June 19, 1945. H. P. NORDMARK 2,378,495

CHAIR

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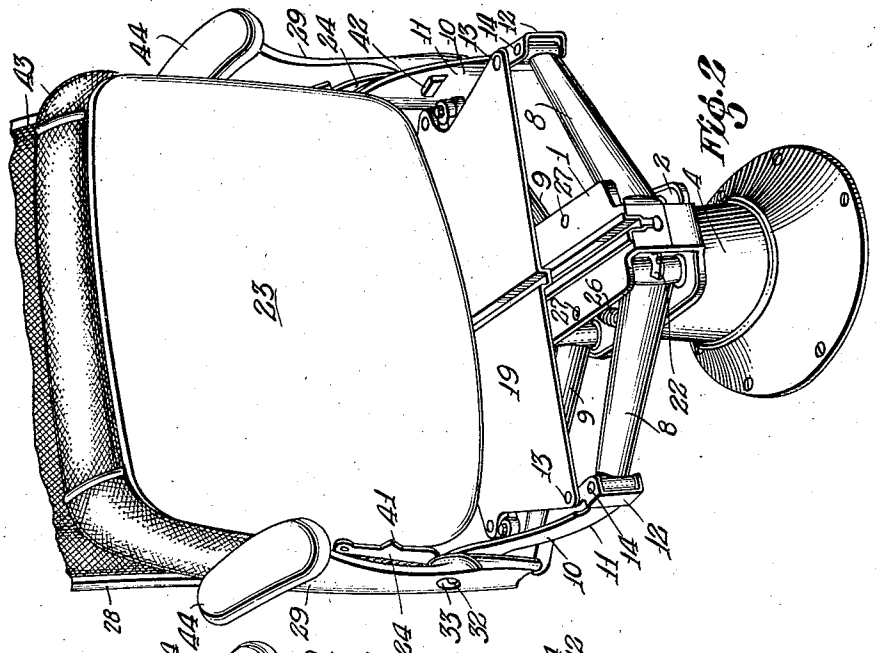


Fig. 2.

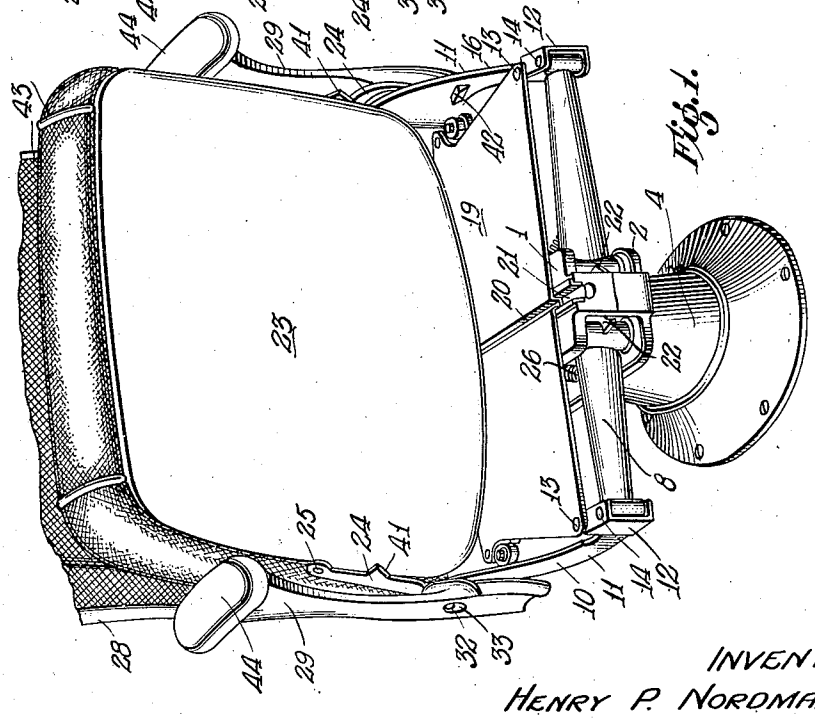


Fig. 1.

