July 2, 1946. H. W. SHELDRICK ET AL 2,403,198

CHAIR IRON

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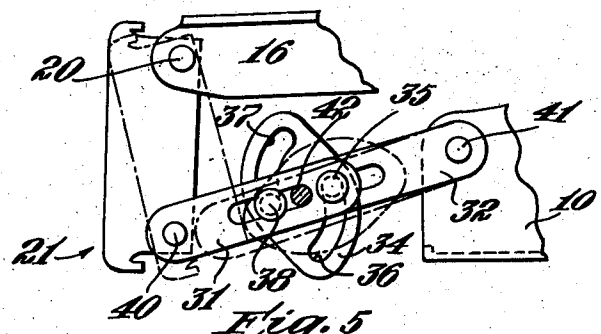


Fig. 5

Fig. 1

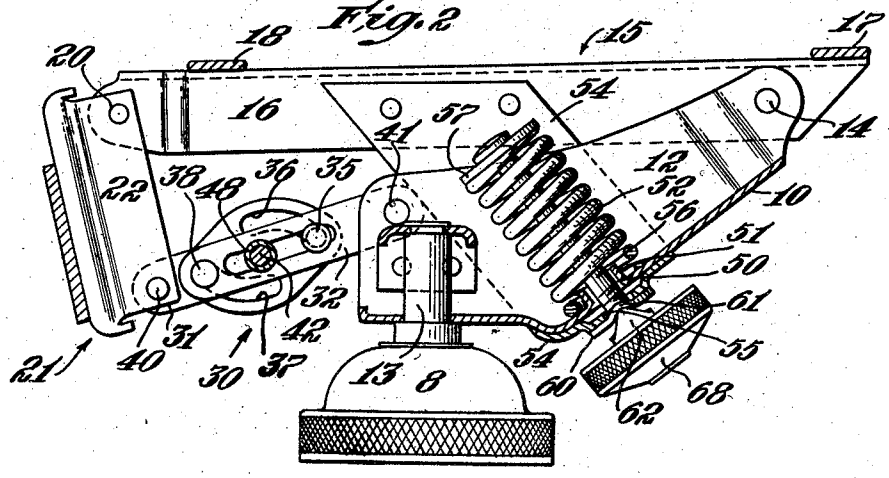
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CHAIR IRON

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Fig. 2



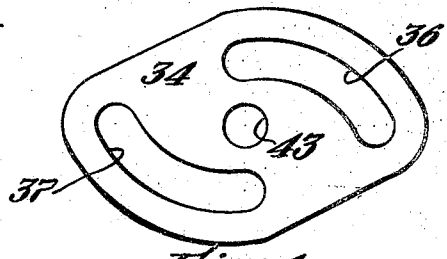


Fig. 4

Fig. 3

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2,403,198

CHAIR IRON

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Application June 6, 1944, Serial No. 538,970

6 Claims. (Cl. 155—77)

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This invention relates to chairs of the type embodying a pivotally mounted seat and back such, for example, as office chairs and the like.

The principal objects of the invention are to provide an improved chair iron for supporting the seat and back for simultaneous controlled movement and to provide an efficient and reliable means for quickly and conveniently adjusting the relative movements of the seat and back so as to suit the comfort of the occupant.

Other objects relate to various features of construction and will be apparent from the consideration of the following description and by the accompanying drawings, wherein

Fig. 1 is a side elevation of a chair embodying the present invention;

Fig. 2 is a central vertical sectional elevation through the chair iron;

Fig. 3 is a top plan view of the chair iron;

Fig. 4 is a plan view of a plate member associated with the adjustable links; and

Fig. 5 is a detail showing the slotted links assembled with the locking plate of Fig. 4.

In accordance with the present invention we provide a chair comprising a base member which may be of any conventional design and construction, separate seat and back members which may also be of conventional design and construction, and a chair iron or supporting mechanism carried by the base member and supporting both the seat and back for tipping movement which may be readily controlled by adjusting certain parts of the chair iron, thereby securing, within limits, the desired angular relationship between the seat and back which is most conducive to the comfort of the occupant.

The chair iron or supporting mechanism comprises a plurality of interconnected members constructed and arranged so as to provide, in effect, a four-bar linkage wherein one of the links is rigidly fixed to the base, another link normally supporting the seat in a substantially horizontal position, a third link supporting the back in an upright position, and a pair of pivotally connected slotted links interconnected with a slotted plate, the assemblage constituting an adjustable fourth link with the opposite ends of the slotted links being pivotally connected with the back-supporting link and the fixed link. By varying the effective length of the adjustable link the angle of inclination of the back and relative movements of the seat and back may be varied as desired. In addition we also provide means for yieldingly opposing tipping movement of the seat and back, which means not only is effective normally to

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maintain the seat and back in substantially horizontal and vertical positions, respectively, but also is capable of adjustment so that the force required to effect tipping movement of the seat and back may be varied.

