March 7, 1950 W. E. NORDMARK 2,500,135

THEATER CHAIRS HAVING TIP UP SEATS

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Fig. 1

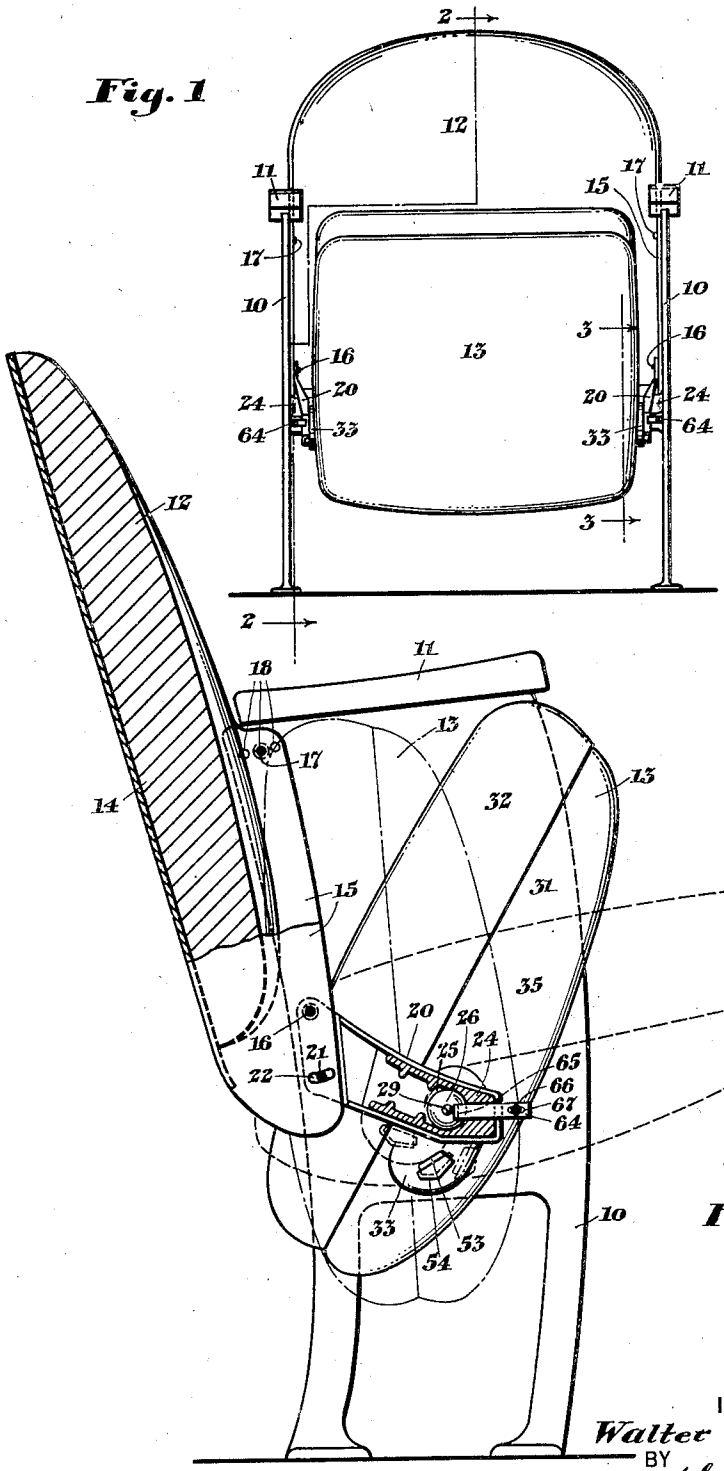


Fig. 2