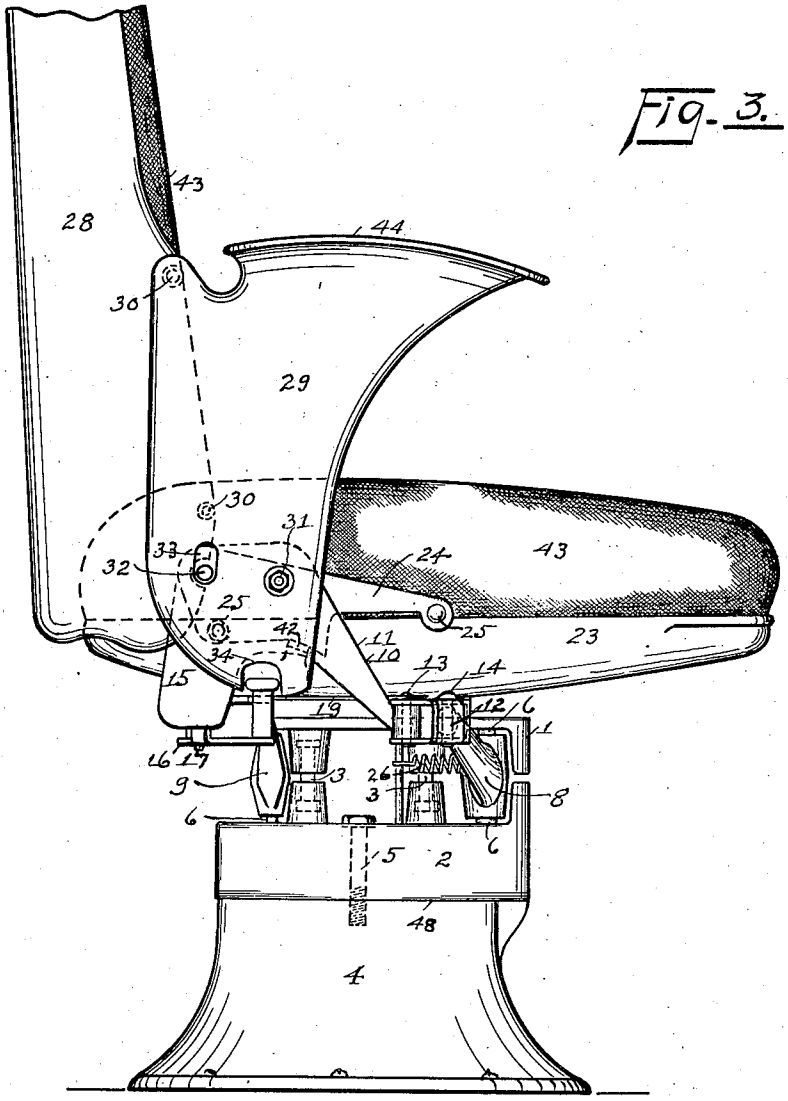
INVENTOR
HENRY P. NORDMARK,
BY Rice and Rice
ATTORNEY

June 19, 1945. H. P. NORDMARK 2,378,495

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Filed May 12, 1941 6 Sheets-Sheet 2

Fig. 3.



Witness:
Geo. L. Chapel

Inventor
Henry P. Nordmark

By Rice and Rice
Attorneys

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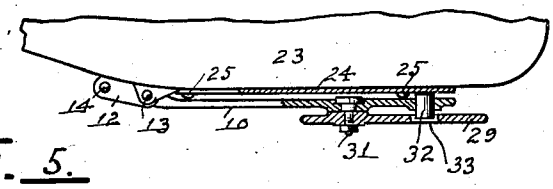


Fig. 5.

