No. 852,559. PATENTED MAY 7, 1907.

A. N. HORNUNG, Jr.

HYDRAULIC CHAIR.

APPLICATION FILED OCT. 23, 1905.

2 SHEETS—SHEET 1.

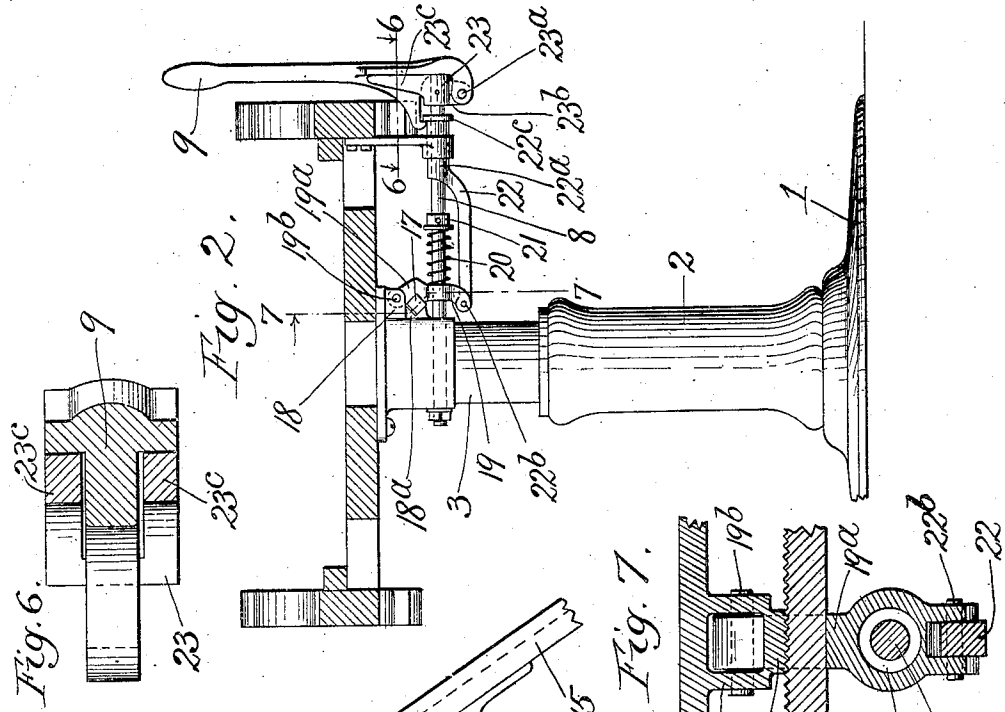


Fig. 2.

Fig. 6.

Fig. 7.

Fig. 1.

Witnesses,
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2 SHEETS—SHEET 2.

Fig. 3.

