

Filed June 20, 1947

RECLINING CHAIR

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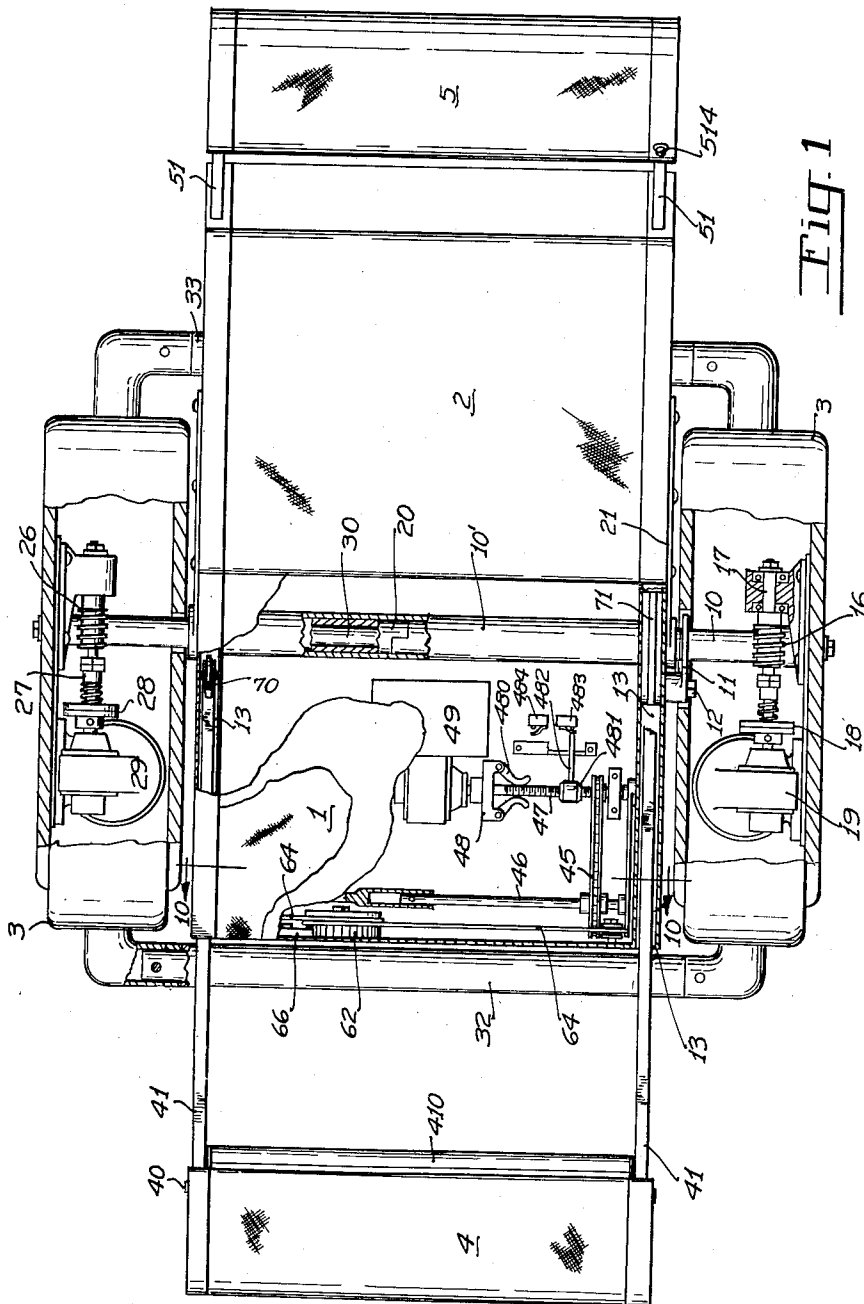


Fig. 1

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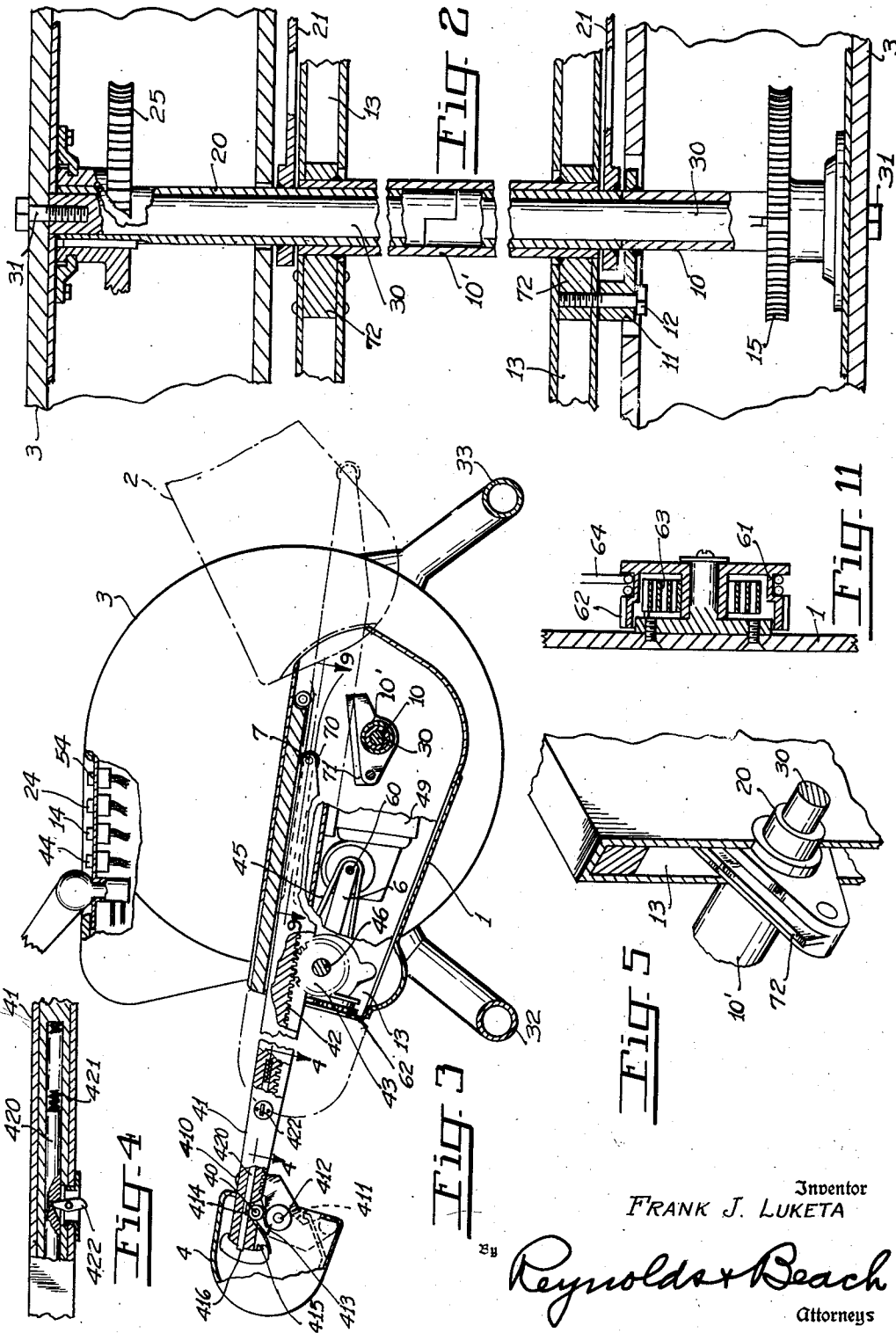
Dec. 12, 1950

