July 21, 1942. M. W. HARD 2,290,556

THEATER CHAIR

Filed Dec. 6, 1939 2 Sheets-Sheet 1

FIG. 2.

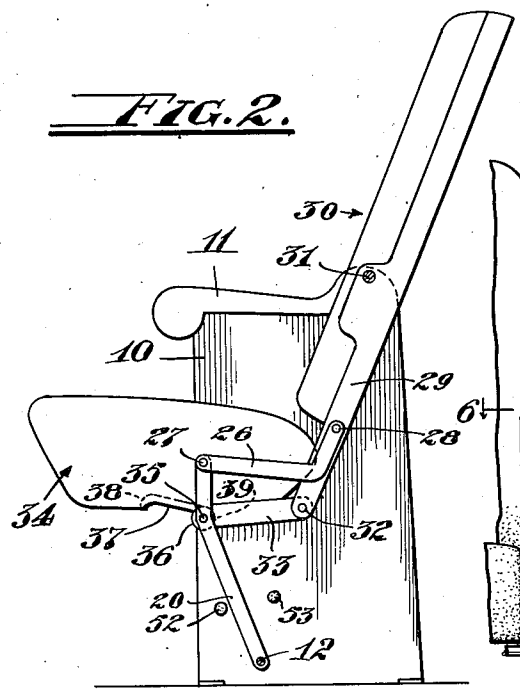


FIG. 1.

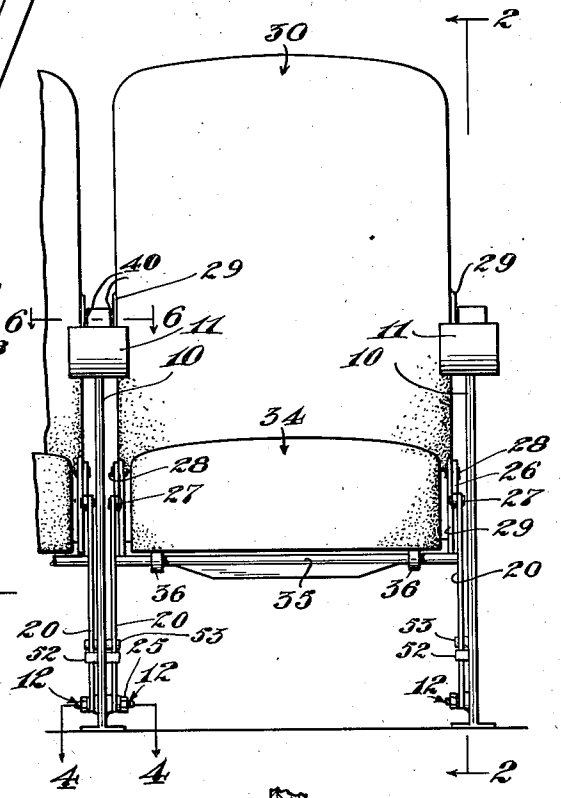


FIG. 3.

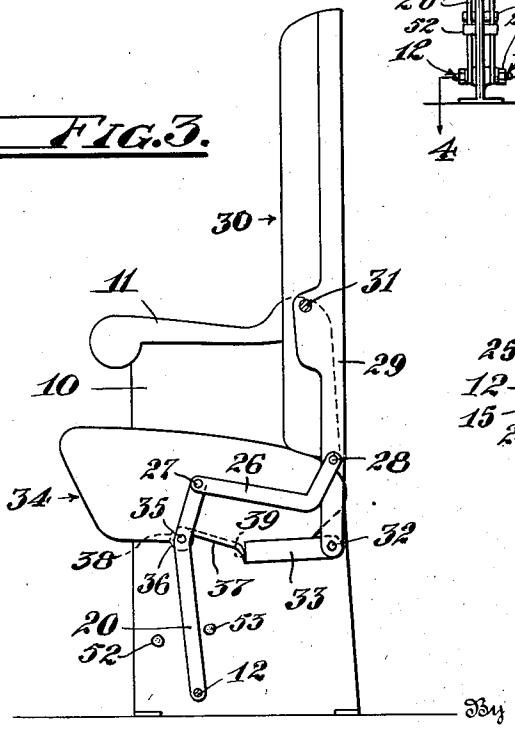
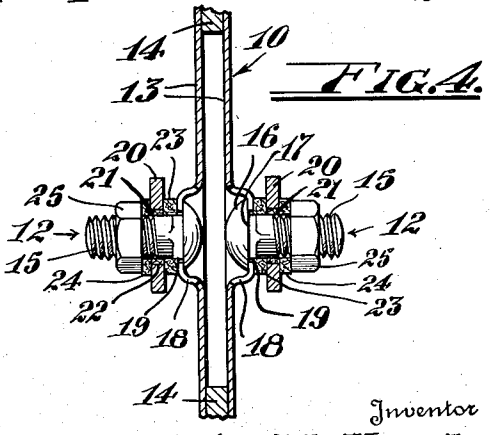


