Sept. 20, 1938. J. C. CORNELL ET AL 2,130,754

SURGICAL CHAIR

Filed Dec. 12, 1935 4 Sheets-Sheet 1

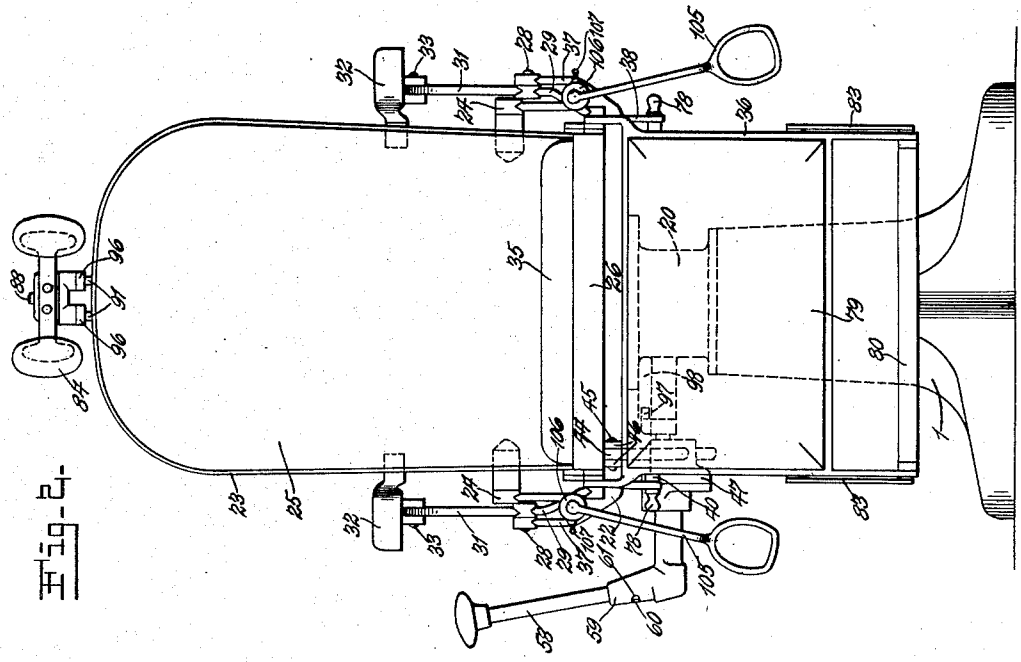


Fig. 2.

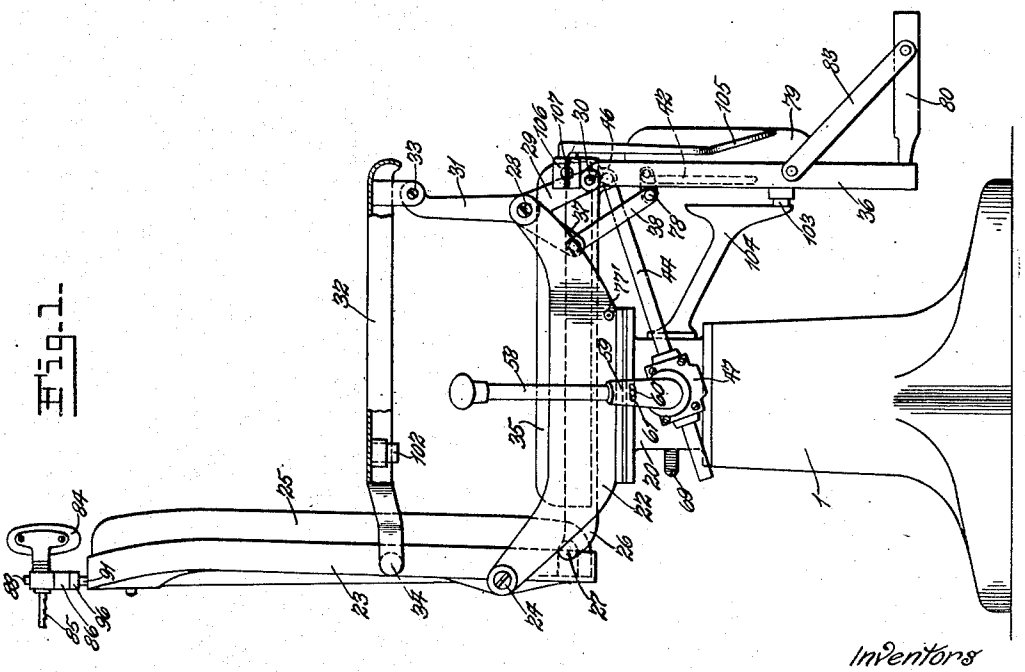


Fig. 1.