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2,533,595

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Fig. 10

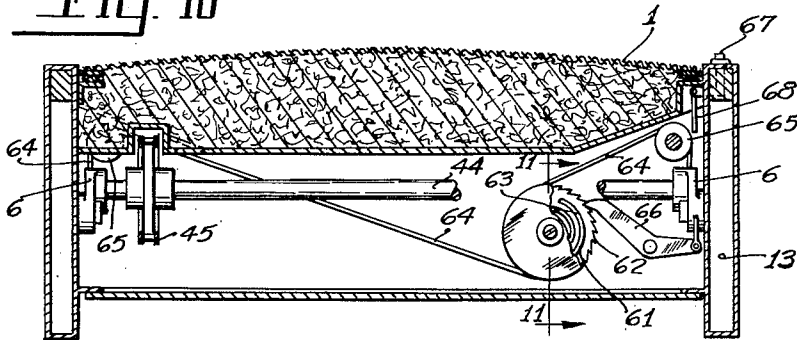
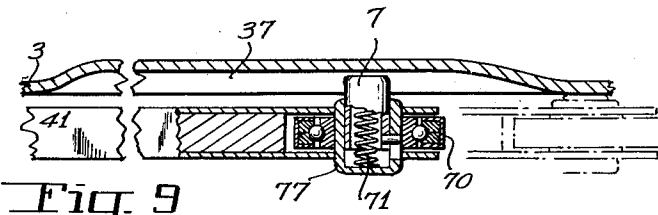


Fig. 9

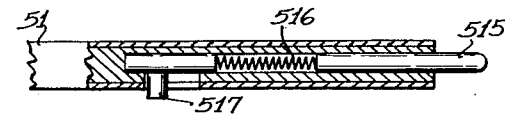


Fig. 7

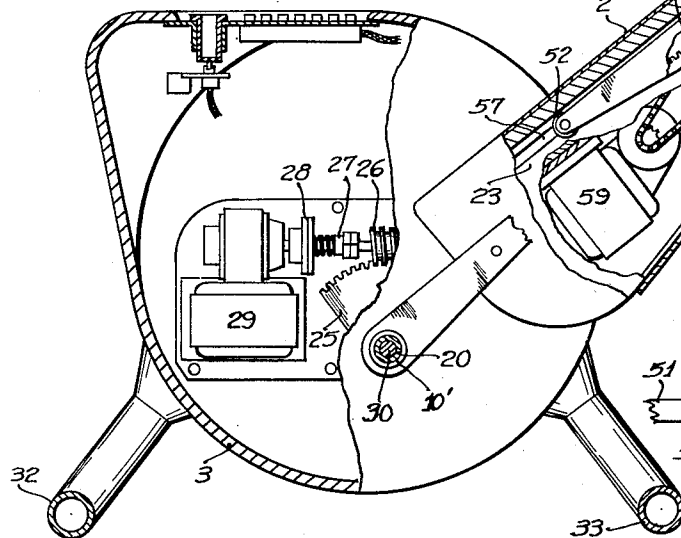


Fig. 6

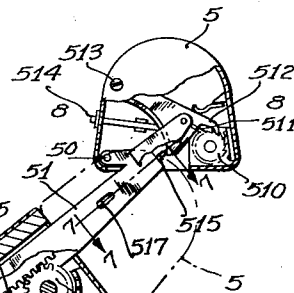
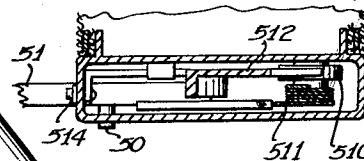


Fig. 8



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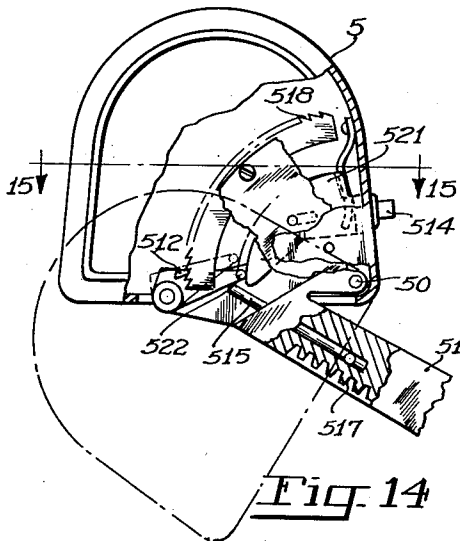