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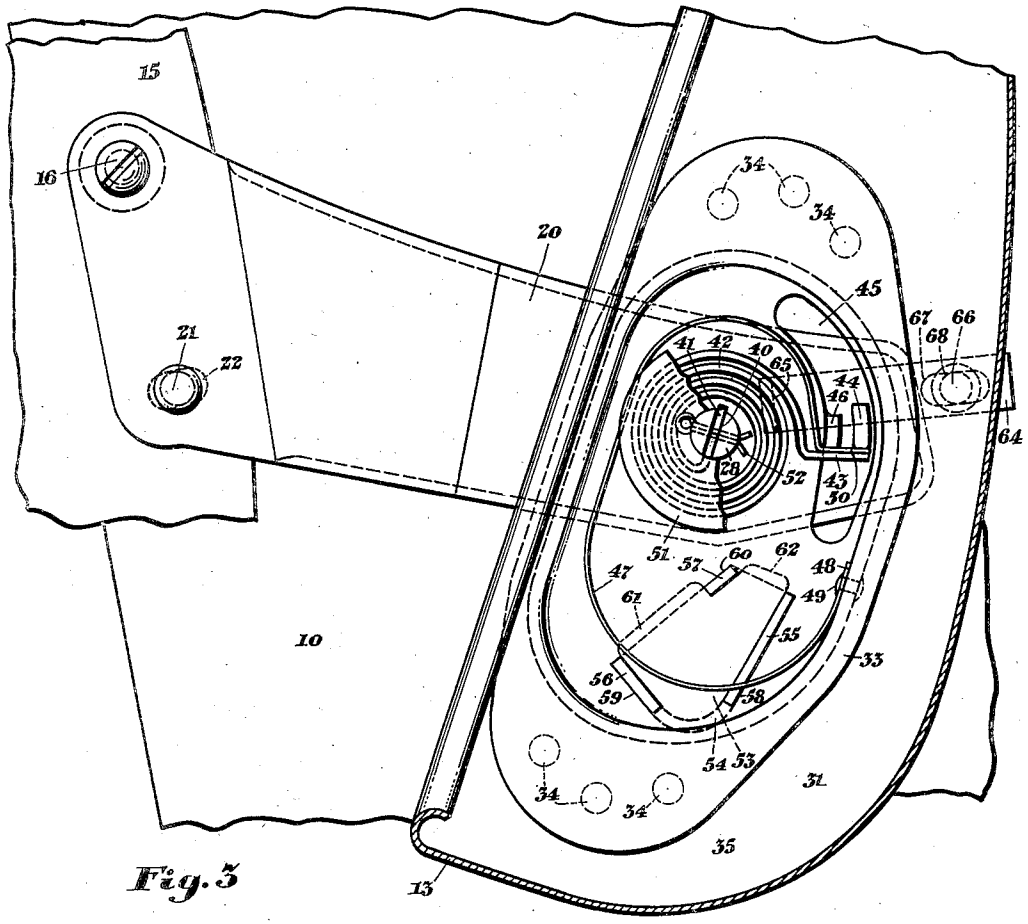


Fig. 3

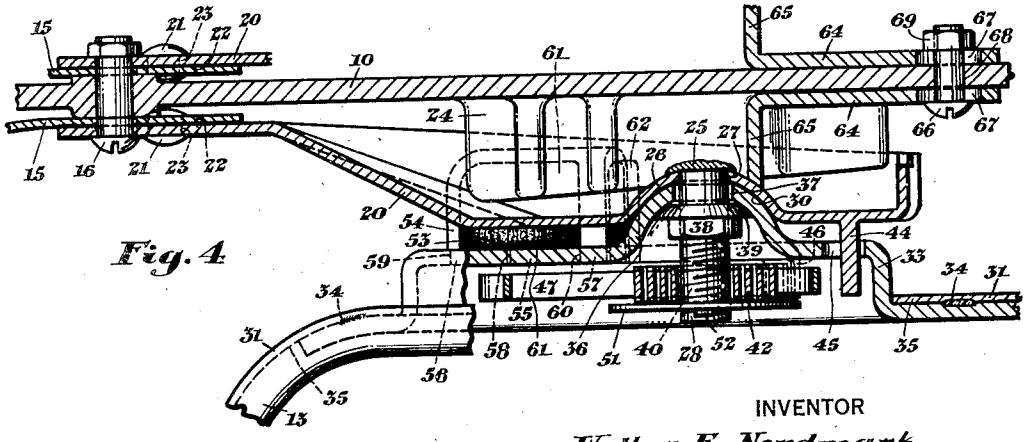


Fig. 4

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THEATER CHAIRS HAVING TIP UP SEATS