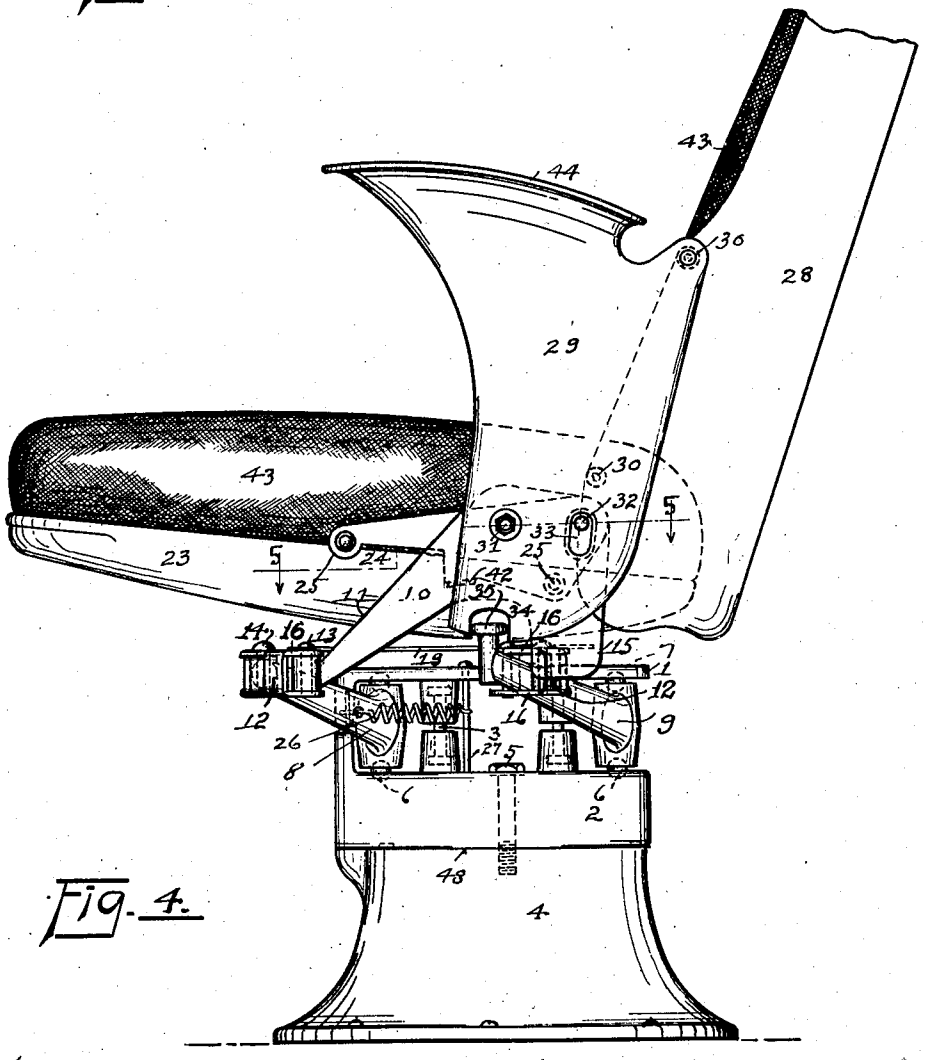


Fig. 4.

Witness:
Geo. L. Chapel

Inventor
Henry P. Nordmark

By Rice and Rice

Attorneys.

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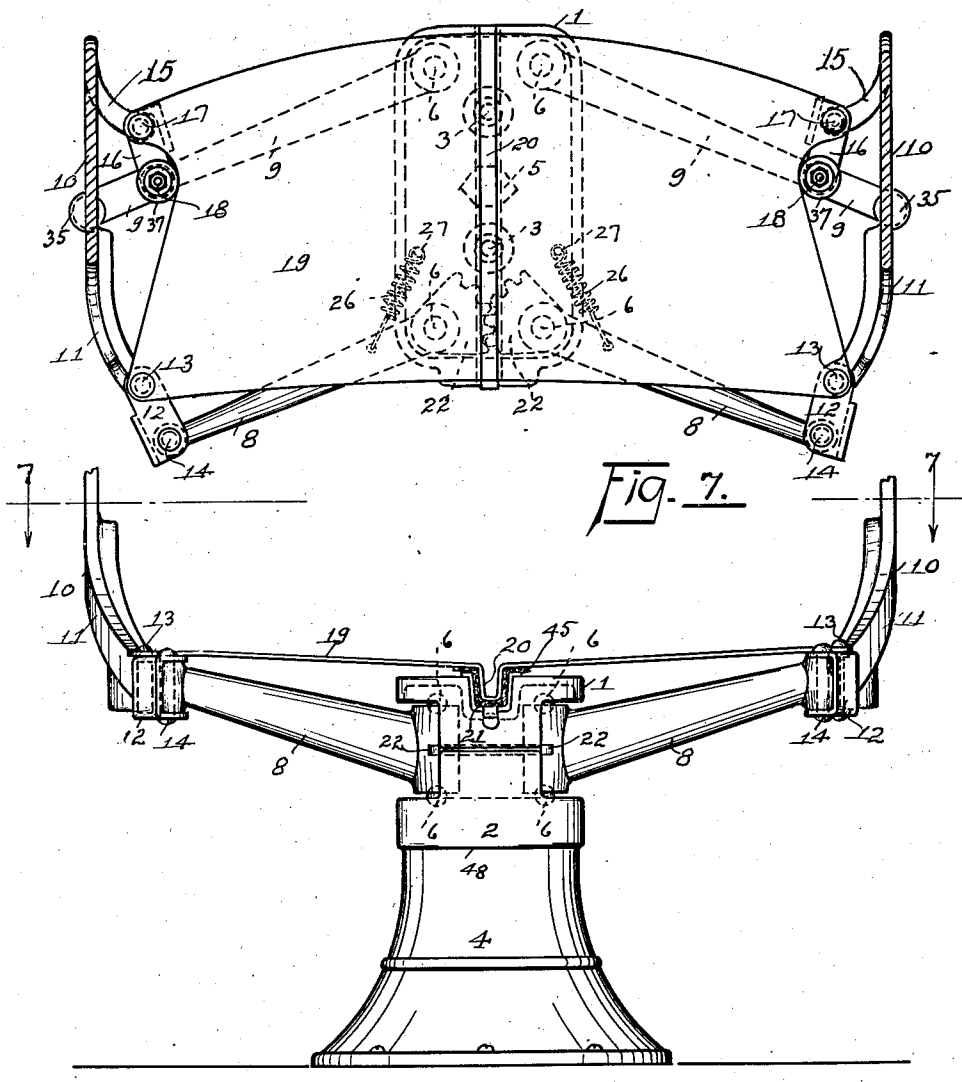


