July 7, 1953 R. C. READ ET AL 2,644,169

SOFA BED

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Fig. 1

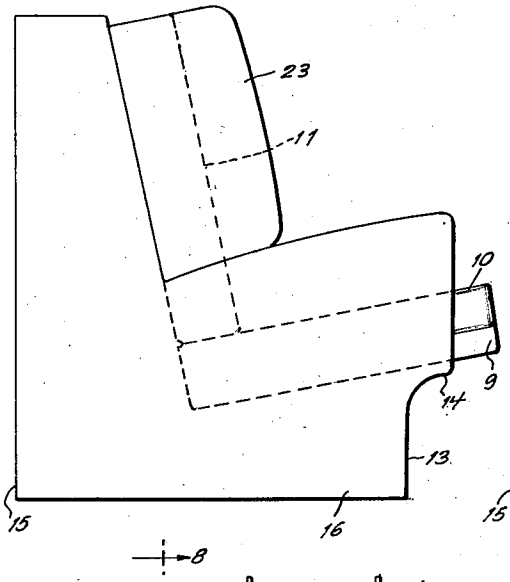


Fig. 2

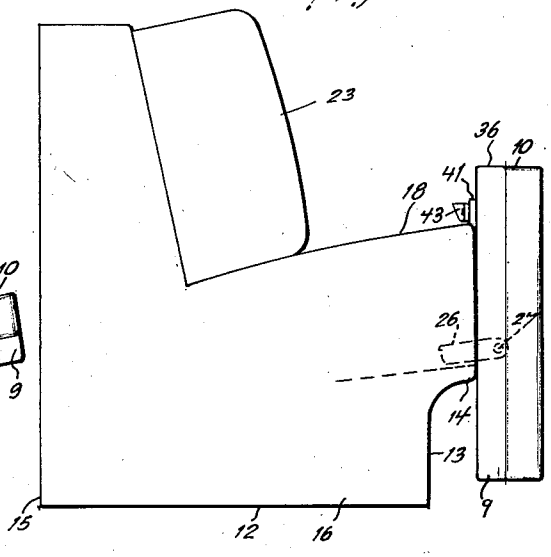
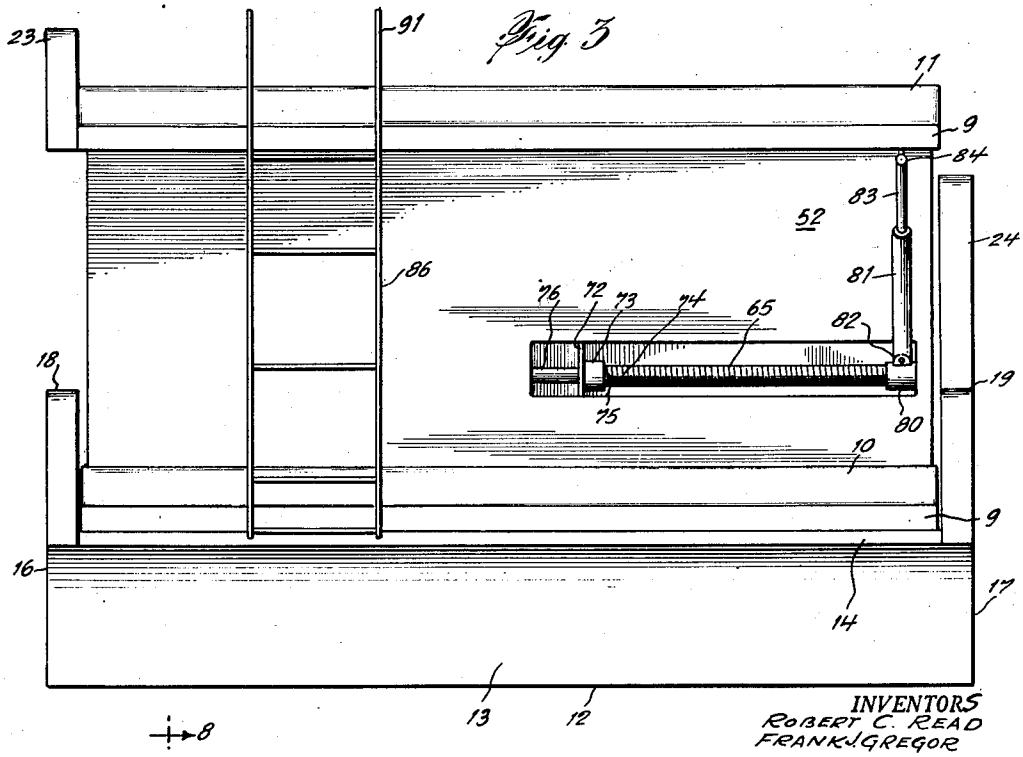