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Fig. 5

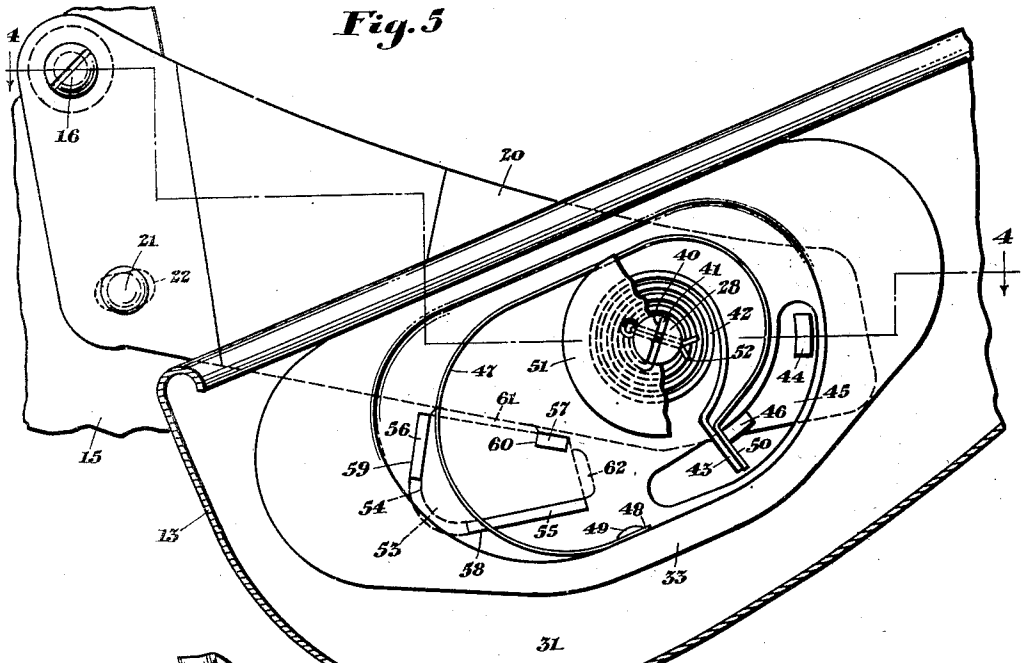
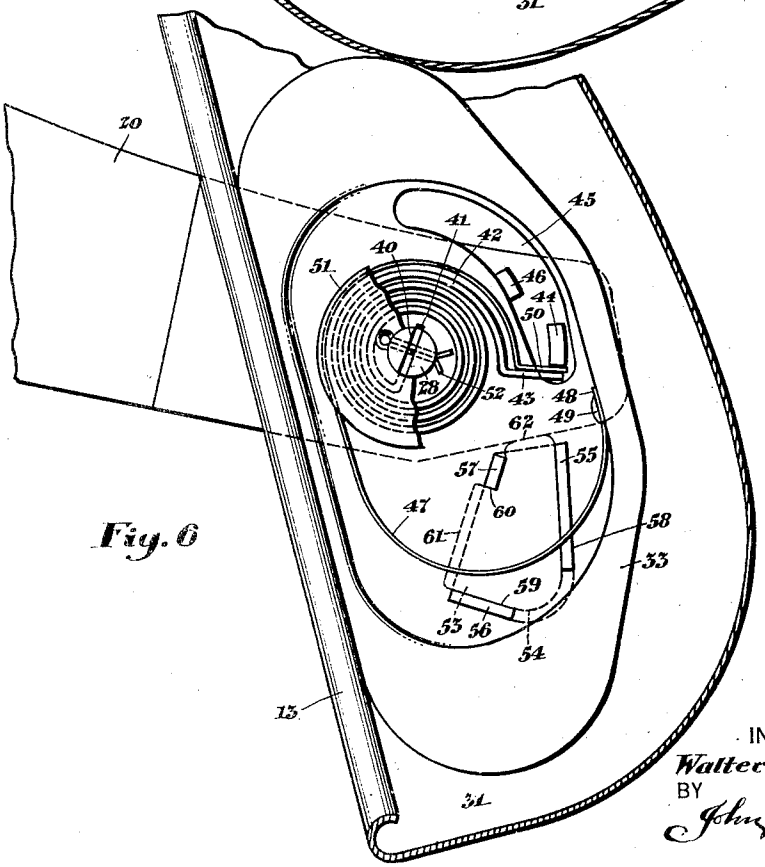


Fig. 6



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THEATER CHAIRS HAVING TIP UP SEATS