Fig. 7.

Fig. 6.

Witness:
Geo. L. Chapel

Inventor
Henry P. Nordmark

By Rice and Rice

Attorneys

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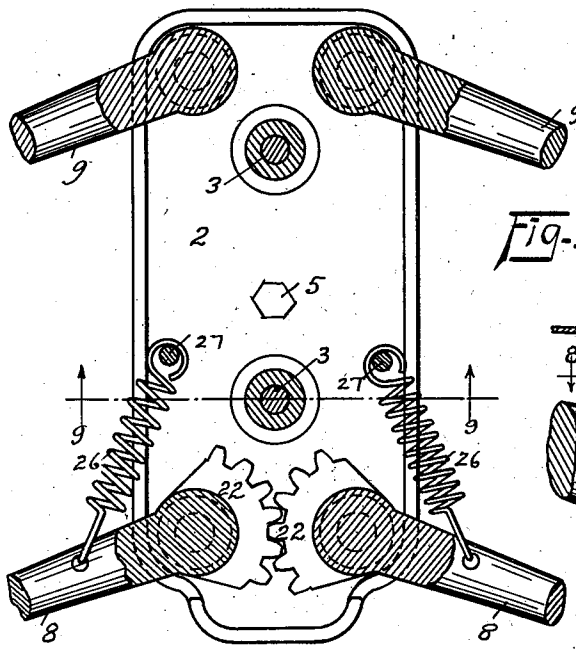


Fig. 8.

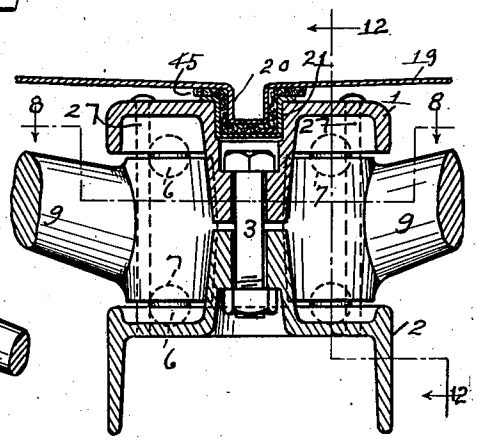


Fig. 9.

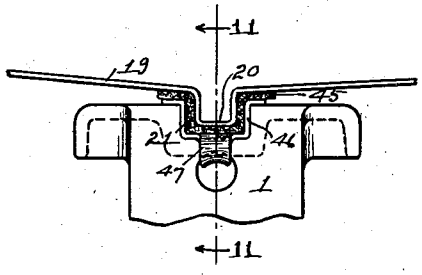


Fig. 10.

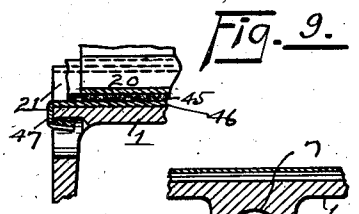


Fig. 11.

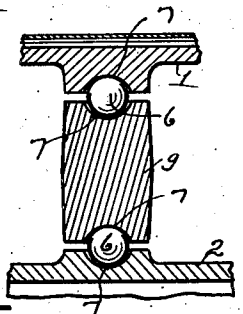


Fig. 12.