FIG. 4.



Inventor

Merrill W. Hard

By R. L. Berry

Attorney

July 21, 1942. M. W. HARD 2,290,556

THEATER CHAIR

Filed Dec. 6, 1939 2 Sheets-Sheet 2

FIG. 5.

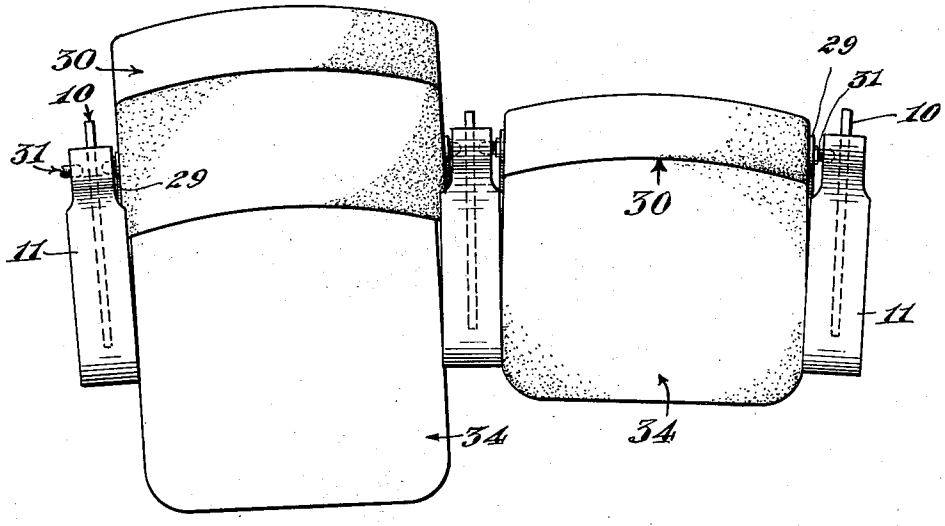


FIG. 6.

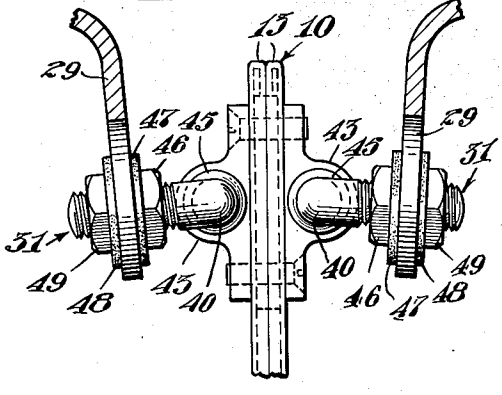


FIG. 8.