Fig. 3



INVENTORS
ROBERT C. READ
FRANK J. GREGOR

BY John P. Chandler
Their ATTORNEY

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Fig. 4

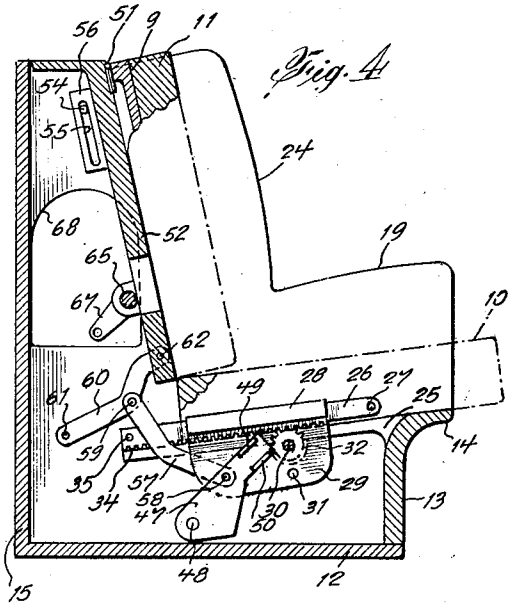


Fig. 5

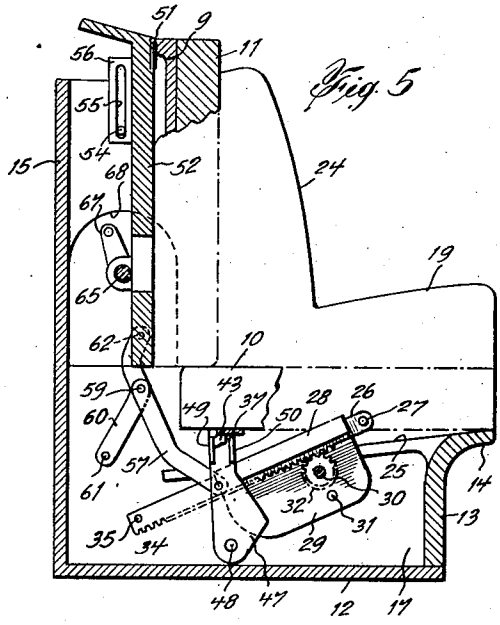


Fig. 6

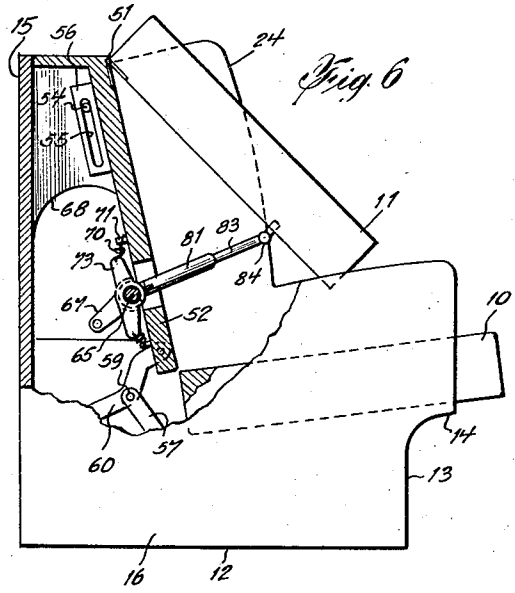
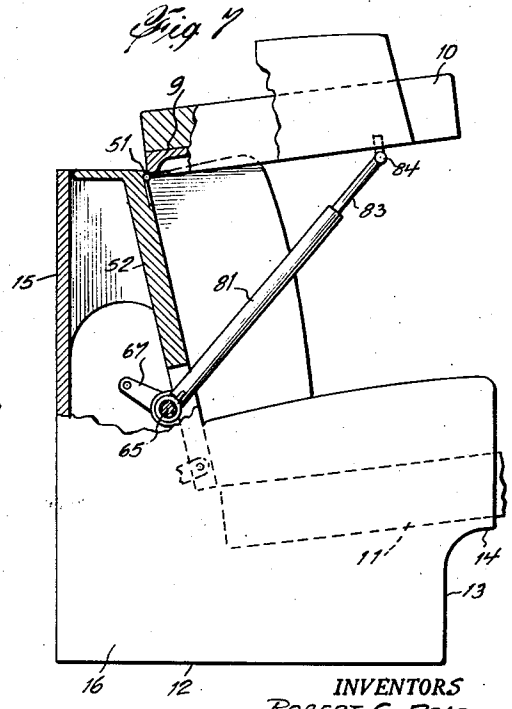