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Fig. 7

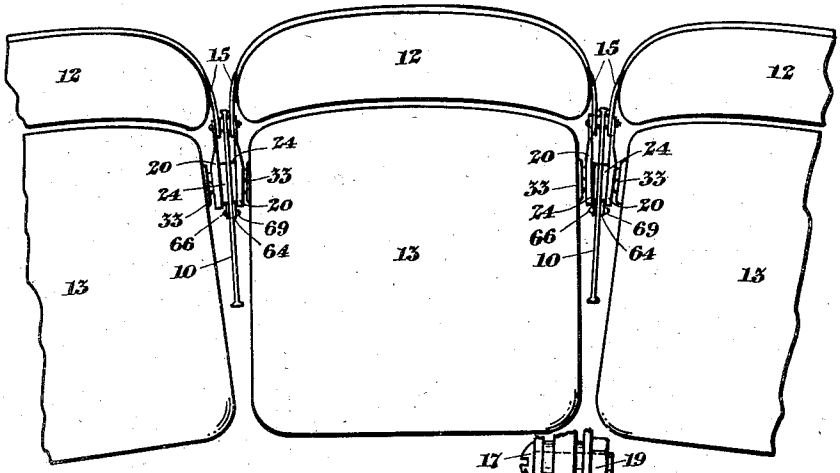
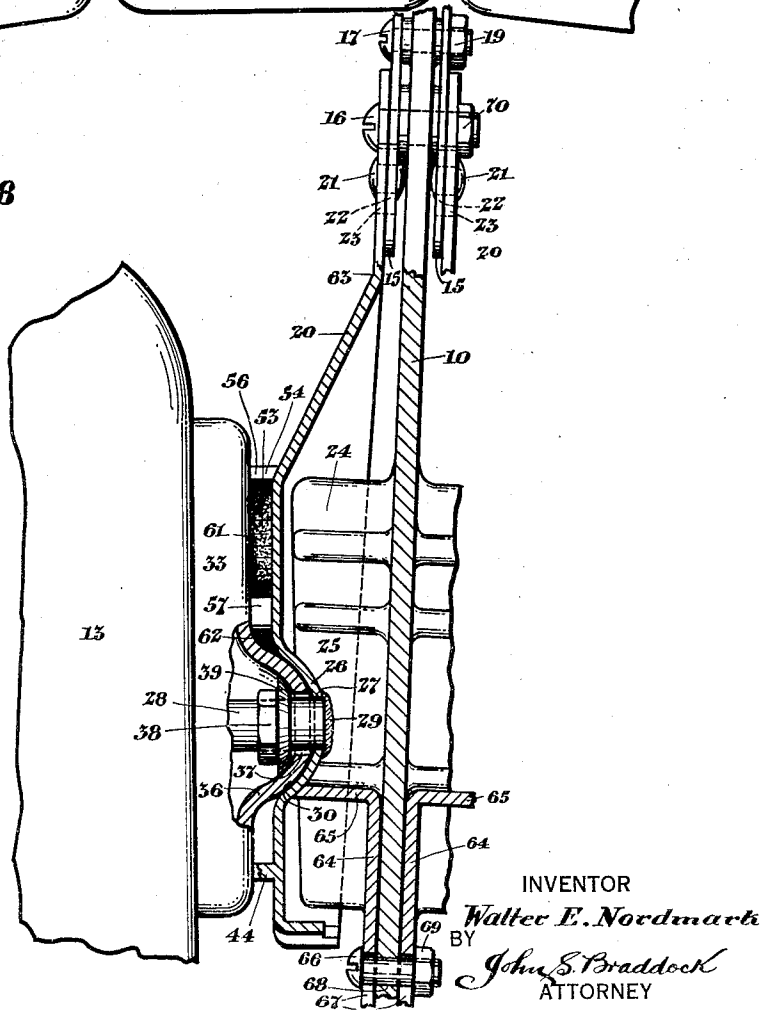


Fig. 8



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UNITED STATES PATENT OFFICE

2,500,135

THEATER CHAIRS HAVING TIP-UP SEATS

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Application June 15, 1946, Serial No. 677,008

14 Claims. (Cl. 155—85)

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The present invention relates to chair structures and more particularly to chairs of the theater type.