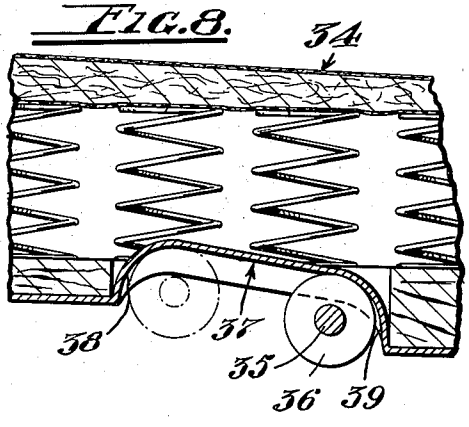
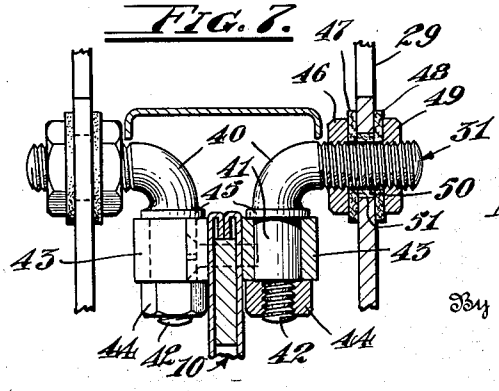


FIG. 7.



Inventor

Merrill W. Hard

By R. S. Berry

Attorney

Patented July 21, 1942

2,290,556

UNITED STATES PATENT OFFICE

2,290,556

THEATER CHAIR

Merrill W. Hard, Glendale, Calif.

Application December 6, 1939, Serial No. 307,782

8 Claims. (Cl. 155—86)

This invention relates to a chair and more specifically pertains to chairs of the character employed in theater auditoriums and the like, where a series of rows of chairs are provided for accommodating audiences; the present invention particularly pertaining to improvements in chairs of the type set forth in Letters Patents Number 1,456,235, issued to me May 22, 1923, and Number 2,098,623, issued to me November 9, 1937, and which chairs are characterized by the embodiment of a seat that may be easily moved back by the occupant of the chair to permit easy passing of persons between the occupant of a chair and a chair in front of such occupant and without requiring the occupant to arise from the seat.

The primary object of the present invention is that sought in the Letters Patents aforesaid, namely, to provide a mounting for the chair seat and back so constructed and arranged that when the occupant of the seat assumes the natural position of a person about to arise from the seat, which involves leaning forward and drawing the feet rearward, the weight of the person together with the natural rearward thrust imparted to the seat will act to effect rearward movement of the seat, thereby causing rearward movement of the knees of the seated person such as to provide ample space for the passing of a person between the back of a chair in front of the occupied seat and the knees of the persons seated on the latter.

Another object which is also incidental to the patents aforesaid is to provide a mounting for the chair and back whereby the retractive movement of the seat as above stated will effect forward movement of the upper portion of the chair back from a rearwardly inclined position to an upright or near upright position so as to effect an increase in the width of the space between the upper portion of the chair back and a chair located rearward thereof in an adjacent row of chairs.

The particular object of the present invention is to provide an improved and greatly simplified construction in the chair seat and back mounting and connections so as to effect reduction in the cost of construction and installation of the chair.

Another object is to provide a construction and arrangement in the chair whereby relative inward movement of the seat and back thereof from the normal position when occupied occasioned on retraction of the seat the extent of the consequent contraction of the chair from front to back will be materially increased over that afforded by the constructions disclosed in the patents aforesaid.

Another object is to provide a mounting for a retractable chair seat embodying an arrangement of arms, links and levers having pivotal mountings and connections so located in relation to a support for the seat that the weight of the occupant of the seat will act both to effect reciprocal movement of the seat and retardation of such movement at the end portions of the path of travel of the seat.

A further object is to provide an improved mode of mounting the chair and back between a pair of standards, such that the latter may be positioned either in parallel relation to each other or be disposed in various radial relations to each other; the mounting of the chair seat and back being adjustable to accommodate the seat and back to the various adjusted positions of the standards relative to each other and whereby assemblage of the chair in rows in a theater auditorium is greatly facilitated.