In the embodiment herein shown for the purpose of illustration, a conventional base or pedestal 1 is supported on casters 2, and a chair iron 3, carried by the base, supports separate seat and back members 4 and 5. The seat and back members may be of conventional design and construction, it being understood that the back rest 5 is pivotally supported independently of the seat 4, as hereinafter described.

The chair iron 3 comprises a fixed member 10 having upstanding side walls 11 and 12, and is swivelly mounted on a pivot 13 projecting upwardly from the cap 8 of the pedestal, the fixed member 10 being forwardly inclined as shown in Figs. 1 and 2. The upper forward end of the fixed member 10 carries a laterally projecting pivot pin 14 on which the seat-supporting member 15 is pivotally mounted. The seat-supporting member 15 comprises a pair of spaced, parallel angle irons 16 rigidly secured at the front and rear ends by crossbars 17 and 18, the seat-supporting member being mounted on the pivot 14 at a point adjacent to but spaced inwardly from the front end of the seat, as shown more clearly in Fig. 1. The seat 4 is screwed or otherwise suitably attached to the angle irons 16 and/or crossbars 17 and 18, the seat being thus supported for tipping movement about the pivot pin 14.

The rear end of the seat-supporting member is pivotally connected by a pin 20 to the upper end of a vertically depending back-supporting member 21 of substantially U-shape cross section which provides side walls 22 and 23 having aligned openings for the reception of the ends of pivot 20. The back rest 5 is adjustably secured to the outer face of the member 21 in any suitable manner, here shown as comprising a clamping mechanism 24, operated by hand wheel 25, for adjustably positioning the back 5 vertically with respect to the seat 4. Since such mechanism is well known to those skilled in the art, a description thereof is unnecessary.

The back-supporting member 21 is connected to the fixed member 10 by a pair of spaced, adjustable members 30 which together constitute, in effect, a link member of adjustable length. Each of the members 30 comprises a pair of slotted links 31, 32 and an interposed locking plate 34, as shown in Figs. 4 and 5. A stud or rivet 35 carried by the outer link 31 extends through one

of the arcuate slots 36 in the plate 34 and the slotted portion of the inner link 32, and similarly a stud 38 carried by the inner link 32 extends through the arcuate slot 37 of plate 34 and the slotted portion of the outer link 31, thus providing pin and slot connections adjacent to the ends of the links, which permit the links 31, 32 to be extended or retracted relative to each other. The rear ends of the outer links 31 are pivotally connected to the back-supporting member by rivets or studs 40 and the front ends of the inner links 32 are pivotally connected to the fixed member 10 by rivets or studs 41, as shown in Figs. 1 to 3. A spindle 42 extends transversely through each adjusting member 30, projecting through the inner ends of the slots in the links 31, 32 and a central opening 43 in the plate 34. One end of the spindle is formed with a head 44 (Fig. 3) which provides an annular shoulder adapted to engage the marginal portions about the slot in one of the outer links 31, and the opposite end of the spindle is threaded to receive the hub 45 (Fig. 3) of a hand wheel 46. The intermediate portion of the spindle 42, i. e., the part disposed between the two adjusting members 30, carries a sleeve 48 (Figs. 2 and 3), the opposite ends of which engage the inner links 32. When the hand wheel 46 is tightened the inner end of the hub 45 and head 44 cooperate with the ends of the sleeve 48 to clamp the links 31, 32 and plate 34 together, thus frictionally locking the parts; and when the hand wheel 46 is unscrewed or loosened, these parts are released so that the links 31, 32 may be extended or retracted.

When the links 31, 32 are retracted or extended, the plate 34 is rotated in one direction or the other, as indicated in Fig. 5, due to the engagement of the studs 35, 38 with the walls of the slots 36, 37, the magnitude of the relative movement of the links 31, 32 in either direction being determined by the length of the slots 36, 37 and their angular position with respect to the opening 43. As here shown, the slots 36, 37 are arcuate and eccentric with respect to the circular opening 43 so that the links 31, 32 may undergo a predetermined relative movement in traveling from fully extended position, as shown by the full lines of Fig. 5, to fully retracted position, as shown by the dot and dash lines of Fig. 5. In this embodiment the slots 36 in the plate 34 are so shaped and located that a great part of the thrust caused by the force applied to the links in any effort to extend or retract them is taken up by the pressure of the studs 35 and 38 against the outer or inner edges of the slots 36 and 37. The amount of force which the device will withstand without slipping depends upon the shape and location of the slots 36 and hence can be changed at will by varying the distance from the center of the slots 36 and/or changing the shape of the slots or their direction. The rotation of the plate 34 in response to relative movement of the links 31, 32 is so arranged as to cooperate with the clamping arrangement, above described, to insure a more reliable frictional locking action when the hand wheel 46 is tightened, and furthermore is operative to prevent objectionable binding of the parts when the hand-wheel is loosened, thus insuring a smoother operation than otherwise possible.

