

Feb. 8, 1944.

H. W. SHELDRICK

2,341,124

CHAIR IRON

Filed May 22, 1942

3 Sheets-Sheet 1

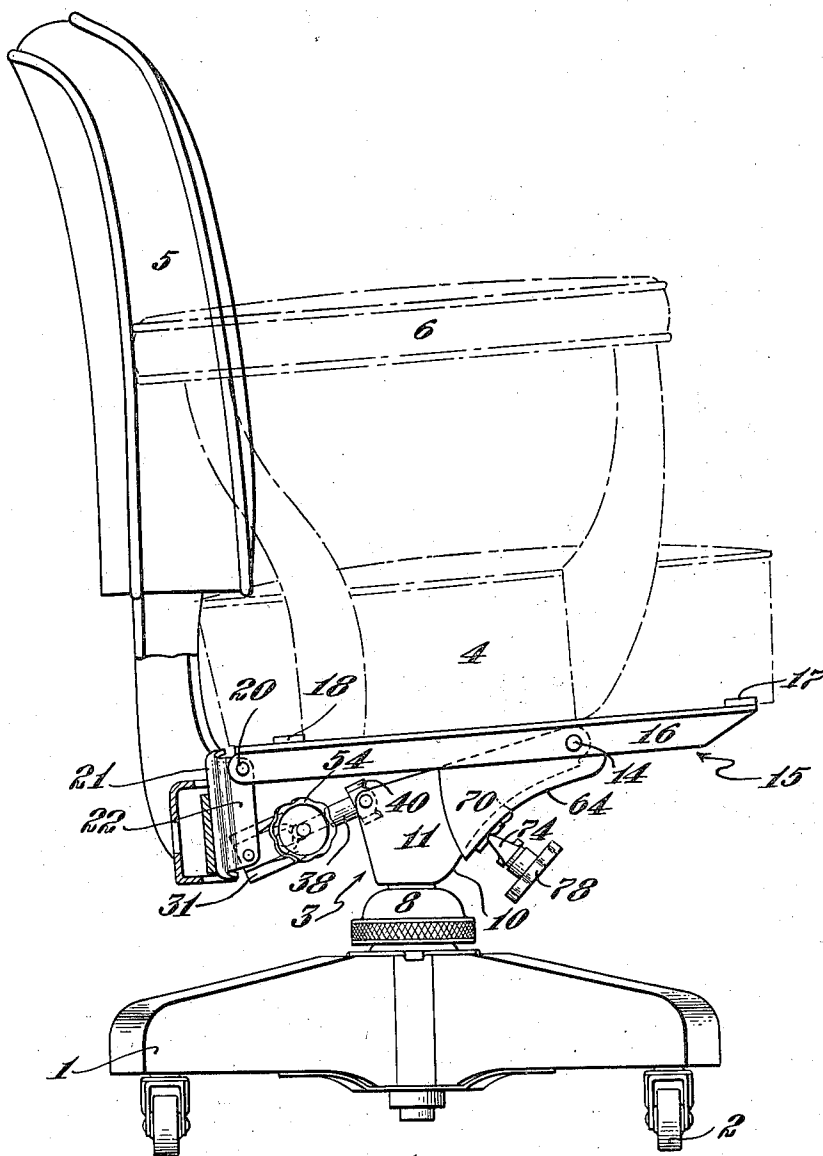


Fig. 1

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3 Sheets-Sheet 2

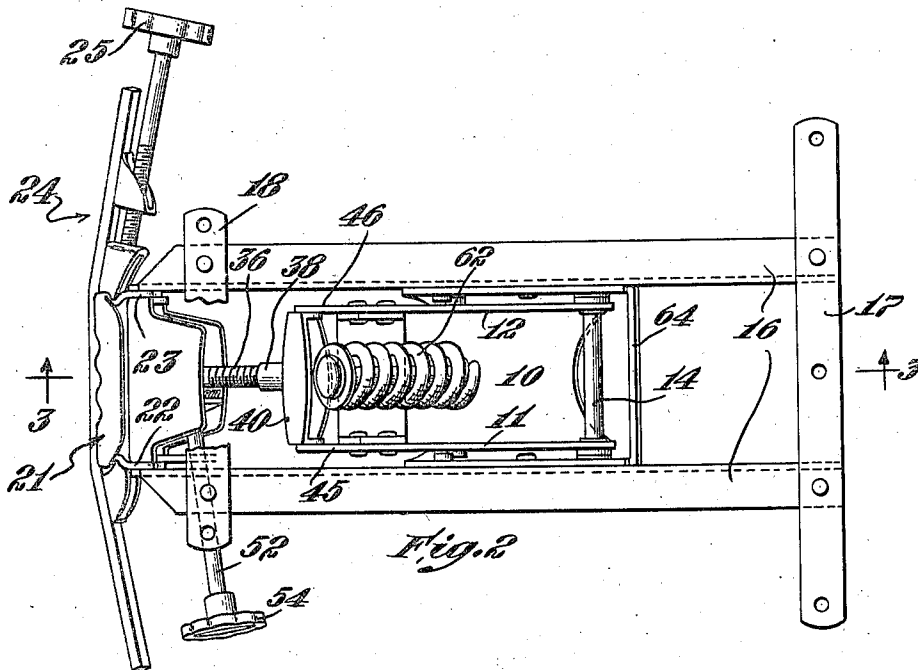


Fig. 2

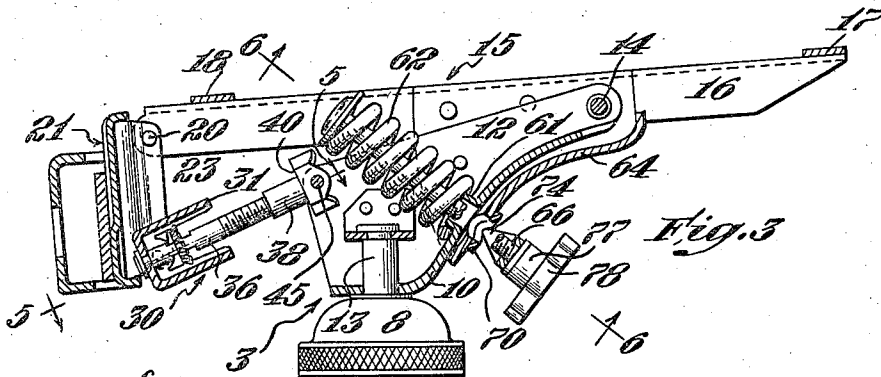


Fig. 3

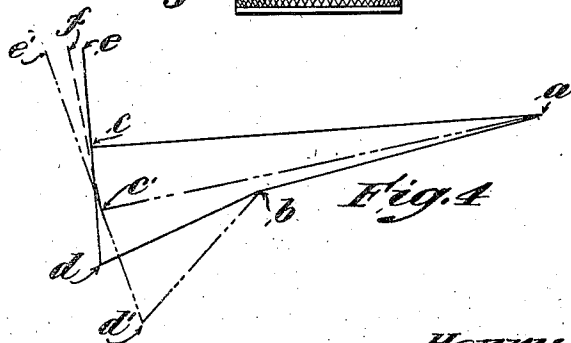