With the foregoing objects in view together with such other objects and advantages as may subsequently appear the invention is carried into effect as illustrated by way of example in the accompanying drawings in which:

Fig. 1 is a view of the chair in front elevation showing it in its normal position and depicting the chair in its relation to a chair arranged alongside thereof in a row:

Fig. 2 is an end view of the chair shown in Fig. 1 with an end standard removed and as seen on the line 2—2 of Fig. 1:

Fig. 3 is a view of the chair shown in Fig. 2 showing it in its operated position with the seat thereof retracted and the back thereof swung forward to an upright position:

Fig. 4 is an enlarged detail in a horizontal section taken on the line 4—4 of Fig. 1 showing the manner of constructing the pivotal mounting of the seat support:

Fig. 5 is a plan view depicting a pair of chairs as arranged side by side and showing one of the chairs in its normal position and the other in its actuated position:

Fig. 6 is a detail in horizontal section and plan taken on the line 6—6 of Fig. 1 showing the adjustable mounting of the seat:

Fig. 7 is a view in front elevation partly in section of the structure shown in Fig. 6:

Fig. 8 is an enlarged detail section taken on the line 8—8 of Fig. 1 showing the construction of the forward seat support and the manner of operation

thereof in limiting the advance and retractive movement of the seat:

In the drawings the sectional views are viewed as looking in the direction of the arrows at the ends of the section lines and corresponding reference characters refer to corresponding parts throughout the several views.

Referring to the drawings more specifically 10 indicates the side standards of the chair; a pair of such standards being employed in each chair with a single standard serving for each of adjacent chairs arranged side by side, as in an assemblage of a row of chairs. Each standard 10 comprises an upstanding panel which may be of any suitable construction and is here shown as formed of sheet metal. The upper end of the standard is fitted with an arm rest 11.

Projecting from adjacent faces of a pair of the standards near the lower ends and forward edges thereof are pivot pins 12 particularly shown in Fig. 4; the pivot pins 12 projecting from opposite sides of the standard 10 in alignment with each other where the standard is interposed between and serves for each of adjacent chairs arranged side by side. As here shown the standard 10 is formed of spaced plates 13 arranged on opposite sides of and connected to reinforcing members 14. The pivot pin 12 is here shown as comprising a bolt having a threaded shank 15 fitted with a head 16 and joined to the latter through a narrow rectangular shoulder 17; the plate 13 being formed with an outwardly pressed pocket 18 formed with a square opening 19 through which the bolt is passed from the inside of the plate to seat the head 16 thereof in the pocket with the square shoulder 17 disposed in the square opening 19 whereby the bolt is held against turning movement relative to the plate 13.

Mounted on the pivot pin 12 for oscillatory movement is an upwardly extending arm 20 which has a slightly cushioned connection with the pivot pin so that it may swing on the latter whether the plane of the arm 20 and the axis of the pin extend perpendicular or slightly oblique relative to each other. This cushioned connection is made by forming the arm 20 with a circular opening 21 having a diameter exceeding that of the shank 15 and interposing a fiber ring 22 between the margin of said opening and the outer periphery of the shank. A fiber ring 23 is interposed between the arm 20 and the outer face of the pocket 18 and a fiber ring 24 is interposed between the outer face of arm 20 and a nut 25 screwed on the shank 15. The enlarged opening 21 and the fiber rings 22, 23 and 24 permit positioning of the arm 20 and the axis of the pin 12 in slightly diagonal relation to each other.

The arm 20 is bent rearwardly at an obtuse angle adjacent the upper end thereof, and is connected at its upper end to a rearwardly extending link 26 through a pivot 27, which link is upturned at its outer end and connects through a pivot 28 with an upwardly extending lever 29 constituting the side member of a chair back 30; the lever 29 being pivotally connected intermediate its ends by a pivot pin 31 to the upper rearward portion of the standard 10 at a point on a plane above the arm rest 11. The lower end of the lever 29 extends below the pivot 28 and is pivotally connected by a pivot 32 with a side bracket 33 on a chair seat 34; the bracket 33 projecting rearwardly from the lower margin of the side of the seat 34 and the latter extending forwardly between the upper end portions of the arms 20 which terminate intermediate the upper and lower side margins of the seat.