Fig. 7



INVENTORS
ROBERT C. READ
FRANK J. GREGOR

BY
John P. Chandler
their ATTORNEY

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Fig. 8

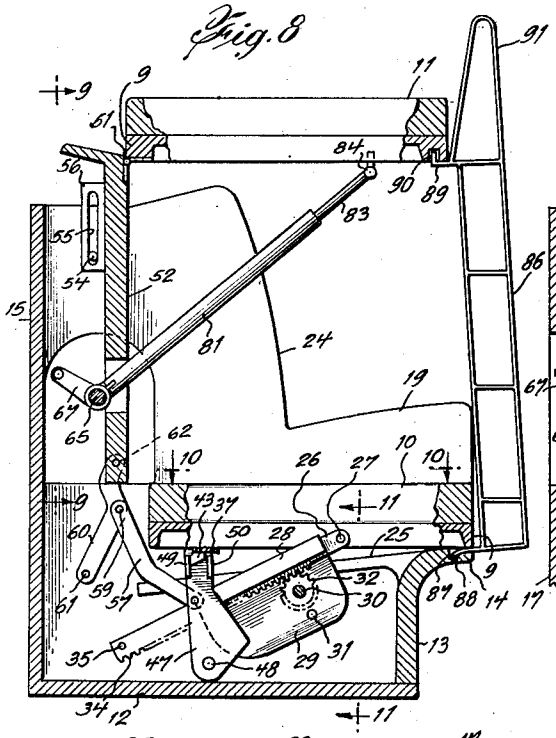
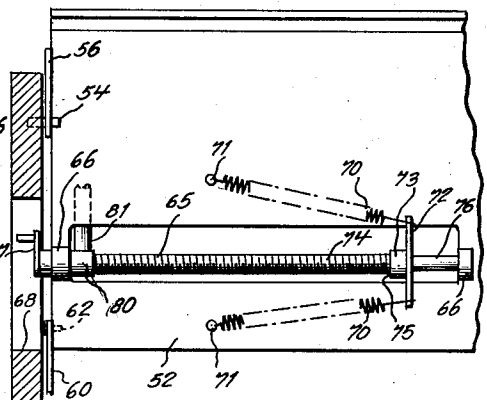


Fig. 9



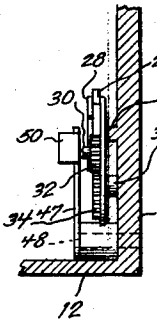


Fig. 11

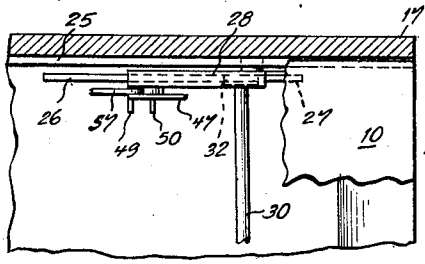


Fig. 10

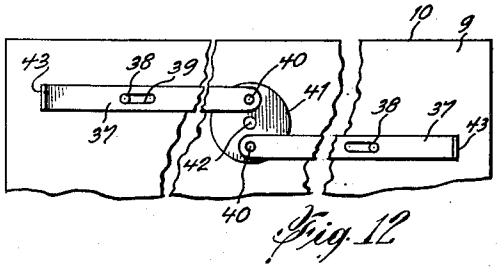


Fig. 12

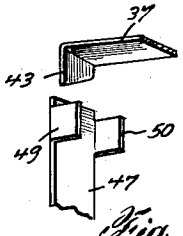


Fig. 13

INVENTORS
ROBERT C. READ
FRANK J. GREGOR

BY John P. Chandler
their ATTORNEY

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UNITED STATES PATENT OFFICE

2,644,169

SOFA BED

Robert C. Read, Weston, and Frank J. Gregor, Wilton, Conn.