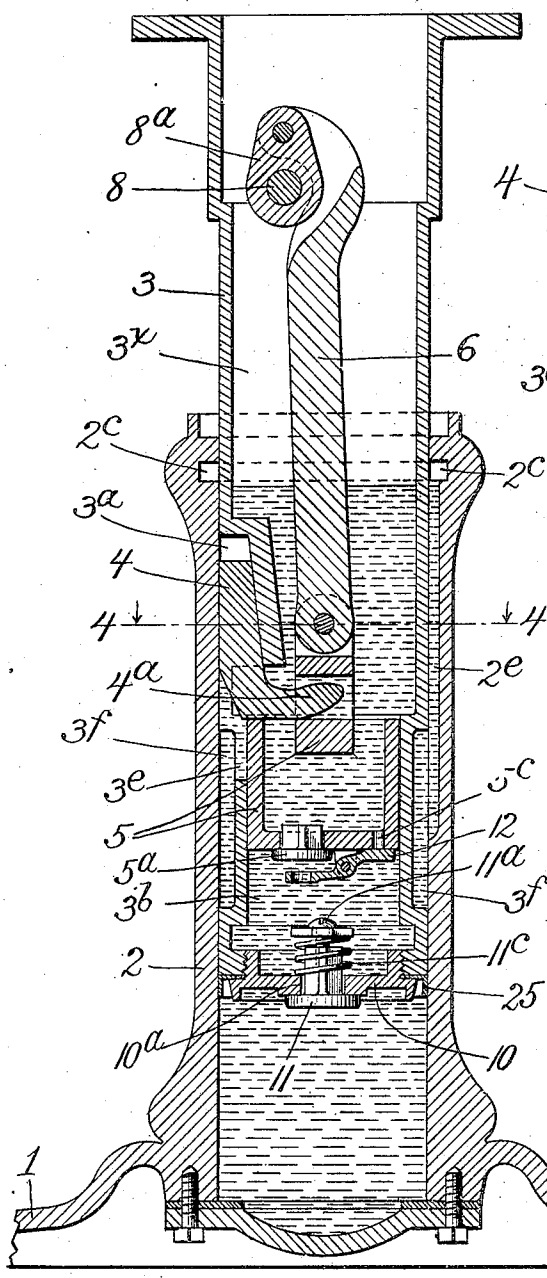


Fig. 4.

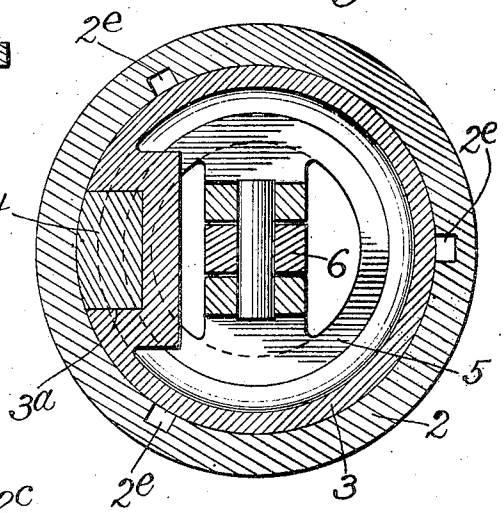
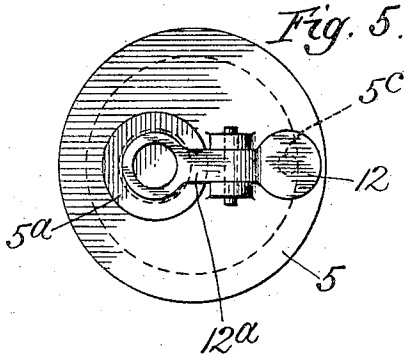


Fig. 5.



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UNITED STATES PATENT OFFICE.

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HYDRAULIC CHAIR.

No. 852,559. Specification of Letters Patent. Patented May 7, 1907.

Application filed October 23, 1905. Serial No. 284,088.

To all whom it may concern:

Be it known that I, ANTON N. HORNUNG, Jr., a citizen of the United States, residing at Chicago, county of Cook, and State of Illinois, have invented new and useful Improvements in Hydraulic Chairs, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

The purpose of this invention is to provide an improved chair of the type commonly termed hydraulic, that is provided with means and having construction for raising and lowering the chair by liquid pressure.

It constitutes all features of construction set out in the claims not altogether limited to use in hydraulic chairs, but having in certain respects special adaptation thereto.

In the drawings:—Figure 1 is a side elevation of a chair having my improvements. Fig. 2 is a vertical section at the line 2—2 on Fig. 1. Fig. 3 is a vertical section axial with respect to the standard as at the line 3—3 on Fig. 2. Fig. 4 is a section at the line 4—4 on Fig. 3 for showing the side elevation of certain parts concerned in the adjustment of the chair. Fig. 5 is a bottom plan view of the piston. Fig. 6 is a section at the line 6—6 on Fig. 2. Fig. 7 is a section at the line 7—7 on Fig. 2.

In the drawings 1 represents the base of the chair in which are located the passages for the operating liquid, and from which the standard 2 extends upward, being rigid and preferably integral with the base as shown in Fig. 3. Within the standard 2 a reciprocating chair-stem 3 operates piston-wise, being suitably fitted in the bored out standard.