With this construction and arrangement and fixed member 10, the seat and back-supporting members 15 and 21, and the adjustable members 30, being pivotally interconnected as above described, constitute in effect a four-bar linkage, in which the angle of inclination of the back-supporting member 21 and the relative movements of the seat and back-supporting members may be controlled or adjusted to suit the comfort of the occupant by varying the effective length of the adjustable members 30 in the manner above described. It will be observed that due to the convenient location of the hand wheel 46, such adjustments may readily be made by the occupant while seated in the chair.

In order yieldingly to restrain tilting movement of the seat and back and effect the return of these parts from fully tilted to normal position, any suitable resilient means acting on the fixed member and any of the movable members may be employed. As here shown (Fig. 2), the lower wall of the fixed member 10 is formed with an opening 50 surrounded by a boss or hub 51 to provide a seat for one end of a coil compression spring 52. A U-shaped depending extension member 54, rigidly secured to the angle iron 16 of the seat-supporting member 15, extends about the lower wall of the fixed member 10, as shown in Fig. 2, and an opening 55 formed on the extension member 54 aligns with the opening 50. A bolt or screw shaft 56 extends axially through the spring 52 and the openings 50 and 55, and its headed end carries a washer 57 against which the other end of the spring 52 acts, the threaded end of the bolt projecting outwardly beyond the extension member 54. A washer-like plate 60, preferably of hardened steel and formed with diametrically disposed recessed portions of grooves 61, is positioned against the outer face of the extension and a yoke 62 is carried by the bolt 56 with its tapered legs extending into the recesses, as shown in Figs. 1 and 2. A washer may be interposed between the outer end of the yoke 62 and the hub of a hand wheel 68 carried by the threaded end of the bolt. By rotating the hand wheel 68 in a clockwise direction, the spring 52 may be compressed, thus urging the U-shaped extension and fixed members together and consequently yieldingly opposing tilting movement of the seat and back with a force dependent upon the degree of compression of the spring 52. The tapered legs of the yoke 62 provide a pivot point or knife edge on which the spring bolt assembly is free to rock as the angle between the center line of the bolt and the front face of the extension 54 changes as the seat is tilted.

With this construction and arrangement the hand wheel 68 may be rotated in one direction or another to vary the action of the spring 52, thus permitting the seat and back to be tilted under conditions controllable by the occupant to suit his comfort. It will be observed that the hand wheel 68, being located beneath the seat 4, is readily accessible for convenient manipulation and that when the proper adjustment of the spring 52 has been made, the hand wheel 68 is frictionally locked against accidental rotation. It will also be observed that the hand wheels 25 and 46 are likewise locked for convenient manipulation by the occupant and hence the height and angular position of the back 5, as well as the tilting action permitted by the spring 62, may be readily controlled by a person occupying the seat.

It will be noted that in a chair constructed in accordance with the present invention the front edge of the seat does not rise appreciably when the chair is tilted from normal horizontal position, because the pivot pin 14 is located near the front. Due to the arrangement of the members of the four-bar linkage, occupants of varying

weight may sit comfortably in the chair without changing the adjustment of the spring 52, since rearward pressure must be exerted on the back 5 before the seat will tilt downwardly. The tilting action of the seat 4 and the rearward movement of the back 5 are dependent on both the spring 52 and the leverage of the back 5 and supporting member 21 about the pivotal connection 20; and in the normal use of the chair the extent of this movement is controlled by the rearward pressure exerted by the shoulders of the occupant, rather than by the weight of the occupant on the seat.

While we have shown and described one desirable embodiment of the invention, it is to be understood that this disclosure is for the purpose of illustration and that various changes in shape, proportion and arrangement of parts, as well as the substitution of equivalent elements for those herein shown and described, may be made without departing from the spirit and scope of the invention as set forth in the appended claims.

We claim:

1. In a chair of the type having separate seat and back members, a chair iron for supporting the seat and back members for simultaneous tipping movement, comprising a fixed member, a seat-supporting member pivotally connected to said fixed member, a back-supporting member pivotally connected to said seat-supporting member, and adjustable means comprising a locking plate, a pair of relatively slidable links pivotally interconnected with the locking plate interposed between said links and means for locking the links and plate together, one of said links being pivotally connected to said fixed member at a point spaced from the pivotal connection with said seat-supporting member and the other of said links being pivotally connected to said back-supporting member at a point spaced from the pivotal connection with said seat-supporting member.