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SURGICAL CHAIR

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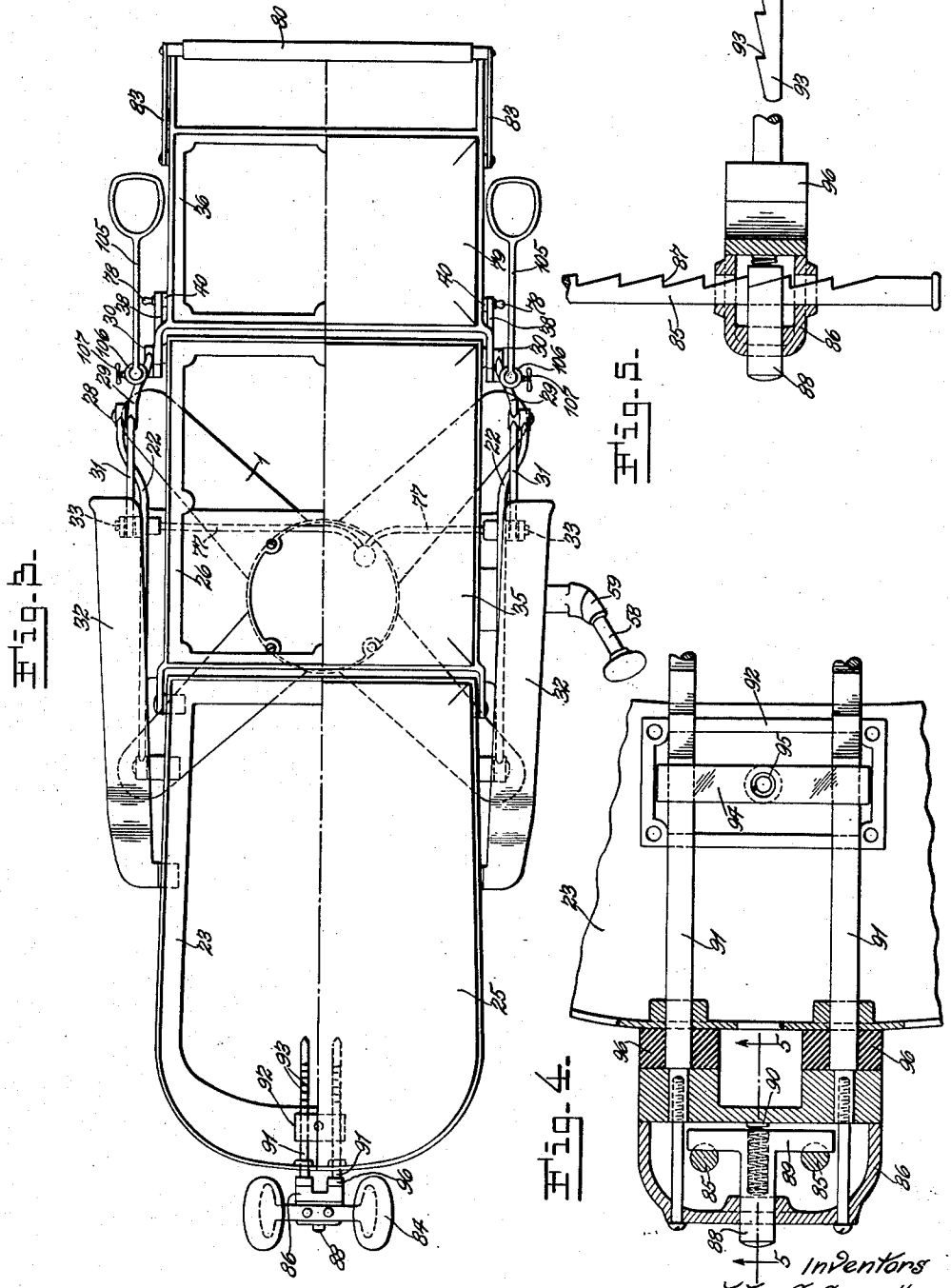


Fig. 4.

Fig. 5.

Fig. 6.