Fig. 14

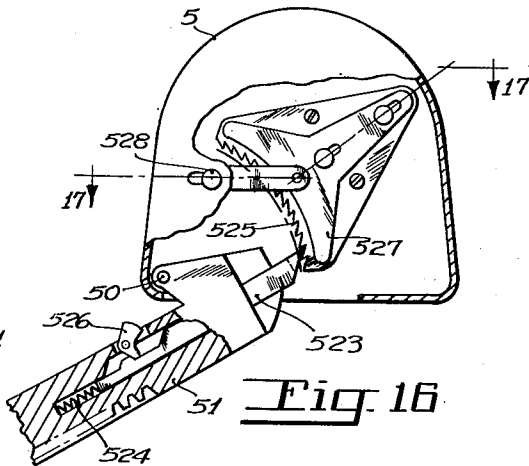


Fig. 16

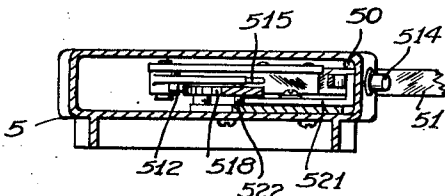


Fig. 15

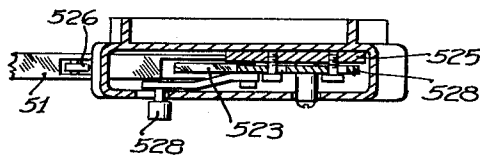


Fig. 17

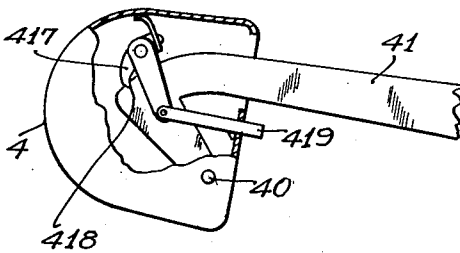


Fig. 13

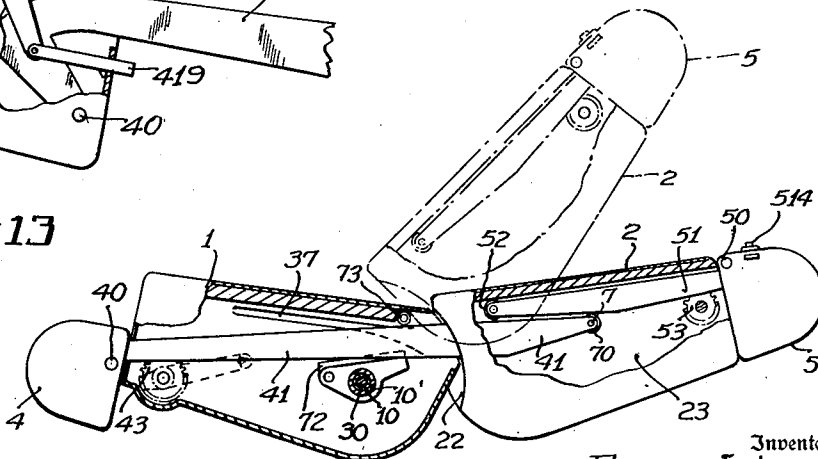


Fig. 12

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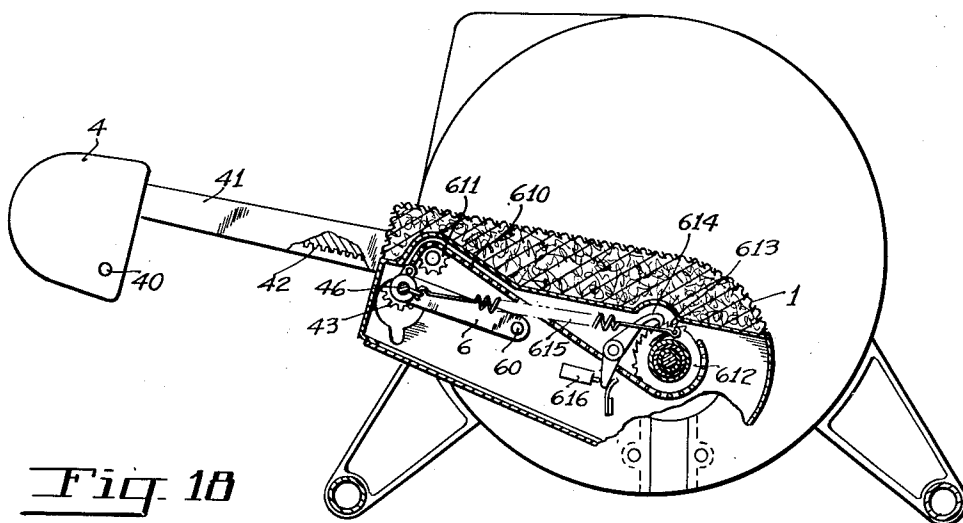


Fig. 18

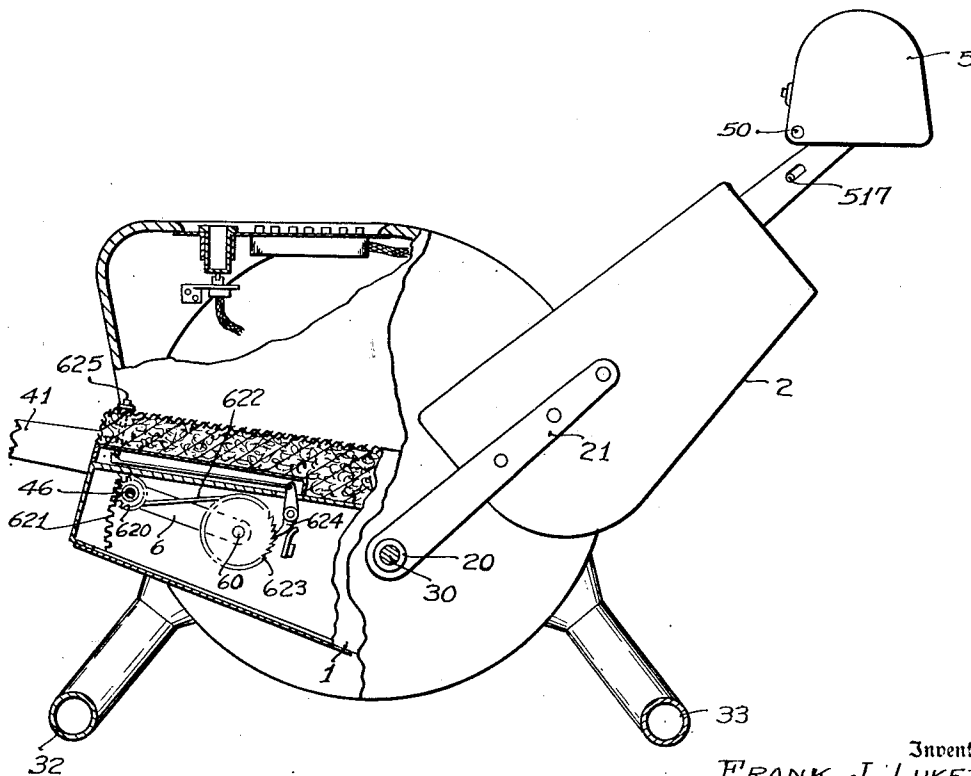


Fig. 19

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UNITED STATES PATENT OFFICE

2,533,595

RECLINING CHAIR

Frank J. Luketa, Seattle, Wash.