As a means for supporting the forward portion of the seat 34, a rod 35 is connected at its ends to the arms 20 and is fitted with rollers 36 on which the seat 34 is adapted to rest. The underside of the seat 34 is fitted with a pair of tracks 37 on which the rollers 36 bear, which tracks are inclined and lead downwardly and rearwardly relative to the forward end of the seat and have their ends curved sharply downward to provide stops 38 and 39 at the front and back ends of the tracks against which the rollers 36 are adapted to abut to limit swinging movement of the arms 20 forward and back.

The effectiveness of the operation of the chair is largely dependent on the relative positions of the several pivotal connections 12, 27, 28, 31 and 32 and their relation to the inclined tracks 37 and rollers 36. This relation will best be understood when explained in connection with Fig. 3 of the drawings in which the chair is shown as disposed in its contracted position with the back 30 thereof extending vertically and with the seat 34 fully retracted and in which position the rollers 36 abut the forward ends 38 of the tracks 37. Referring to Fig. 3 it will be noted that the axis of the shaft 35 carrying the rollers 36 is disposed in forward offset relation to a vertical plane extending through the axes of the pivots 12 and 27, which arrangement is here afforded by forming bends in the arms 20. The pivots 27 at the upper ends of the arms 20 connect with the rearwardly extending links 26 on a plane below the pivots 28 connecting the links to the levers 29 and on a plane above the pivots 32 connecting the lower ends of the levers 29 to the seat brackets 33, which pivots 28 and 32 extend on a common vertical plane extending in rearward spaced relation to the vertical plane of the axes of the pivots 31. The reasons for the locations of the pivots just described will become apparent hereinafter in the explanation of operation of the invention. The links 26 are bent as shown so as to lie in most part below the upper face of the seat 34 where they are not liable to become entangled with garments of occupants of the chair.

An important feature of the invention resides in the construction of the pivots 31 and the manner of mounting same and of connecting the levers 29 thereto, whereby the chair back may be properly supported to swing between a pair of the standards 10 whether they extend parallel with each other or converge in radial relation to each other. As here shown the pivot 31 comprises an angle bolt consisting of an elbow 40 connecting a threaded shank constituting the pivot 31 to a cylindrical shank 41 having a threaded stem 42 on its end; the axes of the pivot 31 and shank 41 extending at right angles relative to each other with the shank 41 extending vertically through a sleeve 43 carried on the standard.

The shank 41 is adapted to be turned in the sleeve 43 to a desired adjusted position and to be secured against movement in the sleeve 43 by a nut 44 screwed on the stem 42 to bear against the lower end of the sleeve and thereby tightly clamp a shoulder 45 on the shank 41 against the upper end of the sleeve.

A stop nut 46 is screwed on the threaded pivot 31 against which is positioned a fiber ring 47 whereupon the lever 29 is positioned on the

pivot 31 against the ring 47 and a fiber ring 48 is placed on the pivot to bear between the lever and a nut 49 screwed on the outer end of the pivot. A fiber ring 50 is interposed between the pivot 31 and the margin of an opening 51 in the lever 29 through which the pivot 31 is passed.

Means are provided for preventing excessive swinging movement of the chair back 30 in either direction in event the seat 34 be swung upward on the pivots 32 such as to move the tracks 37 clear of the rollers 36, as might occur if the forward end of the seat be lifted from the positions shown in Figs. 2 and 3, it being possible to swing the seat upward a short distance from the position shown in Fig. 3 by reason of the abutting surfaces shown therein being cushions and yieldable. This means is here shown as comprising a pair of abutments 52 and 53 mounted on the standards 10 to project on opposite sides of the arms 20 at points spaced slightly from the positions assumed by the front and back edges of the arms 20 when the latter are disposed in their normal forward and rearward positions; the abutments serving to limit swinging movement of the arms 20 and consequently of the back 30 in event the ends 38 and 39 of the tracks 37 are lifted clear of the rollers 36.