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SURGICAL CHAIR

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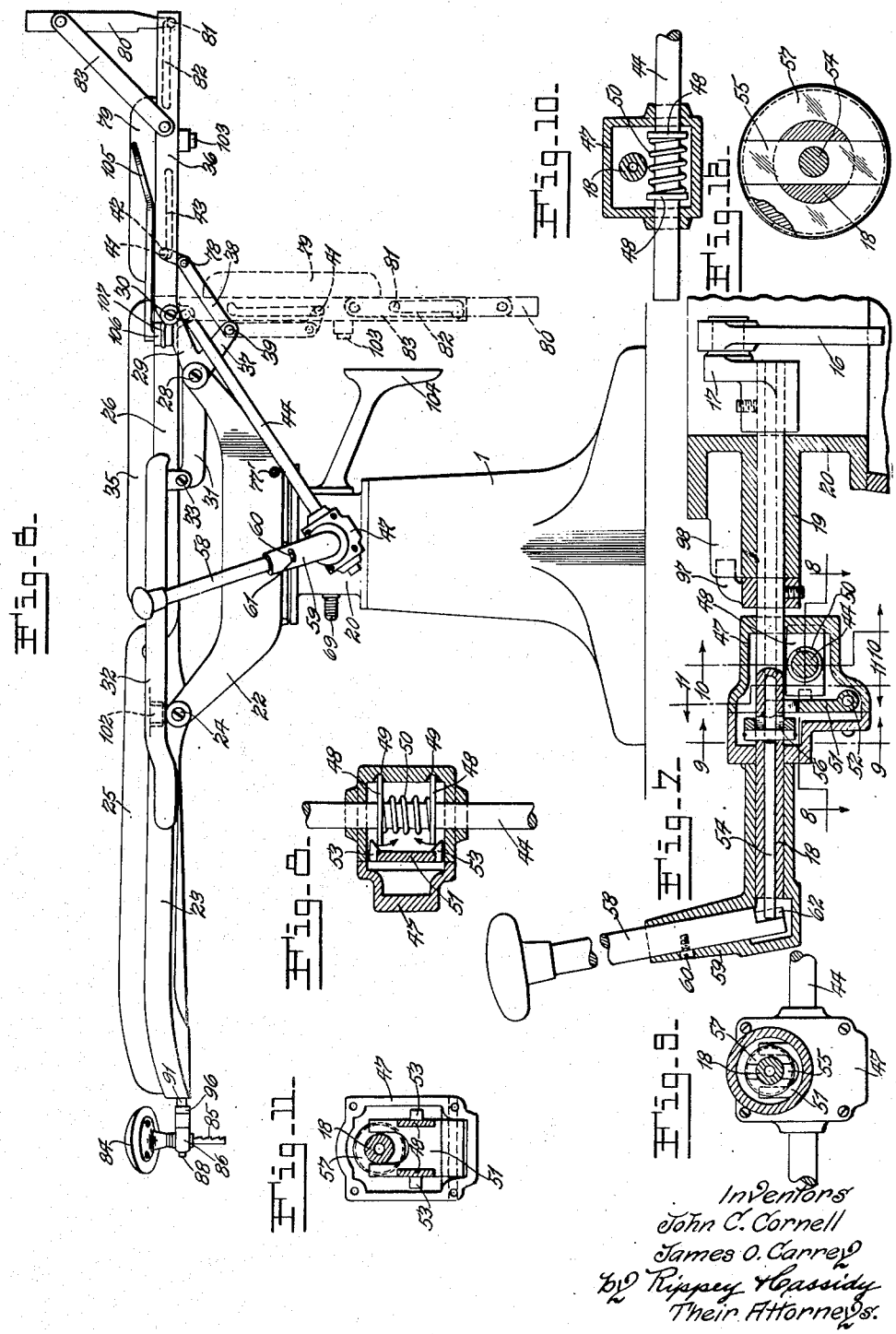


Fig-6.

Fig-10.

Fig-12.

Fig-7.

Fig-8.

Fig-9.

Fig-11.

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SURGICAL CHAIR

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Fig. 12.

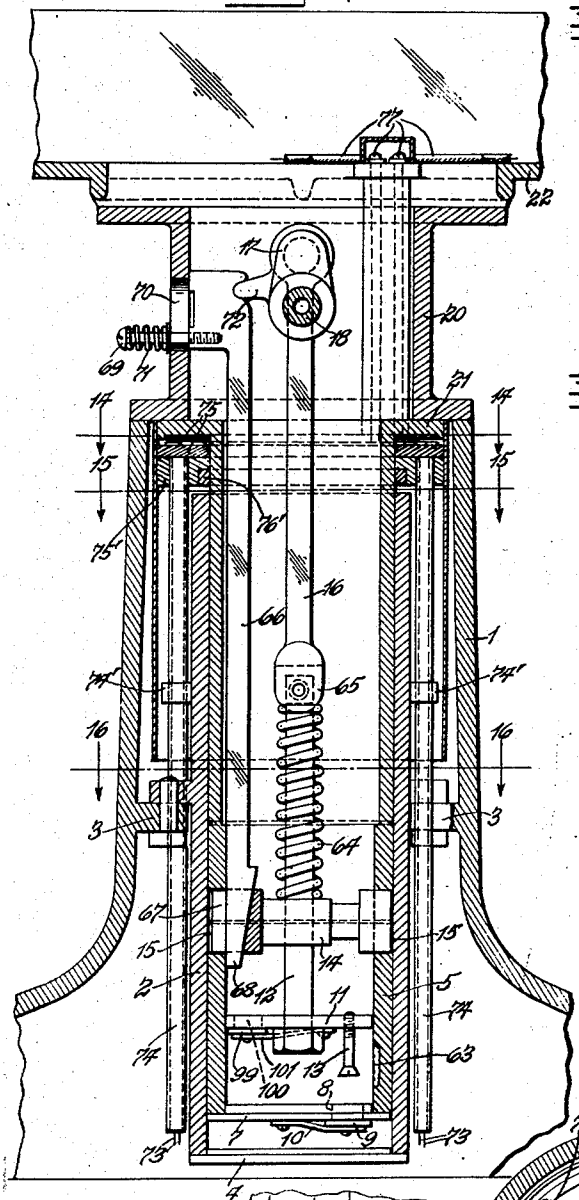


Fig. 15.