Application August 4, 1947, Serial No. 766,074

4 Claims. (Cl. 5—9)

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This invention relates to a sofa bed, and relates more particularly to an improved article of furniture which will serve as a comfortable sofa for daytime use and which can be quickly and easily converted into either a single or double-decker bed.

An important object of the invention is to provide a combined sofa and bed wherein means are provided for positioning the cushion members so as to greatly facilitate the making up of the beds. The cushion element serving as the seat for the sofa and the lower berth for the bed is downwardly inclined toward the rear for comfort when it is used as a seat, and is so arranged as to be moved forwardly from the normal position to a vertical position with its rear edge uppermost. The sheets and blankets can then be easily draped over this edge.

This eliminates the objection to most "day beds" or to beds positioned against walls, namely, that persons making up such beds for night use are required to bend over uncomfortably and lift the rear of the mattresses to tuck in the bed clothes. This type of lifting is also considered dangerous for females and, consequently, its elimination will be of great value to those employing this class of help.

After placing the bed clothes, the cushion element is then tipped downwardly and moved rearwardly to its horizontal night position. The other cushion element forming the back rest, which is normally rearwardly inclined at its upper edge for ease in daytime sitting, is arranged to be moved rearwardly and upwardly out of the way when no upper berth is required. If it is required, however, the bed clothes may easily be placed over the back, while still in a vertical position. The lower edge is then readily moved outwardly until the surface of the cushion element is disposed at an angle of about 45°, and a novel screw arrangement is then employed for bringing it upwardly to horizontal position with its outer edge disposed somewhat inwardly of the outer edge of the lower, at which time the bed clothes are tucked into the front of the bed. Here, again, there is no straining to lift mattresses, etc., in making the bed. Also, the screw lift makes elevation of the upper easy of accomplishment.

Another object of the invention is to provide a convertible sofa and bed wherein the cushion elements may be reversed as to position, and may be interchanged as well, in order to allow uniform wear.

A further object of the invention is to provide novel means for permitting the lower cushion element to be moved inwardly and outwardly without binding. This feature of the invention includes a shaft journalled for rotative movement in the frame. Pinions are keyed adjacent opposite ends of the shaft, such pinions being engaged by racks disposed transversely on the lower surface of the cushion frame. Thus, the cushion element can be pushed or pulled at either end thereof without any binding action.

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Yet another object of the present invention is to provide an improved convertible bed of the character described, wherein novel means are provided for supporting the upper berth when in horizontal position. These means include a crank arrangement employed for raising the cushion element to horizontal position, such means being associated with one end of the cushion element, and a ladder associated with the opposite end which affords the necessary support for such opposite end and also prevents outward movement of the lower cushion element. Also, the upper end of the ladder provides a guard which keeps the occupant from falling out of the upper berth. A wing member at one end of the bed is arranged to move upwardly with the upper berth, and forms a head for the upper berth to prevent the pillow from falling off.

A further improvement resides in the provision of the novel means for mounting of the lower cushion element. A fixed frame supports such lower cushion element in a rearwardly-inclined position when used for sitting. When used for sleeping purposes, however, rearward movement of this frame, after the cushion element has been made up into a bed and engaging elements have been properly positioned, actuates a linkage structure which moves the frame and cushion element into a horizontal position, and, at the same time, moves the panel which supports the rear cushion element to a rearward position so that substantially the full width of the lower mattress may be employed as a bed. This lower cushion element, when used for sitting purposes, extends forwardly of the front wall of the frame to give additional heel room for daytime use. At night, however, this cushion element, when raised to horizontal position, moves its maximum distance rearwardly until its front wall is flush with the front of the frame.