Application June 20, 1947, Serial No. 755,835

13 Claims. (Cl. 155—105)

1 The present invention relates to lounge chairs of the general type shown in various copending applications, for example in that a seat and a back, constituting main body-supporting elements, are supported for tilting by power means about a common pivot, each relative to the other, so that they can move relatively from a nearly horizontal position into a position where either one is nearly upright, and in that an auxiliary body-supporting element, such as the legrest or the headrest, is associated with and adjustable with respect to each of the main body-supporting elements, the seat or the back, respectively.

The present invention is most directly concerned with the adjustment—particularly, though not exclusively, the tilting adjustment—of the auxiliary body-supporting elements, the provision of means for holding the same in tilted position, and the provision of means, in part automatic, for restoring such auxiliary body-supporting element to its normal attitude when retracted into position along the swinging edge of the main body-supporting element with which it is associated, or whereupon it is supported. The invention is also concerned with the projection and retraction, and sometimes the depression or raising of these auxiliary body-supporting elements, and with the interrelationship of the seat and back in order to accommodate the resultant necessary movement of the arms which support and which effect bodily shifting of the auxiliary body-supporting elements each with relation to its main body-supporting element. Particularly in view of the fact that the seat and back must come nearly into alignment when both approach the horizontal, yet each one must tilt independently with respect to the other, and the supporting arm for the legrest in particular requires a long cantilever support of greater length than the seat affords, the invention concerns the avoidance of conflict between this arm and the back, and also the provision of adequate support for the rearwardly projecting portion of the arm.

The general object of the invention is to provide a lounge chair having the parts each relatively and independently adjustable, as has already been indicated in a general manner, and with the parts so interrelated as to support and interact one with another without interference.

More specifically, it is one object of the present invention to provide an auxiliary body-supporting element such as a legrest or headrest, which not only is bodily projectable from its main body-supporting element, but which in addition is otherwise adjustable, and in particular is

2 concerned with the mechanism whereby such further adjustment is accomplished, and by which parts may be in most cases automatically restored to their retracted positions and attitudes, with the auxiliary body-supporting element in general prolongation of the plane of its main body-supporting element.

In some cases, for instance in the case of the legrest, the legrest is not only bodily projectable and retractable and also tiltable when projected, but it is further shiftable downwardly and upwardly with respect to the seat, and since it is supported on long cantilever arms, this involves further problems of adequate support, and of protection against accidental injury during rearward projection of such arms, and it is to the solution of these problems that the invention is directed.

The tilting of the auxiliary body-supporting element and its securement in various adjusted positions, and its release for return from such tilted position to nontilted position is capable of being effected by various mechanisms, and one of the objects of the invention is so to incorporate this phase of the invention in various mechanisms, all suited to achieve the general objects of the invention explained above.

In a mechanism of this sort, particularly where the auxiliary body-supporting element is caused automatically or semi-automatically to return under power to its position close against the swinging edge of the main body-supporting element whereon it is supported, there is some danger that the fingers may be caught and pinched between the two body-supporting elements as they come together under power, and it is one of the objects of this invention to devise mechanism automatically operable to lessen the force by which the final retractive movement of the auxiliary body-supporting element is accomplished, so that if fingers should be disposed between the two elements the power means will be ineffective to pinch them or to do serious injury.

45 Various other mechanisms are disclosed herein, but certain of these, particularly those which relate to the tilting mechanism for the seat and the back, are considered as separate inventions and are claimed in another application which is filed concurrently herewith, Serial No. 755,836, filed June 20, 1947, now abandoned.

50 With the objects indicated, and others, in mind, as will appear more fully hereinafter, my invention comprises the novel parts and the novel combination and arrangement thereof, as shown

in the accompanying drawings in various preferred forms, and as will be more fully explained hereinafter, and the particular parts which constitute my invention will be defined in the co-pended claims.

Figure 1 is a general plan view, with parts broken away, illustrating the arrangement of the whole chair, in a typical form.

Figure 2 is a general axial section, somewhat enlarged, and on a transverse horizontal plane, illustrating the coaxial tilting axis and elements for the seat and back, and the power connections for effecting tilting of these elements.

Figure 3 is in general a vertical longitudinal section through the seat at one side, illustrating one form of mechanism for controlling the projection and retraction and the tilting of the legrest, and illustrating a footrest structure.

Figure 4 is a detail sectional view through the same, taken substantially along the line 4-4 of Figure 3.

Figure 5 is an isometric view of a fulcrum element which is part of the mechanism shown in Figure 3.

Figure 6 is in general a sectional view on a vertical plane from front to rear, through the back and through the headrest, illustrating one form of headrest tilting control, and projecting mechanism for the headrest.

Figure 7 is a detail sectional view through the headrest mechanism taken along the line 7-7 of Figure 6, and Figure 8 is a similar view of a different part of the headrest mechanism, the line of section being indicated at 8-8 in Figure 6.

Figure 9 is a detail section through a portion of the legrest supporting mechanism taken along the line 9-9 of Figure 3.

Figure 10 is a transverse vertical sectional view through the forward edge of the seat taken from the view-point indicated by the line 10-10 of Figure 1.

Figure 11 is a sectional view substantially along the line 11-11 of Figure 10.

Figure 12 is a view in the nature of a longitudinal vertical section through the seat and back illustrating somewhat diagrammatically the manner in which the back and the headrest support assist at times in supporting the legrest.

Figure 13 is in the nature of a broken-away detail of the legrest of Figure 12.

Figure 14 is an enlarged view through a headrest and its tilt control mechanism, somewhat similar to this portion of Figure 6, but illustrating a different mechanical construction, and Figure 15 is a sectional view through the same along the line 15-15 of Figure 14.

Figure 16 is a view similar to Figure 14, and Figure 17 a view similar to Figure 15, but taken on the line 17-17 of Figure 16, these two latter views illustrating a still further modification of the headrest tilting control.

Figure 18 is a view similar to Figure 3, showing a modified arrangement of the mechanism for effecting elevation and depression of the legrest, and Figure 19 is a similar view with headrest mechanism of the type shown in Figure 6, but illustrating particularly a still further modification of the mechanism to effect elevation and depression of the legrest.

The principal parts of the chair are the seat 1, the back 2, the side arms 3 which are part of the supporting frame that rests upon the floor, the legrest 4 and the headrest 5. The seat 1 is tilt-

able about the axis of a hollow shaft 10, to which it is secured by means typified by the bolt 12 which engages the seat frame and the arm 11 fast to the shaft 10' and radiating from the latter (see Figure 2). The back is coaxially tiltable, arms 21 being secured upon hollow shaft 20 and being in turn connected to the frame of the back. A motor 19, operating through a spring-pressed friction clutch 18, the shaft 17, the worm pinion 16, and the worm quadrant 15 fast upon the shaft 10, permits power operation of the seat to tilt it upwardly or downwardly, under control, for instance, of the button 14. Similarly, a button 24 controls a motor 29, which operates through the spring-pressed friction clutch 28, the shaft 27, the worm pinion 26, and the worm gear 25 which is fast upon the shaft 20, and by such means the back may be tilted upwardly or downwardly.