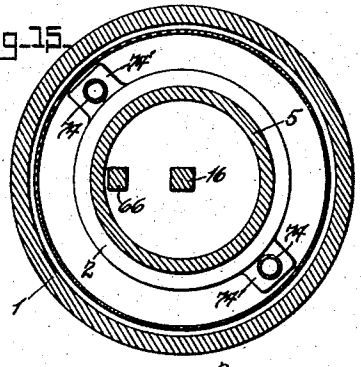


Fig. 16.

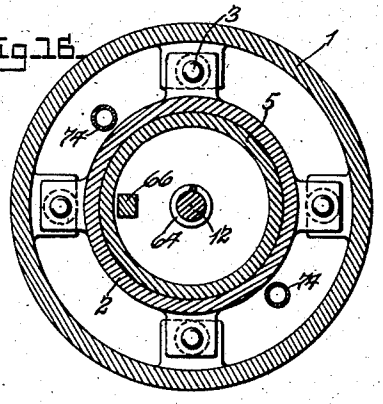


Fig. 17.

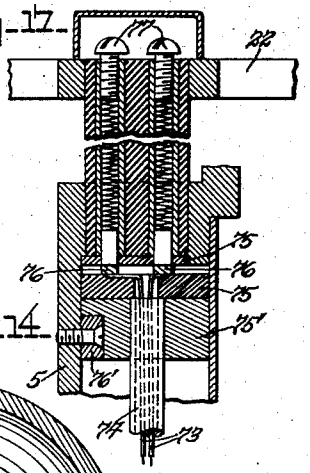


Fig. 14.

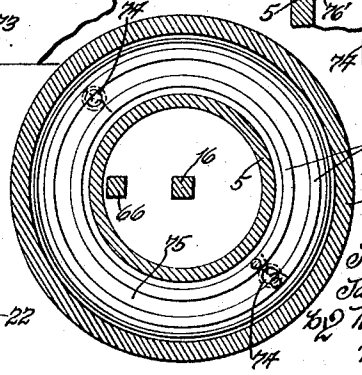
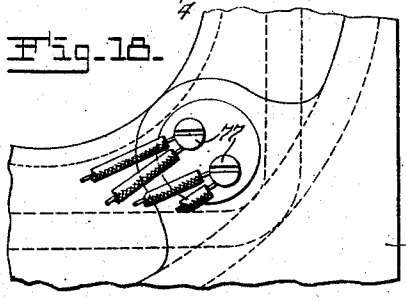


Fig. 18.



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UNITED STATES PATENT OFFICE

2,130,754

SURGICAL CHAIR

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Application December 12, 1935, Serial No. 54,040

8 Claims. (Cl. 155—29)

This invention relates to surgical chairs, and has special reference to mechanism for adjusting a surgical chair in different positions from upright position to horizontal position, and for raising and lowering the chair.

Objects of the invention are to provide an improved surgical chair comprising, essentially, back and seat portions and a leg board, in combination with mechanism for adjusting the back portion and the leg board in any desired relationship to the seat from vertical positions to horizontal positions in continuation of the seat; to form and construct said mechanism so that it may be operated easily and without undue force; to provide convenient means whereby the chair may be supported for turning movements about a vertical axis or held against turning movements as desired; to provide means for easily raising and lowering the chair; to provide a head rest supported by the back portion of the chair and capable of adjustment toward and from the end of the back portion, and also capable of adjustment angularly with respect to the back portion of the chair; and to provide a chair embodying the various improved features of construction and combinations of elements herein disclosed.

Other objects of the invention will be made apparent by the following description, reference being made to the annexed drawings, in which—

Fig. 1 is a side elevation of the chair in upright position.

Fig. 2 is a front elevation of the chair.

Fig. 3 is a plan view of the chair extended to horizontal position.

Fig. 4 is an enlarged sectional view of the head rest.

Fig. 5 is a detail sectional view approximately on the line 5—5 of Fig. 4.

Fig. 6 is a side elevation of the chair extended horizontally.

Fig. 7 is a sectional view of the mechanism that controls the raising and lowering of the chair, and a part of which mechanism controls the locking and unlocking of the chair in its different adjusted positions.

Figs. 8, 9, 10 and 11 are sectional views on the correspondingly designated section lines in Fig. 7.

Fig. 12 is an enlarged sectional view showing a part of the device controlling the locking and unlocking of the chair.

Fig. 13 is an enlarged vertical sectional view of the pedestal and the mechanism supported thereby for raising and lowering the chair.

Figs. 14, 15 and 16 are sectional views on the correspondingly designated section lines of Fig. 13.

Fig. 17 is an enlarged sectional view of an electrical conductor that will function in any of the positions of the chair.

Fig. 18 is a plan view of a part of the electrical conductor connections.

The pedestal 1 is hollow. A cylinder 2 (Figs. 13 and 16) is enclosed within the pedestal 1 and is rigidly secured thereto by connections 3. The lower end of the cylinder 2 is closed by an end wall 4.