The primary objects of the invention are to provide improved means for mounting the seat and back on upright chair supporting frames; to provide improved seat mountings for turnably connecting the seat to the standards so that it may be lowered to a near horizontal position for occupancy or raised to a near vertical position as when the occupant rises to permit others to pass in front of him; to provide such seat mountings whereby the seat is normally caused to assume an intermediate or neutral position between the horizontal and vertical positions, so that all of the seats in a theater will automatically assume the same angular position when unoccupied and thus present a uniform and attractive appearance; to provide such seat mountings arranged so that the springs which normally maintain the seats in their neutral positions may vary considerably in strength and yet the angular tilt of the seats in their neutral positions is the same in all cases; to provide such seat and back mountings which are adaptable for use in either straight or curved rows of chairs, and which include compensating means for slight errors in the positions of the supporting standards; to provide such seat and back mountings in which the angular tilt of the back may be varied at the time of installation to conform to the incline of the theater floor; to provide a novel stop for positively stopping the raising and lowering movements of the seat; and in general to provide improved chair mountings which are effective in use, reasonably economical in manufacture and attractive in appearance.

An illustrative embodiment of the invention is shown in the accompanying drawings, wherein:

Figure 1 is a front elevational view of a theater chair constructed according to the present invention, the seat being shown in its normal or neutral position;

Figure 2 is an enlarged sectional view of the same taken on line 2—2 of Figure 1, the seat being shown in its neutral position by full lines and in its lowered and raised positions by dotted and broken lines, respectively;

Figure 3 is a fragmentary inside view of parts thereof, shown partially in section taken on line 3—3 of Figure 1, the seat upholstering being omitted in this view and the seat foundation being shown in its neutral position;

Figure 4 is a fragmentary, sectional view taken on line 4—4 of Figure 5;

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Figure 5 is a view similar to Figure 3 and showing the seat foundation in its lowered position;

Figure 6 is another view similar to Figures 3 and 5 and showing the seat foundation in its raised position;

Figure 7 is a fragmentary top plan view of a curved row of theater chairs according to the present invention, the arm rests being omitted in this view; and

Figure 8 is an enlarged fragmentary top plan view of the same, with certain parts thereof being shown in horizontal section taken at the level of the seat pivot, and the seat in its lowered position.

Referring now in detail to these drawings, the chair structure there shown generally comprises spaced, upright chair supporting standards 10 having conventional arm rests 11 at their upper ends, and a chair back 12 and seat 13 supported by and between the standards. The standards 10 are of the type known as middle standards, each serving as a common support for the adjacent sides of chairs in a row. The chair back 12 is secured by any conventional means (not shown) to a back plate 14 having forwardly extending flanges 15 at opposite sides thereof which are secured to the standards 10 respectively by fastening means comprising lower bolts 16 and upper bolts 17. The flanges 15 have several apertures 18 arranged in an arc concentric with the lower bolts 16 (see Figure 2), through any of which apertures may be passed the upper bolts 17 thus providing a selective angular positioning of the back conforming to the incline of the floor.

The chair seat 13 is mounted on seat supporting arms 20 which are secured by their flat, rearward ends to the standards 10 by the same (lower) bolts 16 which secure the back 12 to the standards. The seat supporting arms 20 may be additionally connected to the back plate by means of rivets 21 passing through arcuate apertures 22 in the back plate 14 and through apertures 23 in these arms. The seat and back may thus be assembled and packed as a unit prior to shipping and installation, and the subsequent installation is facilitated by this arrangement.

The forward portions of the seat supporting arms 20 are of generally rectangular, box-like construction adapted to fit over and be supported by shelves 24 cast on the standards. As best seen in Figures 2 and 4, these shelves taper slightly forwardly in both horizontal and vertical planes and have hollows 25 therein into which extend hemispherical embossings 26 on the seat supporting arms 20. The embossings 26 have cen-

tral apertures 27 therethrough in which are secured inwardly extending screw-threaded spindles 28, as by welding 29. The concave inner surfaces of the embossings 26 form sockets 30 whose function will hereinafter be made apparent.

The chair seat 13 comprises a stamped metal seat foundation 31 and upholstering 32 secured to the foundation in any suitable manner. Stampings 33 of heavier gauge metal are secured by welding 34 to the opposite side walls 35 of the seat foundation 31, and extend through openings in said side walls. The stampings 33 thus form part of the seat foundation 31, and are provided with outwardly convex embossings or domes 36 having central openings 37 therethrough of greater diameter than the spindles 28 and through which openings these spindles extend. The domes 36 are nested within the sockets 30 of the seat supporting arms 20 and are secured therein by means of nuts 38 threaded on the spindles 28, and convex washers 39 are interposed between the nuts 38 and the domes 36. A universal connection is thus formed between the seat supporting arms 20 and the seat 12, which connection compensates for slight errors and variations in the relative angular disposition of the seat and the standards; for example, if one of the supporting standards should deviate slightly from the vertical.