2. In a chair of the type having separate seat and back members, a chair iron for supporting the seat and back members for simultaneously tipping movement, comprising a fixed member, a seat-supporting member pivotally connected to said fixed member, a back-supporting member pivotally connected to said seat-supporting member, adjustable means comprising a locking plate, a pair of relatively slidable links pivotally interconnected with the locking plate interposed between said links and means for locking the links and plate together, one of said links being pivotally connected to said fixed member at a point spaced from the pivotal connection with said seat-supporting member and the other of said links being pivotally connected to said back-supporting member at a point spaced from the pivotal connection with said seat-supporting member and means associated with the fixed member and seat-supporting member for yieldingly opposing tipping movement of the seat and back members.

3. In a chair of the type having separate seat and back members, a chair iron for supporting the seat and back members for simultaneously tipping movement, comprising a fixed member, a seat-supporting member pivotally connected to said fixed member, a back-supporting member pivotally connected to said seat-supporting member, and adjustable means comprising a pair of relatively slidable links having pin and slot connections with each other, the end of one of the links being pivotally connected to said fixed member and the end of the other link being pivotally connected to said back-supporting member, a locking plate interposed between and pivotally connected to said links, and clamping means for frictionally locking the links and plate together to prevent sliding movement of the links from a selected position of adjustment.

4. In a chair of the type having separate seat and back members, a chair iron for supporting the seat and back members for simultaneous tipping movement, comprising pivotally interconnected seat and back-supporting members, a fixed member pivotally connected to said seat-supporting member, and adjustable means comprising a pair of relatively slidable links having pin and slot connections with each other, a locking plate interposed between and pivotally connected to said links and clamping means for frictionally locking the links in any selected position of adjustment, the end of one of the links being pivotally connected to the fixed member and the end of the other of said links being pivotally connected to said back-supporting member, said fixed member, slidable links and the seat and back-supporting members being arranged to provide a four-bar linkage system wherein the position of adjustment of said slidable links determines the angle of inclination of the back and controls the tipping movement of the back relative to the seat.

5. In a chair of the type having separate seat and back members, a chair iron for supporting the seat and back members for simultaneous tipping movement, comprising pivotally interconnected seat and back-supporting members, a fixed member pivotally connected to said seat-supporting member, and adjustable means comprising spaced pairs of relatively slidable links, each pair of links having slotted portions at their adjacent ends and a plate interposed between each pair of links, said plate having a central opening and slotted portions at opposite peripheral margins, studs passing through the slotted portions of said links and plate to provide pin and slot connections therebetween, a spindle passing through the slotted portions of said links and the central opening in said plate, and locking means associated with said spindle to hold said links in any selected position of adjustment, corresponding ends of the links of each pair being pivotally connected to the fixed member and back-supporting member so that said fixed member, slidable links and the seat and back-supporting members provide, in effect, a four-bar linkage system wherein the position of adjustment of said slidable links determines the angular position of said back and controls the tipping movement of said back relative to said seat.

6. In a chair of the type having separate seat and back members, a chair iron for supporting the seat and back members for simultaneous tipping movement, comprising pivotally interconnected seat and back-supporting members, a fixed member pivotally connected to said seat-supporting member, and adjustable means comprising spaced pairs of relatively slidable links, each pair of links having slotted portions at their adjacent ends and a plate interposed between each pair of links, said plate having a central opening and slotted portions at opposite peripheral margins, studs passing through the slotted portions of said links and plate to provide pin and slot connections therebetween, a spindle ex-

tending from one pair of links through the other pair, said spindle passing through the slotted portions of said links and the central openings in said plates, one end of said spindle having a head member providing an annular shoulder engageable with the outer link of one pair, a sleeve circumposed about the intermediate portion of said spindle so that its opposite ends are engageable with the inner links of each pair, and a hand wheel having a threaded engagement with the opposite end of said spindle and having a hub portion engageable with the outer link of the adjacent pair, said spindle, sleeve and hand wheel being operative frictionally to lock said links and

plates together so as to hold said links in any selected position of adjustment, the corresponding ends of said links being pivotally connected to said fixed member and the opposite corresponding ends being pivotally connected to said back-supporting member, said fixed member, slidable links and the seat and back-supporting members providing, in effect, a four-bar linkage system wherein the position of adjustment of said slidable links determines the angular position of said back and controls the tipping movement of said back relative to said seat.

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