Figure 12 shows in full lines one extreme adjusted position of the seat and back relatively to one another and shows in dot-dash lines an elevated position of the back. It is the intention that the seat be tiltable upwardly until it is nearly vertical and that the back be similarly tiltable upwardly until it is nearly vertical, but it is not necessary or desirable that both be tiltable upwardly at the same time, nor that they ever approach one another by an angle of less than 90°, and while the inclusion or omission of such means will not affect the present invention particularly, means to prevent such an occurrence are disclosed in my Patent No. 2,526,248, granted October 17, 1950 on my application, Serial No. 683,185 filed July 12, 1946, and these or equivalent means may be employed, if desired, in the present construction.

In order to enable the chair to be taken apart readily for servicing or inspection the shaft 20 is made in two parts which intermesh endwise, as may be seen in Figure 2, and a tie-rod 30 extends through and supports these shafts 10 and 20 and gears 15 and 25 mounted thereon, being held in place by the bolts 31 or a similar element, thus constituting a tie between the two side arms 3. In similar fashion cross bars 32 and 33 tie together the side arms 3 and are arranged to come apart. However, since these features of the chair are not a part of the present invention, and are shown in greater detail in said abandoned application, Ser. No. 755,836, it is believed no further detailed description is necessary here.

The seat 1 and the back 2 constitute generally similar main body-supporting elements, the one supporting the lower part and the other the upper part of the body of the occupant. Each is independently tiltable with relation to the other and to the side arms 3. Each has also an auxiliary body-supporting element. With relation to the back 2 the headrest 5 is the auxiliary body-supporting element. With relation to the seat 1 the legrest 4 is the auxiliary body-supporting element. These two auxiliary body-supporting elements are very much alike, and a construction which would serve for one will, in most respects, serve equally well for the other. The differences are dictated largely by the greater weight of the legs which is imposed upon the legrest 4 as compared to the weight upon the headrest 5, and the greater forward extension or projection of the legrest with respect to the seat as compared to the extension upward of the headrest with relation to the back. Also, in some forms, the legrest may be depressed and raised relative to the general

plane of the seat, whereas this is seldom desirable for a headrest.

The legrest 4 in Figures 1 and 3 is carried at the outer end of a pair of arms 41, one at each side, which are guided within channels or tunnels 13 at the sides of the seat frame, for extension outwardly and retraction inwardly. In addition, the legrest 4 is pivotally mounted at 40 to tilt with respect to its supporting arms 41. Each arm 41 is formed, within a channel at its lower edge, with a rack bar 42 which rides upon a spur gear 43 mounted upon a shaft 46 extending transversely of the forward edge of the seat, so that both of the supporting arms 41 may be actuated alike. Rotation of the shaft 46 moves the arms 41 inwardly or outwardly, depending upon the direction of rotation of the shaft. Such movement may be given the shaft through the chain drive at 45 from the motor 49 operating through the friction clutch 48 and the shaft 47 and controlled suitably, as by the button 44.

Since it is desirable ordinarily to permit the legrest 4 to be depressed or elevated with relation to the general plane of the seat 1, the gears 43 and the shaft 46 may be carried at the swinging end of an arm 6 pivotally mounted at 60 coaxially of the shaft 47, and other mechanism is provided for raising or lowering the outer end of the arm 6. This mechanism is best shown in Figures 1 and 10. A drum 61 (see also Figure 11) is formed with ratchet teeth 62, and, being hollow, contains a spiral torsion spring 63. This spring tends to wind up cables 64 which pass about pulleys 65 and thence connect with the swinging end of each arm 6. A dog 66 engages the ratchet teeth 62, and is directed to prevent downward movement of the legrest 4 but the dog 62 can be disengaged by pressure upon a button 67 (see Figure 10) which presses downwardly upon an extension of the dog 66 through the link 68. When the dog is thus disengaged from the ratchet teeth the legrest can be depressed; this action winds up the spring 63, so that any time the depressing force is removed the spring unwinds, and thereby winds up the cable 64 and raises the arms 6 and consequently the arms 41 to their full upward limit.

The gears 43 constitute a support in the nature of a fulcrum for the arms 41, and since these arms 41 at times must be projected well forwardly of the seat and of the gears 43, it is obvious that the cantilever arms 41 must be well supported at their inner ends. Moreover, it is obvious that these arms must be extended well rearwardly when the legrest is fully retracted, yet the seat is relatively short in fore and aft extent. At its rear end each arm 41 is provided with a guide roller 70 and a guide pin 7. The guide roller 70 rolls against the top surface of the tunnel 13 and the pin 7 (see Figures 1 and 9) when projected engages within a groove 37 in the side arm 3, and constitutes a stable balance for this inner end of the arm 41, and, with its housing 77, centers the arm 41 within the tunnel 13. The pin 7, however, is spring pressed outwardly by the spring 71, therefore may yield inwardly when it reaches the end of the groove, as is indicated by the dot-dash line showing in Figure 9. At the position of greatest retraction of the legrest the inner end of the arms 41 project rearwardly beyond the seat, and indeed into range of the tilting movement of the back 2. As Figure 12 shows, however, the frame of the back 2 is also tunneled, and in this tunnel 23 is received, when necessary, the rearwardly projecting end of the arms 41.

The arms 51 which constitute the immediate support of the headrest 5 likewise slide within this tunnel 23. The arms 41 and 51 lie in the same plane, and if the back should ever be tilted downwardly to its limit position, such as is shown in Figure 12, while the seat is also tilted downwardly, the roller 70 bears now upon the lower edge of the arm 51, for the latter does not tilt but only moves inwardly and outwardly, having itself a roller 52 which rolls along the top of the tunnel 23 and a gear wheel 53 which operates in conjunction with a rack 55 in the same manner that the gear 43 and rack 42 cooperate. The back frame may be provided also with the groove 57 corresponding to the groove 37. Inward and outward movement of the headrest and its arms 51 is accomplished by means of the motor 59 operating through the drive means 58, which effects rotation of the gear 53. The headrest is tiltable with respect to the arms 51 upon the pivot axis at 50. Control of the motor 59 is accomplished by means such as the button 54.

