shown in Fig. 1, and is designed to be pushed forward by the foot of the operator to effect the operation of a locking device which serves to prevent further rotary movement of the chair after the latter has been properly positioned. The lock lever 78 is mounted at the outer end of a screw 79 passed through a threaded opening in the wall of the head 3 and having its inner end disposed to bear against the upper end of a locking lever 80 fulcrumed upon a bracket 81 extending forwardly from the wall of the head. The lever 80 is provided with an angular lower end 82 extended outwardly through one of the openings 13 in the head and disposed to be urged into frictional contact with the wall of the base 4 to lock the head against movement. When the rotary supporting structure of the chair has been sufficiently rotated, the operator by pushing upon the lock lever 78 imparts a partial rotation to the screw 79 feeding the latter in an endwise direction, and causing the lock lever 80 to be rocked to that slight extent which is necessary to cause its angular end 82 to frictionally engage the base. When it is desired to rotate the chair, the lock lever 78 is moved slightly in the opposite direction to rotate the screw and relieve the pressure on the locking lever in an obvious manner.

Since the operation of the several mechanisms described has been recited during the course of the preceding description, it is thought to be unnecessary to reiterate what has already been said in order to impart a clear idea of the invention. It should be distinctly understood, however, that while the illustrated embodiment of the invention appears at this time to be preferable, I do not wish to limit myself to the structural details defined. On the contrary, I reserve the right to effect such changes, modifica-

tions and variations of the illustrated structure as may come fairly within the scope of the protection prayed. For instance, the standard 2 may be of sectional or other form, as already remarked, and likewise the piston element of the chair lifting mechanism may comprise a plunger and an extension tube, as shown herein, or may be of single form, if preferred, it being understood that in the latter event the extension tube 17 would be omitted and that the plunger would be properly proportioned to closely fit within the cylinder or outer tube 16.

What I claim is:—

1. In a device of the class described, the combination with a seat, and a base comprising a hollow fixed member, and a hollow rotary member or head mounted therein, of fluid operated seat lifting mechanism, means for supplying motive fluid to the mechanism, a horizontal pivot piercing the wall of the rotary member or head, an oscillatory rocker connected intermediate of its ends with the inner end of the pivot and provided at one end with a cam face, a spring connected with the other end of the rocker, a release valve casing mounted on the head, a release valve in the casing, a valve stem extended above the casing and arranged in the path of the cam face, and a release lever located exteriorly of the head and connected with the outer end of the said pivot.

2. In a device of the character described, the combination with a seat, and a base comprising a hollow fixed member and a hollow rotary member mounted therein, of fluid operated seat lifting mechanism rising from the bottom of the head, means for supplying motive fluid to the lifting mechanism, a release valve casing mounted on the bottom of the rotary member within the latter, a release valve in the casing, a valve stem extended above the casing, a substantially V-shaped rocker pivotally mounted within the head and having a cam face at one arm for engaging the valve stem, and a spring connected with the other arm of the rocker.

3. In a device of the character described, the combination with a seat, and a base comprising a hollow fixed member and a hollow rotary member mounted therein, of fluid operated seat lifting mechanism rising from the bottom of the head, means for supplying motive fluid to the lifting mechanism, a release valve casing mounted on the bottom of the rotary member within the latter, a release valve in the casing, a valve stem extended above the casing, a substantially V-shaped rocker pivotally mounted within the head and having a cam face at one arm for engaging the valve stem, a spring connected with the other arm of the rocker, and an operating lever connected with the pivot of the rocker.

4. In a device of the character described, the combination with a seat, and a base comprising a hollow fixed member and a hollow rotary member mounted therein, of fluid operated seat lifting mechanism, means for supplying motive fluid to the lifting mechanism, a release valve casing mounted on the bottom of the rotary member within the latter, a release valve in the casing, a valve stem extended above the casing, a substantially V-shaped rocker pivotally mounted within the rotary member and having one of its arms arranged to engage the valve stem, the other arm of the rocker being provided with a projection, and a stop arranged in the path of the projection for limiting the movement of the rocker.

5. In a device of the character described, the combination with a seat, and a base comprising a hollow fixed member and a hollow rotary member mounted therein, of fluid operated seat lifting mechanism, means for supplying motive fluid to the lifting mechanism, a release valve casing mounted on the bottom of the rotary member within the latter, a release valve in the casing, a valve stem extended above the casing, a substantially V-shaped rocker pivotally mounted within the rotary member and having one of its arms arranged to engage the valve stem, the other arm of the rocker being provided with a projection, a stop arranged in the path of the projection for limiting the movement of the rocker, a spring connected with the arm having the projection, and an exterior operating lever connected with the pivot of the rocker.

6. In a device of the class described, the combination with a seat, and a base including a rotary member, of seat lifting mechanism carried by said rotary member, a pump for supplying fluid to the lifting mechanism, said pump including a cylinder, a piston therein, and a piston rod having a socket at its upper end, a horizontal rock shaft having a bearing in the wall of the rotary base member, a crank mounted at the inner end of the rock shaft and provided with a horizontally projecting stud arranged to engage the socket at the upper end of the piston rod, a pump lever at the outer end of the rock shaft, and means for retracting the piston.

7. In a device of the class described, the combination with a seat, and a base comprising a fixed member, and a rotary member having a threaded opening and provided at its inner face with a bracket, of seat lifting mechanism carried by the rotary member, and a locking device for retaining the rotary member in its adjustment, said locking device including an upright lever pivoted to the bracket and extending above and below the same, the lower end of the lever being provided with an engaging portion project-

ing through the wall of the rotary member and engaging the fixed member, and a screw mounted in the threaded opening of the rotary member and arranged to bear against the upper portion of the lever.

8. In a device of the character described, the combination with a seat, a base, and fluid operated chair lifting mechanism, of release valve mechanism including a release valve casing formed in a single piece and provided at its lower end with a valve chamber and having a bore extending upward from the chamber and enlarged at the upper portion of the casing, said casing being also provided with a port extending laterally from the bore at a point between the chamber and the said enlarged upper portion, a valve located within the chamber, a valve stem operating within the bore and extending from the valve chamber to the enlarged upper portion of the bore, a spring housed within the upper portion of the bore and engaging the stem of the valve, and means for engaging the valve stem to operate the valve.

9. In a device of the character described, the combination with a seat, base and fluid-operated chair lifting mechanism; of release valve mechanism including a release valve casing formed with a valve chamber at its lower end, a bore extending from the chamber, an exhaust port opening into the bore, said bore being enlarged at its upper end; a valve stem having its upper end enlarged and its lower end reduced and mounted to reciprocate within the casing, a spring encircling the valve stem and bearing at one end against the enlargement thereof, and a stop screw carried by the casing and engaging the valve stem to limit the movement thereof.

In testimony, that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

GUSTAV HOLTZ.

Witnesses:

A. L. RHODES,
C. H. BROWN.