Witness:
Geo. L. Chapel

Inventor
Henry P. Nordmark

By Rice and Rice

Attorneys

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CHAIR

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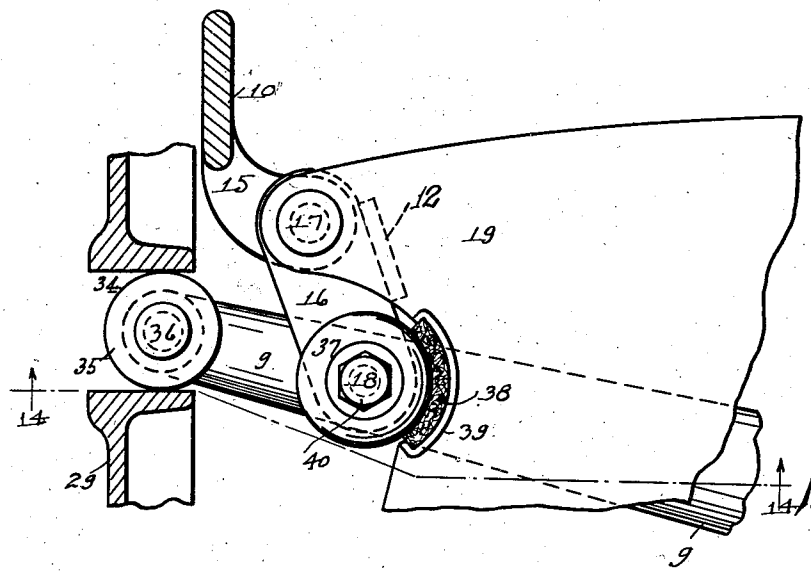


Fig. 13

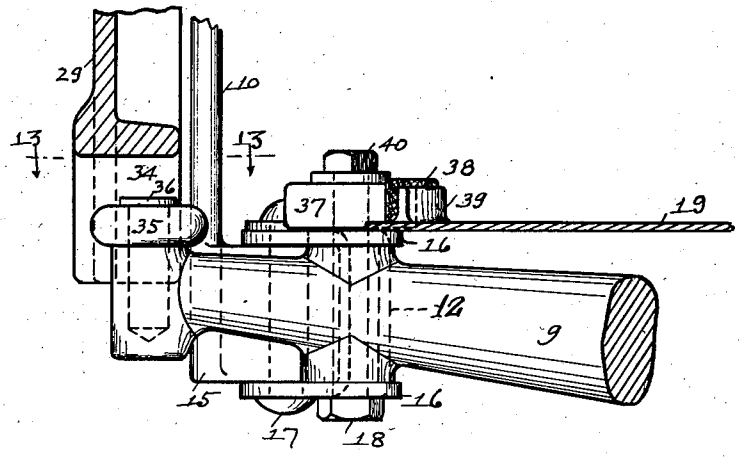


Fig. 14.

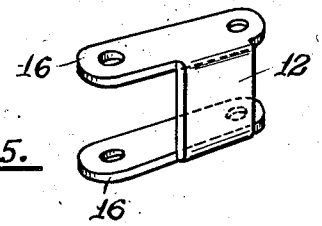


Fig. 15.

Witness:
Geo. L. Chapel

Inventor
Henry P. Nordmark

By Rice and Rice
Attorneys

Patented June 19, 1945 2,378,495

UNITED STATES PATENT OFFICE

2,378,495

CHAIR

Henry P. Nordmark, Grand Rapids, Mich., assignor to American Seating Company, Grand Rapids, Mich., a corporation of New Jersey

Application May 12, 1941, Serial No. 392,995

13 Claims. (Cl. 155—116)

The present invention relates to chairs, particularly chairs of the "opera" type; and its object is to provide a chair mounted on a fixed central support, and turnable horizontally thereon to desired releasably held positions; and further, to provide such a chair having a base and laterally extending opposite arms mounted on the base for forwardly-rearwardly swinging movement and supporting at their free outer ends upper parts of the chair including its seat and back; and further, to provide forward and rearward pairs of such supporting arms; and further, to provide means for connecting such upper parts and the free ends of the arms in free horizontally turnable relation; and further, to provide means for directing the forward-rearward movement of the arms and parts supported thereby; and further, to provide means for braking and limiting said forward-rearward movements; and further, to provide means for mounting the chair's back for rearwardly-downwardly turning movement, and for mounting the chair's seat for turning movement to raised and lowered positions; and further, to provide means for swinging the arms forwardly by the rearwardly-downwardly turning movement of the back; and further, to provide a base portion of the chair comprising upper and lower spaced plates detachably connected between which the arms are at their inner ends pivotally mounted.