Fig. 4

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3 Sheets-Sheet 3

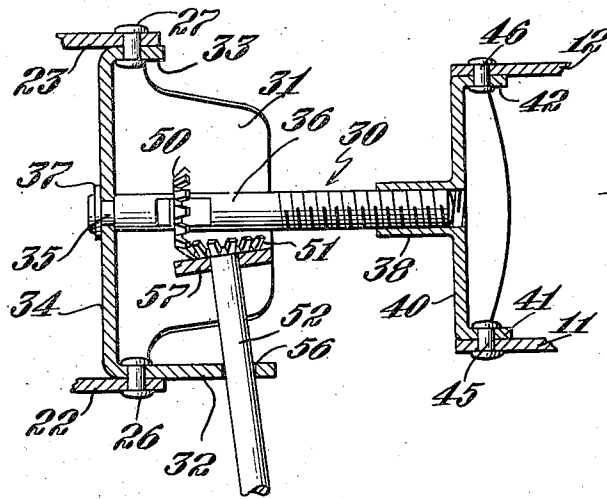


Fig. 5

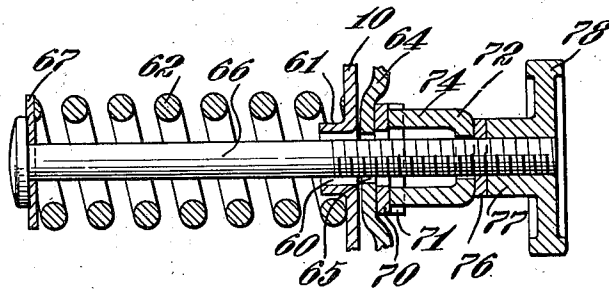


Fig. 6

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UNITED STATES PATENT OFFICE

2,341,124

CHAIR IRON

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11 Claims. (Cl. 155—77)