The spindles 28 on opposite sides of the seat are provided with kerfs 40 in their inner ends, in which kerfs are seated the inner ends 41 of coil springs 42 whose outer ends 43 bear against pins 44 on the supporting arms 20 when the chair seat is in its neutral position illustrated in Figure 3. Arcuate slots 45 in the stampings 33, through which the pins 44 extend, provide clearance for the seat in its turning movement.

When the seat is lowered from its neutral position shown in Figure 3 to its position of occupancy shown in Figure 5, inwardly extending lugs 46 on the stampings 33 at opposite sides of the seat press the outer ends 43 of the coil springs 42 downwardly. These springs are thereby compressed and remain so as long as the chair occupant remains seated. However, when the occupant rises and the coil springs are permitted to expand, the seat is thereby returned to its neutral position. It will be seen that when the seat reaches its neutral position the coil springs' outer ends 43 are stopped by the pins 44 on the supporting arms 20 and thus the springs become disassociated from the seat and no longer urge the same in an upwardly direction.

A second pair of springs 47 here shown as of the loop type is provided for urging the seat downwardly to its neutral position. These loop springs 47 have their lower ends 48 secured as by rivets 49 to the stampings 33 on the seat 12, and the upper ends 50 of these loop springs 47 normally bear against the lugs 46 on the stampings 33.

When the seat is raised from its neutral position shown in Figure 3 to its position shown in Figure 6, as when the occupant rises and moves rearwardly against the seat to permit others to pass, the upper ends 50 of the loop springs 47 remain stationary against the pins 44 and these springs are thus associated with the standards, while the lower ends 48 of these springs travel upwardly with the seat thus compressing the springs. When pressure of the occupant against the seat is released, the loop springs are permitted to expand and return the seat to its neutral position. It will be seen that when the seat again reaches its neutral position the loop springs' upper ends 50 are again engaged by the lugs 46 and the loop springs are thus disassociated from the supporting arms—and thus from the standards. Thus no further downward turning movement is exerted by the loop springs on the seat.

It will be seen from the foregoing that when the seat is in its neutral position the action of both the coil springs and the loop springs is neutralized, because in this position of the seat the coil springs are disassociated from the seat, while the loop springs are disassociated from the standards. This condition obtains irrespective of the relative strength of the springs, and is the same for all of the seats in a theater notwithstanding variations in the strength of springs in different units. Thus all of the seats in the theater, when unoccupied, will normally assume the same angular inclination with respect to the standards and thus present a uniform appearance.

The coil springs 42 are relatively strong, being placed under considerable compression when the seat is lowered, by the weight of the chair occupant. These springs 42 are therefore capable of raising the seat to its neutral position when the occupant rises. The loop springs 47 are relatively weak, thus to offer very little resistance when the occupant rises and stands rearwardly against the upturned seat. These loop springs 47 exert little more than sufficient pressure to return the seat from its extreme raised position to its neutral position.

Discs 51 having central openings therethrough are desirably assembled on the inner ends of the spindles 28 to maintain the springs 42 and 47 in assembly, said discs 51 being held in position as by means of cotter pins 52 passing through apertures in the extreme inner ends of the spindles 28.

Rubber bumpers or stops 53 are secured to the outer surfaces of the stampings 33. These stops 53 are mounted in metal casings 54 having flanges 55, 56 and 57 which are secured as by welding in pierced apertures 58, 59 and 60 respectively in the stampings. The rubber stops 51 have surfaces 61 which contact the seat supporting arms 20 when the seat is in its lowered position for occupancy, and surfaces 62 which contact the seat supporting arms 20 when the esat is in its extreme raised position. Thus positive stops are provided for the lowering and raising movements of the seat.

Figures 7 and 8 illustrate the adaptability of the present seat and back mountings to curved rows of chairs wherein the standards are forwardly convergent. The seat supporting arms 20 have bendable portions 63 so that the box-like forward ends of said arms are laterally movable for adjustment at the time of installation. The shelves 24 on the standards 10 are wide enough to support the forward ends of the supporting arms 20 within the necessary prescribed range of lateral adjustment. The forwardly extending portions 15 of the back plates 14 are also bendable to a slight degree to adapt them to the curved rows. After the chairs are installed on the standards, they are secured against lateral displacement by means of brackets 64 forwardly-rearwardly slidably mounted on the standards, which brackets are adjusted rearwardly until their inwardly extending flanges 65 contact the embossings 26 on the seat supporting arms 20, whereupon the brackets are made secure by means of bolts 66 passing through slots 67 in the brackets and apertures 68 in the standards and provided with nuts 69.