A lifting cylindrical piston 5 is mounted for vertical sliding and for rotary movements in the cylinder 2, and has a lower end wall 7 provided with a port 8. A valve 9 supported by a spring 10 opens and closes the port 8 to permit flow of oil therethrough.

A pump piston 11 is rigidly attached to the lower end of a rod 12 within the lifting piston 5 and supports a projection 13 above the port 8 and the valve 9 so that, when the piston 11 is moved downwardly, the projection 13 will be extended through the port 8 and will engage and open the valve 9 to permit oil to flow from the cylinder 2 into the lifting piston 5. The rod 12 extends for sliding movements through a crosshead 14 having its ends seated in holes 15 in the lifting piston 5. The upper end of the rod 12 is pivoted to the lower end of a connecting rod 16, which has its upper end pivoted to a crank 17 rigidly attached to a rotary shaft 18. The shaft 18 is journalled in a bearing 19 (Fig. 7) in connection with a vertically movable hollow piston portion 20 which is rigid or integral with an outwardly extended portion 21 of the upper end of the lifting piston 5.

The saddle 22 or main frame of the chair is attached to the piston portion 20. The lower end of the chair back frame 23 is connected with the saddle or main frame 22 by pivots 24 and supports the upholstered or yielding chair back 25. Below the pivots 24 the back frame 23 is connected with the seat frame 26 by pivots 27. Thus the back frame 23 is pivotally supported by the saddle or main frame 22 and is pivotally connected with and supports the rear end of the seat frame 26 below the supporting pivots 24 for the back.

The front end of the saddle or main frame 22 supports pivots 28 on which levers 29 are pivoted, and which have their ends connected with the seat frame 26 by pivots 30. Arms 31 extend from the levers 29 and have their ends connected with the forward ends of arm rests

32 by pivots 33 (Fig. 1). The rear ends of the arm rests 32 are connected with the sides of the back frame 23 by pivots 34. The distance between the pivots 30 and 33 is the same as the distance between the pivots 27 and 34, and the distance between the pivots 30 and 28 is the same as the distance between the pivots 27 and 24. Thus, when the back of the chair is swung rearwardly and downwardly from upright position, the seat frame of the chair will be swung forwardly and upwardly. The seat frame supports a seat cushion 35 which is in approximately the same horizontal plane with the back cushion 25 when the back of the chair is extended horizontally (Fig. 6).

The pivots 27 are below and forwardly beyond the pivots 24, and the pivots 30 are below and forwardly beyond the pivots 28 when the back is vertical. The arms 31 are considerably longer than the arms 29 so that, when the back is swung rearwardly and downwardly, the weight of the operating chair parts and the weight of the person seated in the chair are so nearly equalized and balanced that the back can be raised and lowered very easily.

A leg board frame 36 is mounted on the pivots 30. Arms 37 integral with the levers 29 and with the arms 31 have their ends connected with links 38 by pivots 39. The opposite ends of the links 38 are rigidly attached by connections 40 with projections 41 that extend into angular slots comprising the connected slots 42 and 43 on the inner sides of the leg board frame 36 (Fig. 6). When the projections 41 are in the slots 42, the leg board frame 36 will be swung to horizontal position when the back of the chair is swung to horizontal position; and, when the projections 41 are in the slot portions 43, the leg board frame 36 may swing downwardly to vertical position as indicated by dotted lines in Fig. 6 of the drawings.

A lock bar 44 which is also an operating bar, has one end connected with the seat frame 26 by a pivot 45 extending through said lock bar and through lugs 46 rigid with the seat frame 26. Thus when the back of the chair is swung downwardly and backwardly and the seat frame is raised, the leg board frame is swung upwardly by these connections unless the projections 41 are disengaged from the slot ends 42. If the projections 41 are disengaged from the slot ends 42 and are engaged in the slot ends 43, the leg board frame may remain in or swing downwardly to approximately vertical position, as shown in Fig. 6 of the drawings.

The opposite end of the lock bar 44 extends through a frame 47 and through a pair of pivoted lock plates 48 (Figs. 7 and 8). The plates 48 are pivoted at 49 in connection with the frame 47 and have holes through which the lock bar 44 extends. A spring 50 encircling the lock bar 44 between the lock plates 48 spreads said plates apart and into clamping engagement with the lock bar 44 so as to hold said lock bar 44 against longitudinal movements. Thus, when the spring 50 holds the plates 48 in locking or clamping engagement with the lock bar, said lock bar cannot move longitudinally. And, if said plates 48 are swung toward each other in opposition to the spring 50, clamping engagement of said plates with the lock bar 44 is released, and said lock bar may move longitudinally, allowing the chair to be moved to any of its adjusted positions, from vertical to horizontal position of the back of the chair.

Our invention comprises a device for moving the plates 48 out of clamping engagement with the lock bar 44 in opposition to the spring 50. Said device comprises a plate 51 mounted for swinging movements on a pivot 52 and having cams 53 in connection therewith and engaging the plates 48 so that, when said plate 51 is swung toward the lock bar 44, said cams 53 will move the plates 48 toward each other in opposition to the spring 50 and thereby release the plates 48 from clamping or gripping engagement with the lock bar 44 and leave said lock bar 44 free to slide longitudinally. So long as the plates 48 prevent longitudinal movement of the lock bar 44, said lock bar will prevent relative movement of the seat and back portions of the chair and will hold said seat and back portions in rigid relationship.