Since, as has been indicated, the legrest is subject to greater loads than the headrest, it is desirable to provide it with a further support or fulcrum such as is shown at Figure 5. This consists, in essence, of an upstanding longitudinally disposed ridge 72 supported within the tunnel 13 and riding within the groove in the arm 41 at the upper end of which the rack 42 is formed. This support 72 tilts with the seat and is at such inclination and so disposed as to permit full freedom of depression of the arms 41, and yet it affords an adequate support for the legrest against excessive downward movement. Ordinarily the arms 41 are centered within the tunnel 13 by the pin 7, but when the pin is rearwardly beyond the tunnel, the ridge 72 centers the arm.

One feature disclosed in the legrest of Figure 3, and also in Figure 1, is not shown in other forms of the legrest, this being the footrest. The cross bar 410 of this footrest lies normally beneath the lower inner edge of the footrest 4, and is suspended in that position by the side brackets 411, pivoted at 412. Comparison of the full line and dot-dash line positions of Figure 3 will show its retracted and its extended positions. It can be drawn up from its retracted position by engagement of one's toe beneath it, and when lifted to the extended position, is held in such position by a spring-pressed dog 413, as is clear from Figure 3. That dog has a pin 414, which projects upwardly, and a bar 420, slidable within one or both of the arms 41, is notched to receive the lug 414. Inward movement of the rod 420 raises and disengages the dog 413. The rod 420 is normally held projected or thrust to the left by a spring 421 (see Figure 4), and its inward movement in opposition to the spring is accomplished under the influence of a small trip lever 422, one end of which engages within a notch in the rod 420, and the other end of which projects from the side of the arm 41. This projecting end may be depressed by the toe of the chair's occupant, or automatically by other means, as will shortly be explained. Also as will shortly appear, the rod 420 has a further function in connection with the tilting of the legrest 4 about its pivot 40. The function of the footrest 410 is to afford the occupant a place to place his feet other than on the upholstered legrest 4, particularly when he has his knees somewhat drawn upwardly.

As has already been indicated, each of the auxiliary body-supporting elements, namely the legrest 4 and the headrest 5, is pivotable relative

to its supporting arms 41 or 51, respectively, and means are provided for retaining it in certain of such pivoted positions, and of effecting or permitting its return to normal position in general prolongation of the plane of its main body-supporting element when required or desired. Referring to the form shown in Figure 3, the end of the arm 41 engages within an enlarged notch 415, which in effect is integral with the legrest 4, and thus may tilt slightly about the pivot 40 within the limits defined by the notch 415. A locking notch 416 is positioned to be engaged by the end of the rod 420, and when so engaged the legrest may not tilt about the pivot axis 40. When the rod 420 is withdrawn to the right, as viewed in Figure 3, the legrest 4 may tilt about the axis at 40. The rod 420 is thus withdrawn to the right whenever the projecting end of the trip 422 is moved to the left, as viewed in Figure 4. It projects in such position that it engages the forward edge of the frame of the seat 1 as the arms 41 are retracted into the tunnel 13, and this action moves the rod 420 to the right, and holds the rod thus retracted. It follows that, automatically as retraction occurs, the legrest 4 as a whole will be free to pivot about its axis at 40, and thus to adjust itself to lie close against the forward edge of the seat 1. Also by operation of the trip lever 422 the dog 413 is disengaged, to permit the footrest 410 to drop by gravity to its correct or retracted position at the lower inner corner of the footrest 4. Thus it can be seen that retraction of the footrest and adjustment or tilting of the legrest may be accomplished under conscious control of the seat occupant, or automatically, in either instance by rocking of the trip lever 422.

In Figure 13 a somewhat different arrangement is shown. Here a dog 417 is spring-pressed to engage within the notch 418, which is formed on a curved terminus of the arm 41, on a radius about the pivot point at 40. A button 419 projects through the inner face of the legrest 4, and is connected to the dog 417 to lift the dog out of the notch 418. Such movement of the button 419 can be accomplished by the foot of the occupant of the chair. By reason of the lower rear edge of the legrest engaging the forward edge of the seat, it is assured automatically that the legrest will accommodate itself to the proper attitude as it comes back against the forward edge of the seat. While only one notch 418 is shown, there may be several, if desired.

Similar constructions may be employed in the headrest, or the headrest constructions about to be described might be substituted in the legrest, which emphasizes the similarity of the legrest and headrest, respectively.

The headrest 5, shown in Figure 6, pivots about the axis indicated at 50. A spring within the ratchet drum 510, upon the headrest, tends to wind up a cable 511 secured to the arm 51, and thereby to tilt the headrest forwardly. A light push, or the action of gravity, will tilt the headrest backwardly, provided a dog 512 is released from the ratchet drum 510. The dog 512 pivots at 513 upon the headrest, and can be disengaged from the dog, to tilt the headrest rearwardly, by manual pressure upon the button 514 or by pressure upon the rod 515, operable automatically by the retraction of the arms 51. The rod 515 projects from the end of an arm or the arms 51 under the influence of the spring 516 (Figure 7). An actuator 517 projecting laterally from the arm 51 serves much the same function as the

projecting trip lever 422. It is so located that in retraction of the arm 51 it will engage within the tunnel 23, and will urge the projecting end of the rod 515 outwardly or to the right as seen in Figure 6, thereby to lift the dog 512. Either such trip 514 or 515 will operate in any tilted position of the headrest by reason of the curvature of the surface or edge of the dog 512 which they engage. When the dog is so disengaged the headrest will be swung downwardly by gravity, or by a slight push, and so it will come to rest in a position in substantial prolongation of the general plane of the back 2, in much the same manner as did the legrest 4 in conjunction with the seat 1.

The arrangement shown in Figures 14 and 15 is somewhat similar except that the dog 512 engages a ratchet segment 518, which is fixed with relation to the headrest. An actuator 521 is positioned for movement by the push button 514, to engage a rock arm 522, which is connected to and which rocks the dog 512. The rod 515 also engages this rock arm 522. The net result is that pressure upon the button 514 or automatic projection of the rod 515 will disengage the dog 512 from its ratchet, permitting the headrest 5 to drop under the influence of its own weight into or towards the dot-dash line position of Figure 14.