As will be seen in Figures 4 and 8, the seat and back mountings of adjoining chairs are desirably

secured to their common standard by the same fastening means, which are the upper bolts 17 having nuts 19 for securing the back plates 14 to the standard, the lower bolts 16 having nuts 70 for securing the back plates 14 and the rearward ends of the seat supporting arms 20 to the standard, and the bolts 66 having nuts 69 for securing the brackets 64 to said standard.

I am aware that chairs have heretofore been made with self-rising seats, i. e. seats which automatically fold upwardly when not in use. Such structures have utilized springs for raising the seat, and bumpers for stopping the seat at a presumably predetermined angle. However, due to variations in the strength of the springs employed and to wear on the bumpers, such seats have not in practice been uniformly positioned at the same angle. The present invention overcomes this condition inasmuch as seats of the present construction necessarily assume the same inclination when in their neutral positions, in all cases.

The invention being intended to be pointed out in the claims, it is not to be limited to or by details of construction of the particular embodiment thereof herein shown and described.

I claim:

1. In a chair structure: a pair of standards, a seat mounted on the standards turnably to raised, neutral and lowered positions, a spring having an end thereof associated with a standard and the other end thereof associated with the seat whereby the seat is urged upwardly to its neutral position, means for disassociating said spring from the seat when the seat is turned above its neutral position, a second spring having an end thereof associated with the seat and the other end thereof associated with the standard whereby the seat is urged downwardly to said neutral position, and means for disassociating said second spring from the standard when the seat is turned below its neutral position.

2. In a chair structure: a pair of standards, seat supporting arms mounted on the standards, spindles on the arms extending inwardly, a seat mounted on the spindles turnably to raised, neutral and lowered positions, pins on the seat supporting arms, coil springs having their inner ends connected to the spindles and their outer ends adapted to normally bear against said pins, lugs on opposite sides of the seat adapted to engage the outer ends of the coil springs to compress said springs during movement of the seat from its neutral to its lowered position, said springs being adapted to return the seat upwardly to its neutral position when permitted to expand.

3. In a chair structure: a pair of standards, seat supporting arms mounted on the standards, spindles on the arms extending inwardly, a seat mounted on the spindles turnably to raised, neutral and lowered positions, pins on the seat supporting arms, coil springs having their inner ends connected to the spindles and their outer ends adapted to normally bear against said pins, lugs on opposite sides of the seat adapted to engage the outer ends of the coil springs to compress said springs during movement of the seat from its neutral to its lowered position, said springs being adapted to return the seat upwardly to its neutral position when permitted to expand, loop springs having ends thereof connected to the seat and the other ends thereof adapted to normally bear against the lugs on the seat, said other ends being adapted to engage the pins on the seat supporting arms to compress the loop springs during movement of the seat from its neutral to its raised position, and said loop springs being adapted to return the seat downwardly to its neutral position when permitted to expand.

4. In a chair structure: a pair of standards, seat supporting arms mounted on the standards, spindles on the arms extending inwardly, a seat mounted on the spindles turnably to raised, neutral and lowered positions and having arcuate slots in its opposite sides concentric with said spindles, pins on the seat supporting arms extending into said arcuate slots, coil springs having their inner ends connected to the spindles and their outer ends adapted to normally bear against said pins, lugs on opposite sides of the seat adapted to engage the outer ends of the coil springs to compress said springs during movement of the seat from its neutral to its lowered position, said springs being adapted to return the seat upwardly to its neutral position when permitted to expand.

5. A chair structure comprising, in combination: a pair of standards, a back plate extending between the standards, a chair back mounted on the back plate, seat supporting arms extending forwardly from the back plate adjacent the standards respectively, fastening means passing through the back plate and each seat supporting arm for securing these members to the adjacent standard, shelves on the standards for supporting the forward ends of the seat supporting arms, and a seat mounted on said arms.

6. A chair structure comprising, in combination: a pair of standards, a back plate extending between the standards, a chair back mounted on the back plate, seat supporting arms extending forwardly from the back plate adjacent the standards respectively, fastening means passing through the back plate and each seat supporting arm for securing these members to the adjacent standard, other fastening means for securing the back plate to the standards in selected angular position, shelves on the standards for supporting the forward ends of the seat supporting arms, and a seat mounted on said arms.