The outer end of the shaft 18 is tubular and a rod 54 is mounted for longitudinal sliding movements therein. The outer end of the rod 54 extends beyond the end of the shaft 18, and the inner end of said rod engages a cross-piece 55 (Figs. 7 and 12) that extends through a slot 56 through the shaft 18. The cross-piece 55 is seated in grooves in a collar 57 mounted for sliding movements along the shaft 18 close to the plate 51. Thus, when the rod 54 is pushed inwardly, it will slide the collar 57 along the shaft 18 and swing the plate 51 toward the lock bar 44 and cause the cams 53 to move the plates 48 out of clamping or locking engagement with said bar 44 and thereby permit said lock bar 44 to move longitudinally.

A lever 58 is mounted for turning movements in an angular supporting member 59 that is attached to the shaft 18. A screw 60 extends through a slot 61 in the supporting member 59 and is attached to the lever 58. Said screw functions to limit extent of turning movement of said lever 58 and also to hold said lever in the support 59. A cam 62 on the lower end of the lever 58 engages the rod 54 so that, when said lever is turned in one direction, said cam will push the rod 54 inwardly and thereby release the plates 48 from locking engagement with the lock bar 44, in the manner explained. When the lever 58 is released, the spring 50 will move the plates 48 away from each other into clamping engagement with the lock bar 44 and will push the plate 51 away from the lock bar.

It is now clear that, when the lock bar 44 is held against longitudinal movement, the seat and back portions of the chair are maintained in rigid relationship; and, when the lever 58 is turned as described, the lock bar 44 is released and the back and seat portions of the chair may be moved to any desired practicable adjustment from vertical position of the back to horizontal position thereof, and may be locked in such positions by engagement of the plates 48 with the lock bar 44. While the back is in its horizontal position the leg board also will be supported rigidly in horizontal position until the projections 41 are moved from the slot ends 42 into the slot ends 43.

As before stated, the shaft 18 is supported for rocking movements in the bearing 19, and such turning movements are imparted to the shaft 18 by oscillation of the lever 58. When the shaft 18 is rocked by operation of the lever 58 (Figs. 7 and 13), the crank 17 will move the connecting rod 16 and piston rod 12 and thereby operate the pump piston 11. Downward movement of the pump piston 11 opens the valve 9 and forces oil from the lifting piston 5 into the cylinder 2, thus

forcing the lifting piston 5 upwardly to raise the chair.

A by-pass groove 63 (Fig. 13) in the lifting piston permits oil to pass across the pump piston 11 when the pump piston is in its lower position. Thus, the lever 58 performs the function of operating the lock controlling the lock bar 44, and also performs the function of operating the pump mechanism to raise and lower the chair.

When the piston 11 is in its lowest position, the projection 13 enters the port 8 and opens the valve 9. This permits the oil to flow from the cylinder 2 through the port 8 and around or across the piston 11 through the by-pass 63 into the pump cylinder 5 above said pump piston. This allows the chair to descend. When the lever 58 is released, the spring 64 raises the pump piston 11 a distance sufficient to disengage the projection 13 from the valve 9, whereupon said valve 9 is closed by the spring 10. This movement of the pump piston 11 carries said pump piston above the by-pass 63, as shown in Fig. 13.

The chair is rotative upon its support and may be locked against rotation as desired. A rod 66 extends into the lifting piston and through a slot 67 in the cross-head 14. A cam 68 on the rod 66 functions to move the cross-head 14 laterally in one direction and into clamping engagement with the rigid cylinder 2. The upper end of the rod 66 is connected with a screw 69 which projects outwardly through a slot 70 in the piston portion 20. A spring 71 mounted on the screw holds the rod in proper position for vertical sliding movements. A finger 72 in connection with the crank 17 is movable into engagement with the rod 66 by turning movement of the shaft 18 in a counter-clockwise direction, as shown in Fig. 13, and will move the rod 66 downwardly to operate the cross-head 14 into locking engagement with the cylinder 2 and, by slight turning movement in a clockwise direction, will move the rod 66 upwardly and release the cross-head 14 from the cylinder 2.

Electric wiring 73 extends through tubes 74 at opposite sides of the cylinder 2 and within the pedestal. The tubes 74 are mounted for vertical sliding movements in guides 74' in connection with the rigid cylinder 2. The upper ends of the tubes 74 extend through and are attached to an annular member 75' mounted on the lifting piston 5 above the rigid cylinder 2 and movable vertically with the piston. Said annular member 75' does not turn with the pump piston 5 and is supported on a collar 76' attached to the pump piston 5, so that said pump piston may turn while the annular member 75 remains stationary. The wires 73 pass between insulation pieces 75 and upwardly to contact with rings 76. Said rings are in electrical communication with electrical conductors 77 leading to sockets 77' at opposite sides of the chair for reception of plugs connected with wiring leading to head lamps, etc. Thus, the lamps may be kept lighted during turning of the chair because the rings 76 maintain electrical communication from the wires 73 to the conductors 77.