In the drawings:

Fig. 1 is an end elevation of one embodiment of the present invention.

Fig. 2 is similar to Fig. 1, but shows the lower cushion element moved outwardly from its normal position and in vertical position for applying the bed clothes.

Fig. 3 is a front elevation of the convertible

bed when both cushion elements are arranged in horizontal position for sleeping purposes.

Fig. 4 is a vertical transverse section showing the relation of the inner parts when both cushion elements are arranged for sitting purposes.

Fig. 5 is similar to Fig. 4, but shows the relation of the parts when the lower cushion element is arranged for sleeping purposes and the upper cushion element has been moved rearwardly.

Fig. 6 is a broken section showing the upper cushion element in partly raised position.

Fig. 7 is a broken section showing the upper cushion element in raised position prior to moving the same to horizontal position.

Fig. 8 is a section taken on line 8—8 of Fig. 3.

Fig. 9 is a broken section taken on line 9—9 of Fig. 8.

Fig. 10 is a broken section taken on line 10—10 of Fig. 8.

Fig. 11 is a broken section taken on line 11—11 of Fig. 8.

Fig. 12 is a broken rear elevation of the lower cushion element in the vertical position it occupies in Fig. 2.

Fig. 13 is a broken perspective view of a portion of the device.

The convertible sofa of the present invention is provided with two elongated cushion elements 10 and 11 which may be of identical construction and dimensions, one serving as the seat and the other serving as the back rest when the structure is employed for daytime use. The cushion elements may be formed like usual innerspring mattresses which are mounted on a frame 9 to give the cushion element an approved measure of rigidity. The supporting means for both cushion elements is such as to permit each to be turned around to equalize wear. Moreover, the seat normally is subjected to a much greater amount of wear than is the back rest, and it is for this reason that both elements are of identical construction so that they may be interchanged after a reasonable period of use. This has a further obvious advantage in view of the fact that the back rest will be used only occasionally as an upper berth.

The operative parts are enclosed within a housing having a base 12, and a front wall 13 which is outwardly curved at its upper end, as shown at 14, such portion forming a longitudinal support for the front of the lower cushion element 10 whether the latter is employed as a seat (Fig. 4) or as a bed (Fig. 5). This outward flare of the front wall permits ample heel room for the person sitting on the lower cushion element. The housing further includes a rear wall 15 and end walls 16 and 17, the latter having arm rests 18 and 19, respectively, at their upper ends. Superimposed upon the arm rests 18 and 19, at the rear thereof, are wings 23 and 24, the latter one being fixed in the position illustrated and the former being arranged to rise with the back cushion element when the latter is raised to serve as an upper berth, as will be described more in detail.

When lower cushion element 10 is used as a seat, it is supported at opposite ends thereof on frame members or cleats 25 secured on the inner surfaces of end walls 16 and 17. It will be noted that the upper surfaces of these frame members are downwardly inclined rearwardly to afford a maximum measure of comfort when one is sitting upon the seat. The lower cushion element 10 may be moved outwardly on frames 25, and for the purpose of guiding such outward movement there are provided arms 26 which are pivotally secured adjacent the ends of the cushion elements at 27. These arms travel in sleeves 28 which are mounted on plates 29, which, in turn, are pivotally mounted on pins 31 secured to end walls 16 and 17. On the lower surface of each arm 26 is a rack provided with teeth 34. The rack may be a separate member, or it may be formed integrally with the arm. Teeth 34 engage pinions 32 which are keyed adjacent opposite ends of shaft 30. The terminals of this shaft are journalled in plates 29, and the shaft thus moves when the plates move.

When cushion element 10 is pulled outwardly, arms 26 travel in sleeves 28, and the movement of teeth 34 of the racks produces rotation in the pinions and accordingly in the shaft 30. Thus, it will be apparent that the cushion element 10 may be pushed inwardly and outwardly by grasping the same at either end thereof, and there will be no binding effect. It was earlier pointed out that this arrangement may be also employed in connection with bureau drawers, sliding panels, or other members which are arranged to move back and forth.