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 relative 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 an office chair embodying the present invention;

Fig. 2 is a top plan view, with parts broken away, of the chair iron;

Fig. 3 is a section on the line 3—3 of Fig. 2;

Fig. 4 is a view showing the relative positions of the seat, back and associated members of the chair iron at different angular positions; and

Figs. 5 and 6 are enlarged sections on the lines 5—5 and 6—6, respectively, of Fig. 3.

In accordance with the present invention I 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 the fourth link being pivotally connected with the back-supporting link and the fixed or stationary link and being manually adjustable so that the relative movements of the seat and back-supporting links may be varied. In addition I also provide means for yieldingly opposing tipping movement of the seat and back, which means not only is effective normally to maintain the seat and back in substantially horizontal and vertical positions, respectively, but also is capable of adjustment so that the force re-

quired 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 and, if desired, the seat 4 may be provided with arm rests 6, it being understood that the back rest 5 is supported independently of the seat 4 and arm 6, 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 inclined as shown in Figs. 1 and 3. 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 rigidly secured at the front and rear ends by crossbars 17 and 18, the seat-supporting member being mounted on the pivot 14 approximately midway between the center and front end of the seat, as shown more clearly in Fig. 1. The seat 4 is attached to the angle irons 16 and/or crossbars 17 and 18 in any suitable manner, and the seat and arm rests are 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 secured to the outer face of the member 21 in any suitable manner, here shown as comprising a 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 lower ends of the side walls 22 and 23 are pivotally secured by studs or rivets 26 and 27 to one end of an adjustable member 30 (Figs. 3 and 5) which comprises an open-end, box-like coupling 31 having side walls 32 and 33 which receive the rivets 26 and 27, respectively, and a rear wall 34 formed with a central opening 35. A screw shaft 36 has its reduced end rotatably mounted in the opening 35 and the shaft is held against axial movement by a washer or thrust plate 37,

as shown in Fig. 5. The front end of the shaft is received in a threaded socket 33 of a second coupling 40 which is formed with side walls 41 and 42 fitting within the corresponding side walls 11 and 12 of the fixed member 10 and being pivotally connected thereto by studs or rivets 45 and 46.

A gear 50 is fixed on the screw shaft 36 adjacent to its outer end and meshes with a gear 51 fixed to the inner end of a transversely extending actuating shaft 52, the outer end of which carries an actuating member or hand wheel 54 conveniently located for manual operation by the occupant, as shown in Fig. 1. The actuating shaft 52 is rotatably supported in an opening 56 formed in the wall 32 and an opening formed in an upstanding bracket 57 welded or otherwise secured to the wall 31. Rotation of the hand wheel 54 in one direction or the other effects rotation of the screw shaft 36 and hence increases or decreases the effective length of the adjustable member 30, thus varying the angular position of the back 5 relative to the seat 4.

With this construction and arrangement the fixed member 10, the seat and back-supporting members 15 and 21, and the adjustable member 30, being pivotally interconnected as above described, constitute in effect a four-bar linkage, illustrated in Fig. 4, wherein the fixed member, the seat and back-supporting members, and the adjustable member are represented by the lines *ab*, *ac*, *cd* and *db*, respectively; the pivotal connections 14, 45, 20 and 27 are respectively represented by the points *a*, *b*, *c* and *d*; the line *ec* represents the back 5; the lines *ac'*, *c'd'* and *d'b'* representing the position of the three movable members when the seat and back are tilted to their full extent; and the line *fc'* representing the same angular position of the back 5 relative to the seat (*c'a*) as the normal angular position shown by the line *ec*.