These and any other and more specific objects hereinafter appearing are attained by, and the invention finds preferable embodiment in, the illustrative chair structure particularly described in the body of this specification and illustrated by the accompanying drawings, in which:

Figure 1 is a perspective view of a chair embodying my invention, illustrating its seat raised and in medial forwardly-rearwardly moved position;

Figure 2 is a like view thereof, but illustrating its seat in rearwardly moved position;

Figure 3 is an elevational side view of the same, illustrating its seat in lowered and in rearwardly moved position;

Figure 4 is an elevational opposite side view of the same but illustrating its seat in forwardly moved position;

Figure 5 is a detail, horizontal sectional view of certain parts, taken on line 5—5 of Figure 4;

Figure 6 is an elevational front view of lower parts of the chair;

Figure 7 is a top plan view of the same, shown partially in horizontal section taken on line 7—7 of Figure 6;

Figure 8 is a top plan view of middle portions of lower parts of the chair, shown partially in horizontal section taken on line 8—8 of Figure 9;

Figure 9 is a transverse vertical sectional view of said middle portions, taken on line 9—9 of Figure 8;

Figure 10 is a fragmentary front elevational view of said middle portions;

Figure 11 is a vertical sectional view thereof taken on line 11—11 of Figure 10;

Figure 12 is a vertical sectional view of some of said middle parts, taken on line 12—12 of Figure 9;

Figure 13 is a fragmentary top plan view of certain rearward side parts of the chair, shown partially in horizontal section taken on line 13—13 of Figure 14;

Figure 14 is an elevational front view thereof, shown partially in vertical section taken on line 14—14 of Figure 13;

Figure 15 is a view of a short connecting link.

The chair illustrated by these drawings has a central base which includes upper and lower spaced plates 1, 2, detachably connected by threaded bolts 3, the lower plate 2 being mounted on a central support or pedestal 4 by a bolt 5 threaded thereinto.

Laterally extending opposite arms are pivotally mounted on the base for forwardly-rearwardly swinging movement together, being thus mounted, as shown, by balls 6 turning in cup bearings 7 in said plates and arms; and in the illustrated construction, forward and rearward pairs 8, 8 and 9, 9 of such arms are provided. Links or supports 10 at the chair's opposite sides respectively are supported by said arms for forward-rearward movement therewith.

For permitting free turning movement of the links 10 horizontally on the arms, the forward legs 11 of the links are connected with the free ends of the forward arms 8 by short links 12 pivoted at 13 on said legs and at 14 on said arms, and the rearward legs 15 of the links 10 are connected with the rearward arms 9 inwardly from their free ends by like short links 16 pivoted at 17 on said legs and at 18 on said arms, as best seen in Figure 7, these links 16 each comprising spaced parallel bars.

A horizontal plate 19 is connected adjacent its corners with the legs 11, 15 of the links 10 by the pivot pins 13 and 17; this plate has a forwardly-rearwardly extending rib 20 slidable in a guiding groove 21 in the base's upper plate 1; and one pair (the forward pair 8, 8) of the arms have meshing toothed segments 22; all for effecting

the simultaneous and corresponding forward-rearward movement of the arms and the parts carried thereby. Springs 26 connected to the forward arms 8, 8 and to the base's rods 27 urge the arms and the parts carried thereby rearwardly, as best seen in Figure 8.

The chair's back (i. e. its sheet metal rear frame 28) has forwardly extending sides 29 securely fastened thereto by rivets 30 or the like, and is, at its said sides, pivotally mounted at 31 on the links 10 respectively for rearwardly-downwardly turning movement relatively to these links and to the chair's seat. Said seat (i. e. its sheet metal bottom frame or "pan" 23) has flat supporting bars 24 securely fastened thereto on its opposite sides respectively by rivets 25 or the like. This seat is mounted for turning movement to raised position (shown in Figures 1 and 2) and to lowered position of use (shown in Figures 3 and 4), by the laterally extending spindles 32 carried by the links 10 rearwardly of the pivots 31, these spindles extending into the vertically elongated slots 33 in the back's sides 29 and being movable upwardly-downwardly in these slots in relative movements of seat 23 and back 28 (see Figures 5, 3 and 4). As clearly illustrated in Fig. 5 of the drawings, the spindles 32 are fixed to the flat supporting bars 24 of the seat and they are journaled in bearing openings in the links 10. This permits the seat to swing upwardly or downwardly, the downward movement of the seat being limited by the means hereinafter described for supporting the seat in substantially a horizontal position for use.