7. In a chair structure: a pair of standards, a seat disposed between the standards, seat supporting arms connected at their rearward ends to the standards and at their inner forward ends to opposite sides of the seat, said arms being bendable for making adjustment to variations in the spaces between the standards and the opposite sides of the seat, and means mounted on the standards movably to positions of engagement with the outer forward ends of said arms in various adjusted positions of the latter for holding the arms and the seat therebetween against lateral movement.

8. In a chair structure: a pair of standards, a seat disposed between the standards, seat supporting arms connected at their rearward ends to the standards and pivotally connected at their inner forward ends to opposite sides of the seat, said arms being bendable for making adjustment to variations in the spaces between the standards and the opposite sides of the seat, means mounted on the standards movably to positions of engagement with the outer forward ends of said arms in various adjusted positions of the latter for holding the arms and the seat therebetween against lateral movement, said seat being mounted on the arms turnably about a horizontal axis, and stop means on the seat adapted to contact said arms for supporting the seat in its lowered position of use.

9. In a chair structure: a pair of standards, a seat disposed between the standards, seat supporting arms connected at their rearward ends to the standards and pivotally connected at their inner forward ends to opposite sides of the seat, said arms being bendable for making adjustment to variations in the spaces between the standards and the opposite sides of the seat, means mounted on the standards movably to positions of engagement with the outer forward ends of said arms in various adjusted positions of the latter for holding the arms and the seat therebetween against lateral movement, said seat being mounted on the arms turnably about a horizontal axis, and stop means on the seat adapted to contact said arms for limiting the lowering and the raising movements of the seat.

10. In a chair structure: a pair of standards having inwardly extending shelves, a seat disposed between the standards, seat supporting arms connected at their outer rearward ends to the standards and having their forward ends supported by said shelves and connected to opposite sides of the seat, said arms being bendable for making adjustment to variations in the spaces between the standards and the opposite sides of the seat, and means mounted on the standards movably to positions of engagement with the outer forward ends of said arms in various adjusted positions of the latter for holding the arms and the seat therebetween against lateral movement.

11. In a chair structure: a pair of standards, seat supporting arms connected at their rearward ends to the standards and having inwardly extending spindles fixedly secured to their forward ends, a seat mounted at its opposite sides on said spindles for turning movement to raised and lowered positions, means preventing lateral movement of the seat relative to the spindles and the arms, said arms being bendable for making adjustment to variations in the spaces between the standards and the opposite sides of the seat, and means mounted on the standards movably to positions of engagement with the outer forward ends of said arms in various adjusted positions of the latter for holding the arms and the seat therebetween against lateral movement.

12. In a chair structure: a pair of standards, seat supporting arms connected at their rearward ends to the standards and having inwardly extending spindles fixedly secured to their forward ends, a seat mounted at its opposite sides on said spindles for turning movement to raised and lowered positions, stops on the seat adapted to contact said arms for limiting the raising and lowering movements of the seat, means preventing lateral movement of the seat relative to the spindles and the arms, said arms being bendable for making adjustment to variations in the spaces between the standards and the opposite sides of the seat, and means mounted on the standards movably to positions of engagement with the outer forward ends of said arms in various adjusted positions of the latter for holding the arms and the seat therebetween against lateral movement.

13. A chair structure comprising, in combination: a pair of standards, a back plate extending between the standards, a chair back mounted on the back plate, laterally bendable seat supporting arms extending forwardly from the back plate adjacent the standards respectively, fastening means passing through the back plate and each seat supporting arm for securing these members to the adjacent standard, shelves on the standards for supporting the forward ends of the seat supporting arms, a seat, and universal connections between the seat and the seat supporting arms at opposite sides thereof.

14. In a chair structure: a pair of standards, a seat mounted on the standards turnably to raised, neutral and lowered positions, a relatively strong spring having an end thereof associated with the seat the other end associated with the standard whereby the seat is urged upwardly with relatively great force to its neutral position, means for disassociating said spring from the seat when the seat is turned above its neutral position, and a second relatively weak spring having an end thereof associated with the seat and the other end thereof associated with the standard whereby the seat is urged downwardly with relatively weak force to said neutral position, and means for disassociating said second spring from the standard when the seat is turned below its neutral position.

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