It will be observed that when the seat and back are tilted from the normal position, shown by the lines *ac* and *cd*, to fully tilted position, shown by the lines *ac'* and *c'd'*, the angular movement of the seat is represented by the angle *cac'*; the movement of the back relative to the seat is represented by the angle *fc'e'* which equals the angle *e'c'a* minus the angle *eca*; and the total movement of the back equals the angle *fc'e'* plus the angle *cac'*. In other words, the angle *fc'e'* represents the increased angular movement of the back over that of the seat. Since the line *bd* (representing the adjustable member 30) may be varied, the angular position of the back, represented by the angle *ace*, may be adjusted to suit the comfort of the occupant without affecting the foregoing relationships.

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 (Figs. 3 and 6), the lower wall of the fixed member 10 is formed with an opening 60 surrounded by a boss or hub 61 to provide a seat for one end of a coil compression spring 62. A depending extension member 64, rigidly secured to the angle iron 16 of the seat-supporting member 15, has its lower end portion normally disposed in close proximity to the lower wall of the fixed member 10, as shown in Fig. 3, and an opening 65 formed in the extension member 64 aligns with the opening 60, as shown in Fig. 6. A bolt or screw shaft

66 extends axially through the spring 62 and the openings 60 and 65, and its headed end carries a washer 67 against which the other end of the spring 62 acts, the threaded end of the bolt projecting outwardly beyond the extension member 64. A washer-like locking plate 70, formed with diametrically disposed recessed portions of grooves 71, is welded or otherwise secured to the outer face of the extension and a U-shaped member or yoke 72 is carried by the bolt 66 with its tapered legs 74 extending into the recesses, as shown in Figs. 1, 3 and 6. A washer 76 is interposed between the outer end of the yoke 72 and the hub 77 of a hand wheel 78 carried by the threaded end of the bolt. By rotating the hand wheel 78 in a clockwise direction, the spring 62 may be compressed, thus urging the 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 62. The tapered legs 74 of the yoke 72 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 64 changes as the seat is tilted.

With this construction and arrangement the hand wheel 78 may be rotated in one direction or another to vary the action of the spring 62, 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 78, being located beneath the seat 4, is readily accessible for convenient manipulation and that when the proper adjustment of the spring 62 has been made, the hand wheel 78 is frictionally locked against accidental rotation. It will also be observed that the hand wheels 25 and 54 are likewise located 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, and hence occupants of varying weight may sit comfortably in the chair without changing the adjustment of the spring 62, 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 62 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. This desirable feature is possible only when and because the angular travel of the back exceeds that of the seat, as indicated in Fig. 4, wherein the angle between *ed* and *e'd'* exceeds the angle *cac'* by angle *fc'e'*.

While I 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.

I 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 an adjustable member pivotally connected to said fixed member at a point spaced from the pivotal connection with said seat-supporting member and to said back-supporting member at a point spaced from the pivotal connection with said seat-supporting member, said fixed member, seat-supporting member, back-supporting member, adjustable member and their respective pivotal connections providing a four-bar linkage system in which said adjustable member controls a relative tipping movement of the seat and back members.
2. 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, an adjustable member pivotally connected to said fixed member at a point spaced from the pivotal connection with said seat-supporting member and to said back supporting member at a point spaced from the pivotal connection with said seat-supporting member, said fixed member, seat-supporting member, back-supporting member, adjustable member and their respective pivotal connections providing a four-bar linkage system in which said adjustable member controls a relative tipping movement of the seat and back members, 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 simultaneous tipping movement, comprising a fixed member, a substantially horizontally disposed seat-supporting member pivotally connected adjacent to its front end to said fixed member, a substantially vertically disposed back-supporting member pivotally connected at its upper end to the rear of said seat-supporting member, and an adjustable member pivotally connected at one end to said fixed member at a point spaced from the pivotal connection with said seat-supporting member and at its opposite end to the lower part of said back-supporting member, said fixed member, seat-supporting member, back-supporting member, adjustable member and their respective pivotal connections providing a four-bar linkage system in which said adjustable member controls a relative tipping movement of the seat and back members.
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 a fixed member, a substantially horizontally disposed seat-supporting member pivotally connected adjacent to its front end to said fixed member, a substantially vertically disposed back-supporting member pivotally connected at its upper end to the rear of said seat-supporting member, an adjustable member pivotally connected at one end to said fixed member at a point spaced from the pivotal connection with said seat-supporting member and at its opposite end to the lower part of said back-supporting member, said fixed member, seat-supporting member, back-supporting member, adjustable member and their respective pivotal connections providing a four-bar linkage system in which said adjustable member controls a relative tipping movement of the seat and back members, and spring means acting on said fixed member and seat-supporting member for yieldingly opposing tipping movement of the seat and back members.
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 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 an adjustable member comprising a coupling pivotally connected to said back-supporting member, a screw shaft having one end rotatably mounted in said coupling, a second coupling connected to said fixed member, said second coupling having a threaded socket receiving said screw shaft, said fixed member, seat-supporting member, back-supporting member, adjustable member and their respective pivotal connections providing a four-bar linkage system in which said adjustable member controls a relative tipping movement of the seat and back members, and means for rotating said screw shaft so as to vary the effective length of the adjustable member.
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 a fixed member, a substantially horizontally disposed seat-supporting member pivotally connected adjacent to its front end to said fixed member, a substantially vertically disposed back-supporting member pivotally connected at its upper end to the rear of said seat-supporting member, and an adjustable member comprising a coupling pivotally connected to said back-supporting member, a screw shaft having one end rotatably mounted in said coupling, a second coupling connected to said fixed member, said second coupling having a threaded socket receiving said screw shaft, said fixed member, seat-supporting member, back-supporting member, adjustable member and their respective pivotal connections providing a four-bar linkage system in which said adjustable member controls a relative tipping movement of the seat and back members, and means for rotating said screw shaft so as to vary the effective length of the adjustable member.
7. 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 an adjustable member comprising a coupling pivotally connected to said back-supporting member, a screw shaft having one end rotatably mounted in said coupling, a second coupling connected to said fixed member, said second coupling having a threaded socket receiving said screw shaft, an actuating member carried by one of the coupling members, said