The back 28 has elongated bearings (i. e. notches 34 extending upwardly from the bottom of its sides 29) into which bearings extend the free ends of the rear arms 9 having anti-friction rolls 35 on their vertical spindles 36 (as best seen in Figures 13 and 14). In Figures 13, 14 are illustrated means whereby the forward-rearward movements of the seat are yieldingly resisted or braked, toward either end of such movements (i. e. when the arms 9 approach parallelism with said movements), by the increasing friction of the roll 37 (turnable on the pivot pin 18 on each arm 9) with the curved compressible or resilient element 38 held in the socket 39 on the plate 19. The nut 40 on the threaded upper end of the pivot pin 18 is adapted to be turned down to increase the friction of the roll 37 on the short link 16. With the turning of the arms 9 toward their extreme forward or rearward position, the element 38 acts approximately as a stop limiting such movement of the arms. By varying the frictional engagement between the nut, the roll, and the short link 16, the braking action of the roll 37 and the link 16 may be varied. When the arms 8 and 9 swing forwardly the short links 16 are carried inwardly and the pressure of the rolls 37 against the elements 38 is increased, the pressure increasing as the short links 16 are carried inwardly.

In the seat's lowered position of use the portions 41 of its side bars 24 rest on the shelf portions 42 of the links 10.

A lining 45 of felt or the like in the guiding groove 21, for rendering the sliding movement of the rib 20 noiseless, is shown in Figures 6, 9, 10 and 11, and a second lining 46 outside lining 45 is shown, having its end 47 turned over and inwardly to hold it in position. The second lining 46 which forms a backing for the lining 45 may be advantageously constructed of thin sheet metal but any other suitable material may of course be employed.

It will be seen that, the pressure of the chair's occupant on its back, causes the back to turn rearwardly-downwardly on its pivotal mounting 31 and relatively to the seat and to the links 10, and causes the seat to move forwardly, so that the chair now assumes the comfortable seating position seen in Figure 4. In said movements, the arms 8, 8 and 9, 9 swing forwardly, the notch bearings 34 in the back's sides engaging the rolls 35 on the rear arms to effect, or contribute to, the seat's forward movement; and when the occupant rises the springs 26 return the parts to their position seen in Figure 3 and the seat may be turned about the axis of its mounting spindle 32 to its raised position seen in Figures 1 and 2 to provide more space for passing in front of the chair.

It will also be seen that this chair, whose base plate 2 rests on the flat top 48 of the central support or pedestal 4 (which is fastened on the floor), may be turned horizontally about the loosened bolt 5 to desired position for facing or orienting the chair in any determined direction, in which position it may be held by turning down this bolt; and also that, inasmuch as the chair is mounted on a central and single support, the floor thereabout may be easily swept and scrubbed.

Upholstery is shown at 43, and arm rests at 44 on the upper ends of the back's sides 29.

I claim:

1. In a chair of the class described the combination of a central base having detachably connected upper and lower spaced plates with pairs of aligned cup bearings in their adjacent sides; laterally extending opposite arms for supporting the chair's seat having in the upper and the lower sides of their inner ends aligned cup bearings; balls turning in the registering cup bearings of the plates and arms for mounting the arms horizontally swingable on the base.

2. A chair of the class described comprising in combination a base, front and rear horizontally swingable, laterally extending arms arranged in pairs at opposite sides of the base and pivotally mounted thereon, links connecting the free ends of the arms and located at opposite sides of the chair, a chair seat pivotally connected to the links for upward and downward swinging movement, and means for limiting the downward movement of the seat to support the same in substantially horizontal position.

3. A chair of the class described comprising in combination a base, front and rear horizontally swingable, laterally extending arms mounted on the base arranged in pairs at opposite sides of the base, links connecting the free ends of the arms and located at opposite sides of the chair, a chair back supported by said links, a chair seat pivotally connected to the links for upward and downward swinging movement, and means for limiting the downward swinging movement of the seat to support the same in substantially horizontal position.