4 is a dog which is lodged in a recess or pocket 3^a formed in the side of the stem 3, said pocket being sloped at the bottom or inner side extending obliquely radially inward from the upper to the lower end and the dog 4 being correspondingly tapered to seat in said pocket and cylindrically curved exteriorly to correspond with the stem 3, so that it constitutes a continuation of the cylindrical surface of said stem when the dog is at the lower limit of a certain range of movement, which it can have up and down in the pocket 3^a, but so that it would slightly protrude beyond the cylindrical surface of the stem if it were moved to the upper limit of the pocket. It will be seen that with this construction the dog is adapted to operate as a locking wedge to hold the stem tight at any position to which it may be moved up or down in the cylindrical bore of the standard. The dog 4 has at its lower end an inwardly protruding foot 4^a, and the pocket 3^a being open at the bottom permits said foot to protrude inwardly past the inner wall of the pocket. The hollow stem 3 constitutes the barrel of the pump for forcing the operating liquid into the proper chamber for raising the chair. A piston 5 operates in the lower part 3^b of the cylindrical cavity constituting the pump barrel in the stem 3 and is connected by the operating link 6 to the crank or lever arm 8^a of the rock shaft 8, which is journaled near the upper end of the standard 3 extending transversely with respect to the chair under the seat. The shaft 8 is provided with an operating handle 9 which extends up at the right hand side of the seat outside the arm and is adapted to be moved from an upward position down forwardly to a horizontal position for rocking the shaft to operate the piston 5. When operating thus for the purpose of pumping, the operator will not swing the arm through its entire range, but will stop short of both limits.

The cavity $3^\times$ of the stem 3 serves as the reservoir for the operating liquid which passes down past the valve 5^a in the bottom of the piston 5 when the piston is lifted. The depression of the piston operates to close said valve 5^a and force the liquid past the valve 11 through the port 10^a in the bottom fitting 10 which closes—except as to said port—the lower end of the cavity of the stem 3. The valve 11, which is seated upwardly by the spring 11^c may be forced off its seat by the collision of the piston or any part of the bottom thereof with the upper end of the guide stem 11^a of said valve 11 when the piston is forced to the lower limit of its stroke. In the bottom of the piston there is a second port 5^c which is closed at the lower side by a valve 12 pivotally mounted so as to have a lever arm 12^a terminating in a position to collide with the upper end of the stem of the valve 11 when the piston is moved downward to the limit of its stroke. Such action of the piston, therefore, opens both the valves 11 and 12 and permits the liquid to pass back out from under the lower end of the stem up into the reservoir $3^\times$, in the stem. Since

stem 3 is lifted by the liquid forced under it by the piston 5 in the pumping action, such liquid being withdrawn from the upper part of the chamber of the reservoir $3^{\times}$ in the stem, any opportunity for the return of liquid from below the stem back into the reservoir will permit the stem and chair which it supports to descend slowly, because the port 5^{c} is small, until the opportunity for return of liquid is cut off.

At the upper limit of its stroke the piston 5 collides with the under side of the foot 4^{a} of the dog 4 and forces said dog upward in the tapering pocket 3^{a}, wedging it at its outer cylindrical surface tightly against the inner wall of the standard cavity. The piston 5 may thus be operated for three purposes:—first,—for the ordinary or primary purpose of pumping the operating liquid to lift the chair; second: by forcing it to the lower limit of its stroke, to open the valves to permit the liquid to escape for lowering the chair; third: by moving it to the upper limit of its stroke, for driving the dog into a locking position to retain the chair to any position which it may be elevated by the pumping.