The arrangement of Figures 16 and 17 is similar. Here the rod corresponding to rod 515 is designated 523, and itself constitutes a dog, being pointed at its projecting end. It is spring-urged outwardly by the spring 524, recessed within the end of the arm 51. The dog 523 engages the curved ratchet sector 525, to hold the headrest 5 in any tilted position. The dog 523 may be withdrawn from engagement with the teeth at 525 by rocking of the trip lever 526, which occurs automatically as a result of retraction of the arms 51, or the dog may be depressed from engagement with the teeth at 525 by an actuator 527 guided within the headrest and lying alongside the teeth at 525, but normally retracted therefrom. When it is moved to the left and downwardly, as viewed in Figure 16, into the dotted line position, the dog 523 is broad enough that it will be engaged by the actuator 527, and the dog 523 will be urged out of engagement with the teeth at 525. Such movement may be accomplished by the button projecting laterally at 528, which is connected to the actuator 527.

The groove 37 has been mentioned heretofore, but it has not been made entirely clear why the pin 7 is caused to retract and withdraw from the groove 37, when moved to the right, and as the legrest is approaching its retracted position. It is clear that so long as the arms 41 are guided by the pin 7 in the groove 37, and by the gear 43, whatever may be the vertical position of the latter, no further support is necessary nor possible. However, when the arms 41 approach their retracted position, first the upper edge of arm 41 engages fixed roller 73, and then the pin 7 and roller 70 will project beyond the rear edge of the seat. Now the forward support for the legrest arms 41 is assumed by the guide at 72, but still a rearward or inboard guide and support is necessary, yet some tilting of the arms 41 may be desirable, as is best seen in Figure 12. Consequently the pin 7 must withdraw from the groove at 37, and the roller 70 then projects beneath the lower edge of the arm 51, which is guided in the groove at 57, and now the support for the arms 41 is between the members 72 and

43, or between 73 and 43. The back, however, can still tilt upwardly, if necessary. Upon leftward movement of the pin 7 it is guided for re-engagement within the groove 37.

It will be realized that there is the possibility of the occupant having his fingers between the back and the seat during the time that the arms 41 are being projected rearwardly across the gap between the back and seat. Should this happen, there would be danger of injuring such fingers. To guard against this to the greatest extent possible the seat, at least at its side edges, those which constitute the tunnel 13, is carried rearwardly to fit within a recess in the back, and the back is carried forwardly to overlap the seat, the two being interfitted as indicated at 22 in Figure 12.

The forms shown in Figures 18 and 19 differ from those already shown only in the provision of modified mechanism for accomplishing the depression and elevation of the legrest arms 41. In the form of Figure 18, instead of the cable 64, the tilting arm 6 is raised by means of a chain 610 passing over a guide pulley or sprocket wheel 611 from its connection to the swinging end of the arm 6, and passing thence under and about the sprocket wheel 612, which is mounted coaxially with the tilting actions of the seat and back. A ratchet wheel 613, fast to the sprocket wheel 612, is held in position by a releasable spring-held dog 614. A tension spring 615 in effect engages the free end of the chain 610, or equivalently engages and tends to rotate the sprocket wheel 612, in such manner as to pull the arms 6 upwardly. By releasing the dog 614, downward movement may be accomplished, whereas upward movement of the arms 6 is automatic under the influence of the spring 615. Release of the dog may be accomplished by such means as the solenoid 616, suitably operated by the occupant of the chair.

The arrangement in Figure 19 is quite similar. The swinging end of the arm 6 carries a drum and a spur gear, indicated at 620, which meshes with a curved segment 621, which is fast to the frame of the seat. A cable 622, passing about the drum associated with the gear 620, and thence about a ratchet drum 623, serves by reason of a torsion spring within the drum to wind up the cable 622 and thus to return the arms 6 and 41 always to their uppermost position, where they are held by a dog 624. Depression of the arms 41 and 6 can be accomplished whenever the dog 624 is disengaged, and this is accomplished by such means as the projecting push button 625, which the occupant of the chair may depress, thus to rock the dog 624 out of engagement with its ratchet teeth.

It is desirable that whatever spring means is employed to urge the legrest 4 or the lever arms 6 upwardly be of such force that, when the arms 41 are projected by a predetermined amount the legrest 4 will be depressed by gravity, whereas as the arms 41 are retracted, when the same point is reached the spring force will automatically lift the legrest to its upper limit. Thus it is automatically located at the proper level to resume its retracted position in prolongation of the plane of the seat 1, and in such position that, by engagement with the seat's forward edge, it will tilt about its pivot 40 to conform properly with the seat. Of course, an external depressing force can be applied to the legrest, even when it is fully retracted (as in Figure 12), but it will rise again when such depressing force is removed.

It has been mentioned hereinbefore that it is

desirable to avoid the likelihood of injury to the fingers of the occupant if they happen to be positioned, for instance, between the front edge of the seat and the rear edge of the legrest when the latter is retracting to its full retracted position. Indeed it is desirable in all such power operated mechanism to avoid the probability of injury, but the particular point mentioned is one place in particular where such injury is most likely to occur, and the clutch 48 (see Figure 1) is especially designed to avoid this possibility of injury. The parts of this clutch, which are two plates, are cam-urged together by the cams on the ends of the pivoted levers 480. Rocking of these levers 480 outwardly from the axis of the shaft 47 lessens the pressure between the clutch plates at 48. A collar 481 is threaded upon the shaft 47, and is prevented from rotation by the pin 482, and in addition it is coned at at least one end, and preferably at both ends. As the legrest 4 approaches its full retracted position adjacent the forward edge of the seat 1, the collar 481 approaches the levers 480, and spread them apart. The ends of cam levers 480 ride upon the coned end of the collar or nut 481. This lessens the spring pressure urging together the clutch plates at 48 to such an extent disables the clutch that if there is any obstacle interposed between the legrest and the seat, the motor 49 will no longer be able to transmit sufficient power to complete the closing of the legrest, hence the fingers, if these be the obstacles interposed, cannot be pinched and injured. The pin at 482 serves also to actuate limit switches 483 and 484 to deenergize the motor 49 at the respective limits of travel of the legrest.

Various structural forms and arrangements will be observed which permit the parts of the chair to be readily separated and taken apart, but as these form no part of the present invention it is believed unnecessary to describe them in detail.

I claim as my invention:

1. In a chair, an auxiliary body-supporting element, a support therefor whereon the auxiliary body-supporting element is tiltably mounted upon a transverse axis offset from the gravity axis of said element, a ratchet segment and a ratchet dog normally engaged therewith, one carried by the auxiliary body-supporting element and the other by the support, to retain said element in selected tilted positions, a device guided upon said element for movement to engage and disengage said dog from said ratchet segment, and two actuators operatively connected to said device to shift the same, one being disposed for manual operation, and the other for automatic engagement upon bodily shifting of the auxiliary body-supporting element, thereby disengaging the dog from the ratchet segment.