The projections 41 may be moved manually into the angularly disposed slots 42 and 43. For this purpose, handles 78 are attached to the links 38. When the leg board frame 36 is extended horizontally, the upholstery 79 thereon is in substantial alinement with the seat and back portions of the chair.

A foot board 80 has projections 81 movable along angular slots 82 in the leg board frame. Links 83 pivotally connect the foot board 80 with the leg board frame 36 and permit the foot board to be moved to and supported in angular position with respect to the leg board, or to be extended in continuation of the leg board frame, as should be understood by reference to the broken dotted lines illustrating these parts in Fig. 6.

The head rest 84 is attached to two arms 85 extending for sliding movements through a frame 86. The arms 85 are provided with notches 87 (Fig. 5). A latch comprising a stem 88 and a cross-member 89 is mounted in the frame 86 and is actuated outwardly and into latching engagement with the rods 85 by a spring 90. The beveled formation of the walls of the notches 87 and the beveled formation of the cross-part 89 of the latch permit the head rest to be moved upwardly or forwardly without operating the latch manually since the latch will escape along the notches 87. If it is desired to move the head rest rearwardly or downwardly, the latch must be manually released.

The frame 86 is attached to a pair of rods 91 which extend for sliding movements through the back frame 23 and through a latch frame 92 formed on the back frame. The rods 91 are also provided with notches 93 having inclined walls and engaged by a cross-member 94 of a latch having a rearwardly extended stem just like the stem 88. A spring 95 presses the latch into latching engagement with the notches 93. Thus, by proper manipulation of the latch 94, the head rest may be moved toward or from the back frame of the chair. Elastic bumpers 96 are attached to the roads 91 to make yielding contact with the frame of the chair (Fig. 4).

Extent of turning movement of the shaft 18 in operating the pump piston 11 is limited by a projection 97 rigid with the shaft 18 and arranged to engage a rigid part 98 on the piston portion 20. Thus the shaft 18 may be turned in a clockwise direction from the position shown in Fig. 13 and then returned to said position. This will reciprocate the pump piston 11, with the result that oil above said piston 11 passes through a port 99 controlled by a valve 100 mounted on a spring 101. Sufficient suction is created by the upward movement of the piston 11 to cause the oil above said piston 11 to open the valve 100. Then, when the piston 11 is moved downwardly, oil is forced through the port 8 below the lift piston 5 to raise said lift piston and thereby raise the chair. When the piston 11 is left in its lower position, in which the valve 9 is held open by the projection 13, oil may flow from below the lift piston through the port 8 into the lift piston 5, and thence through the by-pass 63 to the space above the piston 11. This will permit the chair to descend.

Elastic bumpers 102 on the arm rests 32 engage the rear ends of the saddle or main frame 22 when the chair is adjusted to horizontal position. Elastic bumpers 103 on the leg board frame 36 engage arms 104 projecting from the piston portion 20 when the leg board is in its lower position.

Stirrups 105 are pivoted in sockets 106 which are integral or rigid with the levers 29. As shown, these stirrups extend downwardly when the back of the chair is in its vertical position and are swung upwardly when the back of the chair is swung rearwardly and downwardly to operate the levers 29. When the back of the chair is extended upwardly and the leg board is extended downwardly, as shown in Fig. 1, these stirrups extend downwardly at the sides of the leg board

upholstery. When the back of the chair is in a horizontal adjustment and the leg board is supported horizontally, the stirrups extend approximately horizontally at the sides of the upholstery of the leg board. Set screws 107 are screwed laterally into the sockets 106 and may be set to hold the stirrups rigidly in any of their adjustments and loosened to permit the stirrups to be moved to their different adjustments. It will be observed that the pivots for the stirrups extend horizontally when the chair is in the adjustment shown in Figs. 1 and 2 and extend vertically when the chair is in horizontally extended position, as shown in Fig. 6. Thus, the stirrups may be swung laterally about vertical axes and secured in their selected adjustments when the chair is extended horizontally as in Fig. 6.

Our improved chair constructed and operated in the manner described attains all of its intended functions. The raising of the chair seat during the descent of the chair back while the patient is on the chair shifts the center of gravity during the movement of the chair with the patient thereon, so that there is no overbalancing and the chair may be easily raised and lowered. It may be said that the back, seat and leg board portions of the chair counterbalance each other so that the swinging or pivotal movements of said parts are very easily effected.

The construction and arrangement of the parts may be varied widely from the specific construction and arrangement shown and described without departure from the nature and principle of the invention.