The abutments 52 and 53 serve as stops for the arms 20 only when the seat is elevated to clear the rollers 36, since the latter are better suited to limit swinging of the arms during operation of the chair as they act in conjunction with the end portions of the inclined tracks to retard free movement of the arms at the ends of the paths of travel thereof and thus obviate impact and resultant jolt as might occur were the arms brought against the abutments 52—53.

In the application of the invention the seats 34 with their associated backs 30 are mounted and arranged between a pair of spaced standards 10, as before described, ordinarily with a series of the chairs thus formed arranged side by side in either a straight row or a row disposed in the arc of a circle in the fashion commonly employed in seating arrangements in theater auditoriums, and the like; a series of such rows being usually provided with adjacent rows spaced such distance apart as to afford adequate room for persons occupying the seats, but which distance is ordinarily insufficient to permit the easy passage of persons between the occupants of the seats and the backs of the chairs in front thereof.

In the operation of the invention the seats are normally disposed as shown in Figs. 1 and 2 when occupied by a person sitting on the seat in a normal position, that is with the body well back on the seat, with the back resting against the seat back 30 and with the lower limbs below the knees disposed in an upright or forwardly extending position. The weight of the person will then act to maintain the seat in its forwardmost position by reason of the forward inclination of the arms 20 and also the weight of the person imposed on the seat 34 bearing on the rollers 36 tending to maintain the arms 20 in their forwardly inclined positions.

The downturned rear ends 39 of the tracks 37 will then engage the rollers 36 and act to limit the forward inclination of the arms 20 in cooperation with the toggle connection between the arms 20 and the standards afforded by the links 26 and levers 29, coupled with the interconnection between the back portion of the seat and the chair back afforded by the brackets 33 and the protruding lower ends of the levers 29.

When the occupant of the seat leans forwardly and moves the feet rearwardly as in assuming a position preparatory to arising from the seat when the latter is in its forward position shown in Fig. 2, a rearward thrust is imposed on the seat such as to move the latter backward and thereby shift the brackets 33 rearwardly together with the lower portion of the seat back 30 through the lever 29 whereby the upper portion of the back is swung forwardly. The rearward movement of the lower portion of the lever 29 causes the links 26 to swing the upper end portion of the arms 20 upwardly and rearwardly. The weight of the occupant of the seat is then imposed in most part on the forward portion of the seat causing the inclined track 37 to traverse the roller 36 thereby exerting a rearward thrust on the seat and thus assist in effecting retrograde movement of the seat until the latter is brought to rest with the rollers 36 abutting the downturned forward ends 38 of the tracks. On the seat being thus brought to rest the back 30 will be disposed in a vertical or near vertical position as shown in Fig. 3, while the seat will be disposed in a retracted position substantially on a plane corresponding to that occupied by the seat when it is in an advanced position. By the operation just described the seat 34 is retraced considerably at its forward edge and likewise the upper portion of the back 30 is advanced forwardly so that the chair will then be considerably contracted in its dimensions from front to back. The operation as above described is effected without the occupant of the chair arising therefrom, but by reason of the retraction of the seat, the torso and knees of the occupant are automatically moved rearwardly and by reason of having retracted the feet, an increase in the space between the chair's occupant and a chair or chairs in front thereof is effected, thereby permitting persons to pass in front of the occupant of the retracted seat without tripping over the latter's feet.

On the occupant again assuming a normal position by advancing the feet and leaning back the seat will move forward and the parts will be restored to their normal position of occupancy. In assembling the chairs in rows in an auditorium the standards 10 are disposed either in parallel or in radial relation to each other according to requirements and the standards are affixed to the floor of the auditorium in any suitable manner. By the provision of the adjustable pivotal mountings 12 and 31 between the supports of the seat and back and the standards, the axis of rotation of the seat supporting arms 20 and of the back supporting levers 29 may be varied to permit positioning of the standards in either parallel or angular relation to each other; the elbow 40 being turned in the sleeve 43 and then affixed in the latter by the nut 44 in a position to dispose the axis of the pivotal mountings 31 in the desired requisite angular relation to the plane of the adjacent standard, and the nut 25 on the threaded ends of the pins 12 being adjusted to permit pivotal movement of the links 20 either perpendicular to the axes of the pins 12 or in diagonal relation thereto.