The standard 2 is provided in the inner wall of the cylindrical bore in which the stem 3 operates, with longitudinal channels 2^{e}, which extend at their lower ends to a point at which they are exposed below the lower end or piston head of the stem 3, when the latter is at the highest position to which it is designed to be forced for lifting the chair. At the upper part of the bore of the standard there is formed in its inner wall an annular or circumferential channel or recess 2^{c}, into which the longitudinal channels lead at their upper ends. Near the lower part of the stem 3, it is exteriorly reduced in diameter to form an annular or circumferentially encompassing recess 3^{f} which extends from a point of sufficient distance above the extreme lower end of said stem to leave still at that end a piston head, and at its upper end extends above an aperture 3^{e} formed in line with the pocket 3^{a} and in continuation of the open face of said pocket, opening from the outer side of the stem to the liquid reservoir $3^{\times}$ within it. These longitudinal and circumferential recesses in the inner cylindrical wall of the standard and in the outer cylindrical surface of the stem, respectively, serve two purposes: First: It will be seen that if the stem is lifted until its lower end passes above the lower end of the channels 2^{e}, the liquid in the standard below said lower end of the stem can pass by the piston up through said channel and reach the annular recess 3^{f} and pass by way of that recess to the aperture 3^{e} and thence back into the reservoir $3^{\times}$. Such escape of liquid from below the stem would permit the chair to descend until the lower end of the stem 3 should pass the lower end of the channel 2^{e} and close the escape passage; the channels, therefore, operate in conjunction with the recess 3^{f} to prevent the lifting of the chair by continued pumping beyond the point at which the piston end of the stem reaches, or slightly passes, the lower end of the longitudinal channels. Second: The operation of the stem in the cylindrical chamber of the standard is facilitated by the lubrication afforded by oil which can pass freely from the reservoir $3^{\times}$ out through the aperture 3^{e} so as to enter between the two surfaces requiring such lubrication; and in the operation of the chair, there is a tendency for the oil to pass between such surfaces, and but for means tending to prevent it, it would eventually escape at the top of the chamber and flow upon the surfaces of the standard and chair. This is prevented by the provision of the channels in the inner surfaces of the cylindrical walls of the standard chamber for the oil thus passing up between the two surfaces in contact and reaching the annular recess 2^{c} will flow around until it reaches the upper ends of the longitudinal channels 2^{e} by which it will flow back until it reaches the annular recess 3^{f}, from which it will pass through the aperture 3^{e} into the reservoir, or at least be in communication with the liquid in that reservoir so that it will stand no higher outside the same than the level of the liquid within the reservoir.

Preferably, the bottom or piston head of the said stem 3 is packed for piston-fit in the bore of the standard by means of a spun brass annular packing flange 25, which is right angular in cross section, its horizontal web being clamped between the end of the stem and the bottom plate, 10, which is screwed into the lower end of the stem and carries the valve 11, as already described. The vertical flange of the annular packing 25, seated outwardly against the cylindrical wall of the chamber, is slightly extensible and sufficiently flexible to be forced in to perfect seating against said cylindrical wall by the pressure of the liquid under the end of the stem, thus acting after the manner of a cup-leather packing in similar situations.

The pump operating handle 9 is arranged to serve the additional purpose of releasing the apron operating means for permitting adjustment of the apron, foot rest and any other parts of the chair which are connected therewith for adjustment. In the drawings the apron 15 pivotally attached to the chair frame is connected at a lug 16 with a fore-and-aft sliding bar 17, which is mounted for sliding in a slot one-half of which is formed at 18^{a} in a lug 18 on the side of the stem 3, the other half of the seat being formed at 19^{a} in a clamp 19, which is pivoted to the stem at 19^{b} and swings on its pivot outwardly to release and inwardly clamp the bar 17. Said bar is preferably square in

cross section and is mounted with its diagonals respectively vertical and horizontal, having the inner of the two obliquely lower faces serrated for engagement with the correspondingly serrated face of its seat. Said seat is located directly above the rock shaft 8, which thus extends through the clamp, the latter having an elongated aperture 19^d to accommodate the shaft. By this arrangement the shaft is utilized for carrying the spring 20, which yieldingly forces the clamp against the bar 17, said spring being coiled around the shaft, reacting at one end against the clamp, and being stopped at the other end by the stop-collar 21, pinned fast on the shaft. The shaft also carries means for releasing the clamp, which consists of a link 22, sleeved at 22^a on the shaft, and deflected downward from said sleeved part to extend past the spring 20 at the underside of the latter in order to reach the lower end of the clamp 19, to which the link is connected at 22^b. The handle 9 in order to operate for withdrawing the clamp at will and for locking the shaft, is connected to the shaft by being hinged at 23^a to a lug 23^b at the lower side of the collar 23 which is pinned fast on the shaft, and the collar has also an upwardly extending bifurcated stop-arm 23^c, against which the handle 9 is stopped inwardly, being free to swing outwardly for operating the link 22 with which it is engaged by means of a hooked arm, which is vertically flat and extends between the forks of the bifurcated stop-arm between which it fits closely enough to obtain from said fork arms the lateral reinforcement in both directions which the handle requires for rocking the shaft, but free enough to permit the handle to be swung about its hinge pivot. The inner hooked end of this hook arm engages an anular flange 22^c on the outer end of the sleeve 22^a for pulling the link 22 outward on the shaft against the tension of the spring 20 to withdraw the clamp from the bar 17. The engagement of the hooked arm of the handle with the collar, both above and below the shaft, the lower engagement being at the hinge pivot and the upper engagement being that of the hooked arm of the lever, with the bifurcated arm of the collar, makes the connection of the lever to the shaft for rocking the latter very secure, notwithstanding the freedom of movement of the lever arm about its pivot for the purpose described.