We claim:—

1. A chair comprising a supporting frame, a back having pivotal connection near its lower end with said frame, angular levers having pivotal connection with the front end of said frame and having lower arms extending downwardly and forwardly and upper arms extending upwardly from said pivotal connections, a seat having pivotal connection at its rear end with the lower end of said back below said first named pivotal connections and having pivotal connection at its forward end with said lower arms of said levers below and forwardly of said second pivotal connections, and arm rests having their rear ends pivotally connected with said back farther above said first pivotal connections than the pivotal connections of said seat with said back and having their forward ends pivotally connected with the upper ends of said upper arms of said levers farther from said second pivotal connections than the pivotal connections of said seat with said levers, whereby downward movement of said back to horizontal position will move said seat upwardly and said arm rests downwardly differentially to extend said seat above said arm rests.

2. A surgical chair comprising a rigid supporting frame, a back having pivotal connection with the rear end of said frame for upward and downward swinging movements, angular levers having pivotal connection with the front of said frame and having downwardly and forwardly extending arms and also upwardly extending arms, a seat, pivots connecting the rear end of said seat to said back below and forwardly from said first named pivotal connections and having its front end pivoted to said downwardly and forwardly extending arms of said levers below and in front of said second pivotal connections, and arm rests having their rear ends pivoted to said back above said first pivotal connections a distance greater than the distance between said first named pivotal connections and the pivotal connections of said seat with said back and having their front ends pivoted to said upwardly extending arms of said levers a greater distance above said second pivotal connections than the distance between said second named pivotal connections and the pivotal connections of said seat with said levers for moving said seat and arm rests to positions in which the seat is above the arm rests when the back is in horizontal position.

3. A surgical chair comprising a supporting frame, a back having pivotal connection with said frame for upward and downward swinging movements, angular levers having pivotal connection with the front of said frame and having downwardly and forwardly extending arms and also upwardly extending arms, a seat having its rear end pivoted to said back below and forwardly from said first named pivotal connections and its forward end pivoted to said downwardly and forwardly extending arms of said levers below and forwardly from said second pivotal connections, and arm rests pivotally connected with said back and with said upwardly extending arms of said levers for operating said levers when said back is swung downwardly to raise said seat and lower said arm rests to position in which the upper surface of the seat is above the arm rests when the back is moved to horizontal position.

4. A surgical chair comprising a supporting frame, a back having pivotal connection with said frame for upward and downward swinging movements, levers pivotally supported by said frame, a seat having its rear end pivotally supported by said back below the pivotal connection of said back with said frame, pivots connecting the front end of said seat with said levers, a leg-board having its upper end mounted on said pivots, connections for operating said levers by said back when said back is swung upwardly and downwardly, means for extending said leg-board horizontally when said back is swung downwardly, and stirrups attached to said levers and moved thereby to horizontal position when said leg-board is extended horizontally as aforesaid.

5. A surgical chair comprising a supporting frame, a back pivoted on said frame for upward and downward swinging movements, a pair of levers pivoted on the front of said frame, a seat having its rear end pivoted to said back and its front end pivotally supported by said levers for movement upwardly and downwardly when said back is swung downwardly and upwardly, a leg-board pivotally connected with said levers, means for operating said levers by said back and extending said leg-board horizontally when said back is swung downwardly as aforesaid, and stirrups pivotally supported by said levers at the sides of said leg-board, and operated by said levers to extend said stirrups horizontally with said leg-board.

6. A surgical chair comprising a rigid supporting frame, a back pivotally supported by said frame, levers pivoted at the front of said frame, arm rests pivotally connecting said back and said levers for operating said levers when said back is swung downwardly and upwardly, a seat pivotally supported by said back and by said levers and moved thereby into horizontal alinement with said back and above the plane into which said arm rests are moved, a leg-board pivotally supported by said levers, and connections from said levers to said leg-board and operated by said levers for moving said leg-board in extended horizontal continuation of said seat when said seat is

moved to horizontal position into alinement with said back as aforesaid.

7. A surgical chair comprising a rigid supporting frame, a back pivoted on said frame for upward and downward swinging movements, levers pivoted on the front of said frame, a seat pivotally supported by said back and said levers for upward and downward movements, arm rests connected with and operated by said back for operating said levers to move said seat upwardly when said back is swung downwardly and vice versa, a leg-board pivotally supported by said levers, means operated by said levers for moving said leg-board to horizontal position when said back is swung downwardly and said seat is moved upwardly as aforesaid, and a locking device connected with the forward end of said seat for locking said seat and back members against relative movements in their different adjusted positions irrespective of the position of said leg-board.

8. A surgical chair comprising a rigid frame, a back pivotally supported by the rear end of said frame for upward and downward swinging movements, a seat having its rear end pivoted to said back for upward swinging movements when said back is moved downwardly and vice versa, levers pivoted to the front of said frame and pivotally supporting the front of said seat for upward and downward swinging movements, connections operated by said back for operating said levers to raise the front end of said seat when the back is swung downwardly and vice versa, a locking device connected with the forward end of said seat for positively locking the seat and thereby the back against relative movements in their different adjusted positions, stirrups, means rigid with said levers pivotally supporting said stirrups on said levers, whereby said stirrups may be extended horizontally when said seat is operated by downward movement of said back as aforesaid and may be extended vertically when said seat is operated by upward movement of said back.

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