4. A chair of the class described comprising in combination a base, front and rear horizontally swingable, laterally extending arms arranged in pairs at opposite sides of the base and pivotally mounted thereon, links connecting the free ends of the arms and located at opposite sides of the chair, a seat connected at its sides with the links for turning movement to raised and lowered positions and having a limited downward movement,

and a back mounted on the links for rearward and downward turning movement.

5. A chair of the class described comprising in combination a base, front and rear horizontally swingable, laterally extending arms arranged in pairs at opposite sides of the base and pivotally mounted thereon, links connecting the free ends of the arms and located at opposite sides of the chair, a seat connected at its sides with the links for turning movement to raised and lowered positions and having a limited downward movement, and a back mounted on the links for rearward and downward turning movement and having bearings receiving the free ends of the rear arms for swinging the arms forwardly with the rearward downward turning movement of the back.

6. A chair of the class described comprising in combination a base, front and rear horizontally swingable, laterally extending arms arranged in pairs at opposite sides of the base and pivotally mounted thereon, links connecting the arms, a chair seat carried by said links, a back mounted on the links for rearward and downward turning movement, means for effecting forward movement of the arms when the back is subjected to rearward pressure, and yieldable means for urging the arms rearwardly when the back is relieved of pressure.

7. A chair of the class described comprising in combination a base, front and rear horizontally swingable, laterally extending arms arranged in pairs at opposite sides of the base and pivotally mounted thereon, a seat, a pair of links supporting the seat and having forward and rearward leg portions connected with the free ends of the front and rear arms, and a back mounted on the links for rearward and downward turning movement.

8. A chair of the class described comprising in combination a base, front and rear horizontally swingable, laterally extending arms arranged in pairs at opposite sides of the base and pivotally mounted thereon, links connecting the free ends of the arms and located at opposite sides of the chair, a seat, a back mounted on the links for rearward and downward turning movement and having sides provided with vertically extending slots, spindles pivotally connecting the seat to the links and projecting therefrom into the slots of the sides of the back, and means for limiting the downward movement of the seat for supporting the same in substantially horizontal position.

9. A chair of the class described comprising in combination a base, front and rear horizontally swingable, laterally extending arms arranged in pairs at opposite sides of the base and pivotally mounted thereon, links connecting the free ends of the arms and located at opposite sides of the chair, a seat, a back mounted on the links for rearward and downward turning movement and having sides provided with vertically extending slots, spindles pivotally connecting the seat to the links and projecting therefrom into the slots of the sides of the back, said back having vertically elongated bearing slots in its sides receiving the free ends of the rear arms for swinging the latter forwardly with the rearward downward turning movement of the back.

10. In a chair, the combination of a base, front and rear horizontally swingable, laterally extending arms arranged in pairs at opposite sides of the base and pivotally mounted thereon, a horizontally disposed plate turnably connected adjacent its forward corners with the free ends of the front arms and adjacent its rear corners with the rear arms for effecting movement of all the arms simultaneously, a seat, and means for supporting the seat on the arms.

11. In a chair, the combination of a base, front and rear horizontally swingable, laterally extending arms arranged in pairs at opposite sides of the base and pivotally mounted thereon, a horizontally disposed plate turnably connected adjacent its forward corners with the free ends of the front arms and adjacent its rear corners with the rear arms for effecting movement of all the arms simultaneously, said plate having a depending forwardly and rearwardly extending rib and the base having a forwardly and rearwardly extending groove wherein said rib is slidably guided in forward and rearward movements of the plate, a seat, and means for supporting the seat on the arms.

12. In a chair of the class described, the combination of a central base, a pair of laterally extending arms for supporting the chair's seat and mounted on the base for horizontally forward and rearward swinging movement, means for braking said movement including a plate, means pivotally connecting said plate with the arms adjacent their free ends for direct forward and rearward movement with the arms in their swinging movement, circular brake members turnably mounted on spindles carried by certain of the arms adjacent their free ends, and concave brake members carried by the plate in frictional engagement with the peripheries of the circular brake members certain of said means comprising links pivotally connected with the plate and said spindles, the spindles having threaded ends and provided with nuts turnable into frictional engagement with the circular brake members.

13. In a chair of the class described, the combination of a central base, a pair of laterally extending opposite arms for supporting the chair's seat mounted on the base for horizontally forward and rearward swinging movement, means for braking said movement, said means including a plate pivotally connected with the arms adjacent their free ends for direct forward and rearward movement with the arms in their swinging movement, convex brake members movable with the arms in their swinging movement, and concave brake members on the plate in frictional braking engagement with the convex brake members.

HENRY P. NORDMARK.