While I have shown and described a specific embodiment of my invention I do not limit myself to the exact details of construction set forth, and the invention embraces such changes, modifications and equivalents of the parts and their for-

mation and arrangement as come within the purview of the appended claims.

I claim:

1. A chair comprising a pair of standards, a pair of upwardly extending arms pivotally connected to the lower portions of said standards, a chair back, pivotal connections between said chair back and the upper portions of said standards, a chair seat pivotally connected at its rear portion to the lower portion of said chair back, means for supporting the forward portion of said seat on said arms in movable relation thereto including stop means for limiting relative movement of said seat and arms, and links connecting the lower portion of said chair back to the upper ends of said arms.

2. A chair comprising a pair of standards, a pair of upwardly extending arms pivotally connected to the lower portions of said standards, a chair back, pivotal connections between said chair back and the upper portions of said standards, a chair seat pivotally connected at its rear portion to the lower portion of said chair back, means for supporting the forward portion of said seat on said arms in movable relation thereto comprising inclined tracks on said seat and rollers on said arms on which said tracks are adapted to seat, and links connecting the lower portions of said chair back to the upper ends of said arms.

3. A chair comprising a pair of standards, a chair back pivoted intermediate its ends to the upper portion of said standards, a seat, a pivotal connection between the lower end portion of said chair back and the rear portion of said sheet, a pair of upwardly extending arms pivoted relative to the lower portions of said standards, links connecting the upper ends of said arms to said chair back intermediate the pivotal mounting thereof and the pivotal connection at the lower end portion thereof with said seat, and means for supporting said seat on said arms by which said arms are movable relative to said seat.

4. A chair comprising a pair of standards, a chair back pivoted intermediate its ends to the upper portion of said standards, a seat, a pivotal connection between the lower end portion of said chair back and the rear portion of said seat, a pair of upwardly extending arms pivoted relative to the lower portions of said standards, links connecting the upper ends of said arms to said chair back intermediate the pivotal mounting thereof and the pivotal connection at the lower end portion thereof with said seat, inclined tracks on said seat, and rollers on said arms on which said tracks bear, said arms being movable relative to said seat.

5. A chair comprising a pair of standards, a chair back pivoted intermediate its ends to the upper portion of said standards, a seat, a pivotal connection between the lower end portion of said chair back and the rear portion of said seat, a pair of upwardly extending arms pivoted to the lower portions of said standards, links connecting the upper ends of said arms to said chair back intermediate the pivotal mounting thereof and the pivotal connection at the lower end portion thereof with said seat, inclined tracks on said seat, rollers on said arms on which said tracks bear, said arms being movable relative to said seat, and stops on said seat for limiting relative movement of arms and seat, said stops comprising spaced curved ends on said track against which said rollers may abut.

6. The structure called for in claim 4, together with stops on the standards for limiting movement of said arms in either direction when said seat is elevated from operative relation to said rollers.

7. The structure called for in claim 4, together with spaced stops on said standards arranged on opposite sides of said arms for limiting movement of said arms in either direction when said seat is elevated to lift the tracks from engagement with said rollers.

8. In a chair, a pair of standards adapted to be fixed in either parallel or angular relation to each other, a chair back arranged between said standards, pivotal connections between said standards and chair back having axially aligned pivot pins on which said chair back is pivoted intermediate its ends to swing back and forth and stems depending from said pivot pins and movably mounted on the standards for varying the angular relation of the axis said pins relative to the standards whereby the latter may be disposed in either parallel or angular relation to each other without materially disaligning the axes of said pins, a seat pivotally carried by said seat back for vertical swinging movement, upwardly extending arms pivotally mounted on said standards arranged to swing in parallel relation to each other, means for supporting the forward portion of said seat on said arms, the pivotal mounting of said arms embodying pivot pins carried by said standards on which said arms are carried, and yieldable bearings embodied in the connections between said arms and pins.

MERRILL W. HARD.