fixed member, seat-supporting member, back-supporting member, adjustable member and their respective pivotal connections providing a four-bar linkage system in which said adjustable member controls a relative tipping movement of the seat and back members, and means operatively associated with said actuating member and screw shaft for effecting rotation of the latter in response to actuation of the former, thereby to vary the effective length of the adjustable member.

8. 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 connected seat and back-supporting members, a fixed member pivotally connected to the seat-supporting member, and an adjustable member pivotally connected to the fixed member and back-supporting member, said fixed member, adjustable member and seat and back-supporting members being arranged to provide a four-bar linkage system wherein said adjustable member controls the tipping movement of the back relative to the seat.

9. 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 connected seat and back-supporting members, a fixed member pivotally connected to the seat-supporting member, an adjustable member pivotally connected to the fixed member and back-supporting member, said fixed member, adjustable member and seat and back-supporting members being arranged to provide a four-bar linkage system wherein said adjustable member controls the tipping movement of the back relative to the seat, an extension member depending from the seat-supporting member with its end portion disposed in close proximity to said fixed member, and resilient means acting on said fixed member and the extension member for yieldingly opposing tipping movement of the seat and back members.

10. In a chair of the type having a seat supported to tip from a substantially horizontal po-

sition to an inclined position, a chair iron having a fixed member, a seat-supporting member pivotally connected to said fixed member, an extension member depending from said seat-supporting member, resilient means acting on the fixed and extension members so as to oppose tilting movement of the seat, and adjustable means for varying the action of said spring on the extension and fixed members, said adjustable means including a screw projecting through aligned openings in the fixed and extension members, the marginal portions about the opening in one of said members being provided with diagrammatically disposed recessed portions, a U-shaped member carried by said screw shaft with its legs extending into said recessed portions, and an operating member having a threaded engagement about said screw shaft and acting on said U-shaped member so that the latter exerts a frictional locking action tending to oppose relative rotation of the screw shaft and actuating member.

11. In a chair of the type having a seat supported to tip from a substantially horizontal position to an inclined position, a chair iron having a fixed member, a seat-supporting member pivotally connected to said fixed member, an extension member depending from said seat-supporting member, a spring having one end acting on the fixed member, a screw shaft projecting through aligned openings in the extension and fixed members, means carried by the screw shaft for acting on the opposite end of said spring, a locking plate disposed about the opening in the extension member, said locking plate being formed with diagrammatically disposed recessed portions, a U-shaped member carried by the screw shaft with its legs extending into said recessed portions, and an operating member having a threaded engagement about said screw shaft and acting on said U-shaped member so that the latter exerts a frictional locking action opposing relative rotation of the screw shaft and actuating member.

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