2. In a chair, a floor-supported frame, a seat supported thereon for limited tilting about an axis adjacent the seat's rear edge, a back limitedly coaxially tiltably mounted, a legrest, a headrest, an arm guided in the seat for projection and retraction, constituting a cantilever support for the legrest, and of a length such that, when retracted, it projects behind the seat, a similar arm guided in the back for projection and retraction, constituting a cantilever support for the headrest, and of a length to overlap the legrest arm when the latter is retracted, the two arms lying generally in the same vertical longitudinal plane and being formed and located to pass by one another in all relative positions of themselves and of the seat and back, within their limits of movement.

3. A chair as in claim 2, including a support

for the legrest supporting arm located adjacent the forward swinging edge of the seat, and means to elevate and lower said support to adjust the level of the legrest relative to the seat.

4. A chair as in claim 2, including a support for the legrest supporting arm located towards the swinging edge of the seat from its tilting axis, and guide means upon the rear end of said arm engageable beneath the headrest supporting arm, to constitute a rear support for the legrest supporting arm.

5. In a chair, in combination, a main body-supporting element, an auxiliary body-supporting element, arms supporting said auxiliary element substantially in prolongation of the general plane of said main element, guide means in the main element receiving said arms for projection and retraction of themselves and their supported auxiliary element, said auxiliary element being supported from said arms for tilting relative thereto about a transverse axis, securing means carried by said arms and engageable with said auxiliary element to secure the same in any such tilted position, and release means operatively connected to said securing means for disengaging the same from said auxiliary element, said release means including an element for actuation thereof, movable with the auxiliary element, and said main element having a portion positioned in the path of said actuating element for actuation of such release means by approach of the auxiliary element to its retracted position, thereby to release said auxiliary element from its tilted position, for self-positioning relative to and by contact with said portion of the main body-supporting element.

6. The combination of claim 5, wherein the securing means includes ratchet teeth and a spring-urged dog, and the release means actuating element which is carried by the auxiliary body-supporting element, projects from the latter towards the main body-supporting element, and is operatively connected to said dog to disengage the same upon being engaged and pressed by the main element itself.

7. In a chair, in combination, a main body-supporting element, an auxiliary body-supporting element, means on the main body-supporting element supporting the auxiliary element for projection from its normal position close to the main element, and for retraction thereto, power means to effect at least such retraction, and means co-operating with said power means for reducing the power thereof available to retract said auxiliary element, said means including a control member movable with the auxiliary element and a cooperating control member positioned for engagement thereby during final approach movement of the auxiliary element toward its retracted position, and for actuation of said power-reducing means, to prevent injury or damage in the event full retraction is obstructed.

8. The chair combination defined in claim 7, wherein the power-reducing means comprises clutch mechanism having cooperable clutch elements and spring means normally urging the same together with predetermined pressure for transmission of normal retracting power to the auxiliary element without slippage of such clutch elements, and wherein the power-reducing control members cooperate with such clutch mechanism to reduce the clutch pressure progressively during the final approach movement of the auxiliary element, and thereby progressively reduce the power which can be transmitted through the

clutch elements without slippage therebetween.

9. In a chair, in combination, a seat, a back, means supporting each thereof for tilting independently of the other about a common axis adjacent the rear edge of the seat, between generally horizontal and more nearly upright positions, means so to tilt each of the seat and back, a leg rest, arms supporting the leg rest for projection and retraction, and extending when parts are retracted from the forward edge of the seat rearwardly through and beyond its rear edge, means carried by the seat engaging and guiding said arms for projection and retraction of the leg rest, said leg rest being supported on the arms for tilting about a transverse axis, means to secure the leg rest in any such tilted position, and release means operatively connected to said securing means, and mounted for projective and retractive movement with the leg rest, in position to engage the seat as the leg rest approaches its retracted position, to release it from said securing means for free tilting about such transverse axis.

10. In a chair, in combination, a seat, a back, means supporting the seat for tilting about a horizontal axis, a legrest, arms carried by the seat and projecting forwardly therefrom to support the legrest, means guiding said arms for lengthwise movement to project and retract the legrest relative to the seat, such means including pivot and antifriction means guiding the rearward portions of said arms for swinging in a vertical plane and for movement generally fore and aft of the seat, downwardly facing gear racks extending along said arms intermediate their ends, pinions engaging such racks to support the arms and rotatable to shift the same lengthwise for projection and retraction thereof, generally horizontal crank arms rotatively supporting said pinions at the swinging ends of such crank arms for raising and lowering the pinions and thereby the gear racks and legrest, and separate operating means for rotating the pinions conjointly and for rocking the crank arms conjointly, for independent fore and aft shifting, and raising and lowering of the legrest relative to the seat.

11. In a chair, in combination, a seat, a back, means supporting each thereof for tilting independently of the other about a common axis adjacent the rear edge of the seat, between generally horizontal and more nearly upright positions, means so to tilt each of the seat and back, a leg rest, arms supporting the legrest for projection and retraction, and extending when parts are retracted from the forward edge of the seat rearwardly through and beyond its rear edge, means carried by the seat engaging and guiding said arms for projection and retraction of the legrest, means carried by the seat and engageable with said arms near their forward ends to elevate or depress them and the legrest supported thereby, retaining means automatically engageable with the arms to retain them in any depressed position, but disengageable at will, and spring means to restore the arms to their upraised position upon such disengagement.

12. A chair as in claim 11, wherein the legrest is also supported on said arms for tilting relative thereto about a transverse axis, means to secure the legrest in any such tilted position, and release means operatively connected to said securing means, and positioned to engage the seat as the legrest approaches retracted position, and regardless of the elevation or depression of the arms, to disengage said securing means and there-

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by to free the legrest for self-positioning relative to and by contact with the seat.

13. In a chair, in combination, a seat, a back, means supporting the seat for tilting about a horizontal axis, a legrest, arms carried by the seat and projecting forwardly therefrom to support the legrest, means guiding said arms for lengthwise movement to project and retract the legrest relative to the seat, such means including pivot and antifriction means guiding the rearward portions of said arms for swinging in a vertical plane and for movement generally fore and aft of the seat, means engaging said arms to shift the same lengthwise for projection and retraction thereof, generally horizontal crank arms pivoted at one end and having swinging opposite ends supportingly engaging said legrest arms for raising and lowering the same and thereby the legrest, and separate operating

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means for rocking the crank arms conjointly, thereby to raise and lower the legrest relative to the seat.

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