I claim:—

1. In a hydraulic chair; in combination, the support having a vertical chamber a chair-stem operating piston-wise in such chamber; such stem being itself chambered for a liquid reservoir; a piston operating in the lower part of the chamber of the chair-stem, said piston and the bottom of the piston-wise operating stem having liquid ports and upwardly seating check valves controlling such ports; the piston having a second liquid port and a valve controlling it; said last mentioned valve having an operating arm for opening said valve when the arm is forced upward, and the valve of the chair-stem being in position to collide with such operating arm when the piston is moved down to the lower limit of its stroke.

2. In a hydraulic chair; in combination, the support having a piston chamber, the chair-stem operating piston-wise in such chamber, being itself chambered for a liquid reservoir, said reservoir having an aperture for communication with the outer surface at a point above the path of the lower end of the stem, the inner wall of the chamber and the outer wall of the stem in contact therewith having coöperating passages constituting a channel which extends from the upper part of the standard chamber to a point reached by the communication with the reservoir in the vertical operation of the stem, for draining the oil back into the reservoir from between the stem and the chamber wall.

3. In a hydraulic chair; in combination, the support having a piston chamber; the chair-stem operating piston-wise in such chamber and being itself chambered for a liquid reservoir and having an aperture for communication of said reservoir with its exterior surface, the inner wall of the standard chamber having at its upper part a circumferentially extending channel and the outer surface of the stem having in its lower part a circumferentially extending channel communicating with said aperture and means of communication between said two circumferentially extending channels.

4. In a hydraulic chair; in combination, the support having a piston chamber; the chair stem operating piston-wise in such chamber, and being itself chambered for a liquid reservoir; a piston operating in the lower part of the stem chamber; suitable valves for feeding liquid downward from the reservoir into the chamber of the standard and a tapered dog lodged between the wall of the standard chamber and the stem, one of said parts having a tapered seat for said dog; the stem chamber having an opening through which the dog protrudes into the path of the piston in said stem chamber.

5. In a hydraulic chair; in combination, the support having a piston chamber; the chair-stem operating piston-wise in such chamber, being itself chambered for liquid reservoir; a piston operating in the lower part of the stem chamber; suitable valves for feeding the liquid downward from the reservoir into the chamber of the standard; a tapered dog lodged between the walls of the standard chamber and the stem, the latter having a pocket for the dog provided with a tapered seat for the latter, said pocket opening into

the piston chamber, and the dog being protruded through the opening into the path of the piston.

6. In a hydraulic chair; in combination, the support having a piston chamber; the chair-stem operating piston-wise in such chamber, and being itself chambered for liquid reservoir; a piston operating in the lower part of the stem chamber; suitable valves for feeding the liquid downward from the reservoir into the chamber of the standard; a tapered dog lodged between the wall of the standard chamber and the stem one of said parts having a tapered seat for said dog; the dog having a projection, which the piston engages for carrying the dog up and down along its tapered seat for tightening and releasing the dog.

7. In a hydraulic chair; in combination, the support having a piston chamber; the chair-stem operating piston-wise in such chamber and being itself chambered for a liquid reservoir; a piston operating in the lower part of the stem chamber; a dog for frictionally locking the stem to the standard, having an arm which protrudes into the piston chamber of the stem and is engaged by the piston, and means by which such dog locks the stem of the standard when moved in one direction to the limit of the piston's movement in that direction and releases said locked parts when moved in the opposite direction.

8. In a hydraulic chair; in combination, the support having a piston chamber; the chair-stem operating piston-wise in such chamber, and being itself chambered for liquid reservoir; a piston operating in the lower part of the chair stem chamber; said stem and piston having each bottom ports and valves controlling them; a piston having a second bottom port; a lever fulcrumed on the bottom of the piston, and a valve carried thereby, seating upwardly to close said second port; the opposite arm of the lever from that which carries the valve being in position for collision with the stem of the valve which controls the port in the end of the chair stem when the piston is moved to the lower limit of its stroke.

9. In a hydraulic chair, in combination with the means for pumping the liquid to operate the chair comprising a pump-operating lever; means for otherwise adjusting the relatively adjustable parts of the chair, comprising a movable bar and releasable means for locking it, the pump-operating lever being mounted for other movement independent of and in different direction from its pump-operating movement, said releasable locking means being operatively connected with the pumping lever for actuation by said other independent movement.

10. In a hydraulic chair; in combination, with the means for pumping the liquid to lift the chair, comprising the pump-operating lever arm; a bar mounted for sliding transversely of the axis of the pump-operating movement of said lever arm; a clamp for releasably locking the sliding bar, mounted for having its clamping movement in a direction longitudinal of said axis; said lever being mounted for movement independent of its pump-operating movement in a plane transverse to the sliding bar; the clamp being operatively connected with the lever for actuation thereby in said transverse movement.

11. In a hydraulic chair, in combination with means for pumping comprising rock-shaft and an operating lever arm thereof; means for otherwise adjusting the relatively adjustable parts of the chair, comprising a bar for sliding transversely of the rock-shaft; a clamp for releasably locking the bar mounted adjacent to the rock-shaft; a spring stopped in one direction on the rock-shaft, and reacting in the opposite direction on the clamp; the lever arm being hinged to the rock-shaft for movement in a plane longitudinal of the latter, and connection from the lever arm to the clamp for operating the clamp by such longitudinal movement of the lever.

12. In a hydraulic chair; in combination with means for pumping comprising a rock-shaft and an operating lever arm thereof; means for otherwise adjusting the relatively adjustable parts of the chair, comprising a bar mounted for sliding transversely of the rock-shaft; a clamp for releasably locking the bar, mounted adjacent to the rock-shaft; a link connected to the clamp and guided longitudinally on the rock-shaft; a spring coiled about the rock shaft stopped in one direction on the same and reacting in the opposite direction on the clamp, the lever arm being hinged to the rock-shaft for movement in a plane longitudinal of the latter, and connection from the lever arm to the link for actuating the latter longitudinally of the shaft by the movement of the lever about its hinge connection.

13. In a hydraulic chair; in combination with means for pumping comprising a rock-shaft and an operating lever arm thereon; means for otherwise adjusting the relatively adjustable parts of the chair, comprising a bar mounted for sliding transversely of the rock-shaft; a clamp for releasably locking the bar, mounted adjacent to the rock shaft; a link connected to the clamp and guided longitudinally on the rock-shaft; a spring coiled about the rock shaft, stopped at one end on the shaft and reacting at the other end on the clamp, the link having an annular flange encompassing the rock-shaft; the lever being hinged to the rock-shaft and having an arm extending along the shaft at the opposite side thereof from the hinge pivot and engaging said flange.

14. In a hydraulic chair; in combination, with a rock-shaft adapted by rocking to operate the pumping devices; means for adjusting the relatively adjustable parts of the chair, comprising a link sliding on the rock-shaft; a collar fast on the end of the rock-shaft; an arm hinged to the collar at one side of the shaft and extending past the end of the latter; said collar and lever arm having mutually engaging parts at the opposite side of the shaft from the hinge pivot, adapted to permit the movement of the lever arm about the hinge and to guide it in such movement, and means by which the part on the lever arm engages the link for operating it longitudinally on the shaft in such movement of the arm.

In testimony whereof, I have hereunto set my hand at Chicago, Illinois, this 2nd day of October, A. D. 1905.

ANTON N. HORNUNG, JR.

Witnesses:

CHAS. S. BURTON,

J. S. ABBOTT.