When it is desired to make up the lower cushion element 10 into a bed, it may be first drawn outwardly to its maximum position, such movement being limited by means of stops 35 adjacent the inner terminals of arms 26. When in this outermost position the cushion element 10 may be tilted downwardly to occupy the vertical position shown in Fig. 2. Sheets and blankets may then be placed over the now upper edge 36 and draped downwardly over the front.

If lower cushion element 10, after being made up as a bed, is tilted from its position of Fig. 2 to a substantially horizontal position and then moved rearwardly, it returns to its inclined position of Fig. 1. If, however, it is desired to cause it to assume a horizontal, sleeping position, push rods 37 (Fig. 12) are moved outwardly. These push rods are mounted on the lower surface of cushion element 10 adjacent the rear edge thereof. The extent of movement of these push rods is limited by means of headed pins 38 which pass through slots 39 in the push rods. The inner terminals of such push rods are pivoted at 40 eccentrically of circular plate 41 rotatably mounted at 42 on the lower surface of the cushion element. Thus, both of these push rods move conjointly inwardly and outwardly. At their outer terminals these push rods are provided with downwardly-projecting fingers 43.

A bracket 47 is pivotally mounted at 48 on each of end walls 16 and 17. This bracket may be formed from sheet metal and normally occupies the position shown in Fig. 4. When, however, fingers 43 associated with push-rods 37 have been moved to extended position, these fingers engage rearward ears 49 associated with the upper ends of brackets 47. Thus, rearward movement of cushion element 10 causes fingers 43 to engage such rearward ears 49 and move the upper end of bracket 47 rearwardly and upwardly to a position wherein it is past vertical center, as shown in Figs. 5 and 8. This movement likewise causes the rear edge of cushion element 10 and its frame 9 to be raised so that the entire cushion element is now on a horizontal plane. Conversely, upon forward movement of cushion element 10, fingers 43 engage forward ears 50 associated with brackets 47 and move the bracket forwardly to the position of Fig. 4.

Frame 9, which supports back cushion element 11, is pivotally mounted, as at 51, on a panel 52

which extends the full length of the structure. When the lower only is to be used and it is desired to move lower cushion element 10 rearwardly to sleeping position, it is also desired to move back cushion element 11 rearwardly a sufficient distance to enable the user to occupy substantially the full width of the lower cushion element. This is accomplished by the following structure.

Pins 54 are secured in end walls 16 and 17, and such pins are received in slots 55 in brackets 56 mounted on the rear of panel 52. Thus, when cushion element 10 is moved rearwardly, panel 52 and back cushioin 11 are moved rearwardly and upwardly by the following movement transmission mechanism. Links 57 at each end of the structure are pivoted at their lower ends at 58 on brackets 47. The opposite ends of links 57 are pivoted at 59 substantially midway between the ends of levers 60 which are pivotally secured at their lower ends, as at 61, to end walls 16 and 17. The upper end of each lever 60 is pivotally secured, as at 62, to the ends of panel 52. Thus, it will be appreciated that upward movement of brackets 47 from the position of Fig. 4 to that of Fig. 5 is also accompanied by such upward and rearward movement of panel 52 and back cushion element 11. During such upward and rearward movement of panel 52, it is guided by means of pins 54 in slots 55, and when the panel has reached its upward position, pins 54 are at the lower ends of slots 55.

In the event that only the lower cushion element is being used at the instant, the convertible bed is now ready for use. In the event, however, that it is also desired to make up the upper berth, the following means are employed for raising the upper berth to elevated position.

A lead screw 65 is journalled for rotative movement in bearings 66 on the rear of panel 52. This screw is arranged to be rotated by means of a crank 67 disposed within an opening 68 in end wall 17. If desired, of course, this crank could be placed at the front of the sofa, and suitable intermediate gearing provided. Also, the shaft may be arranged to be rotated by means of a motor. Opening 68 may be arranged to be closed by any suitable closure (not shown). No particular effort is required to move back-cushion element 11 from its position of Fig. 1 to that of Fig. 6 wherein such cushion element is disposed at an angle of substantially 45°. From thereon, however, to its upper position of Fig. 7, it is raised by means of the lead screw arrangement. Moreover, this movement from its generally vertical position to its 45° position of Fig. 6 is aided by means of springs 70. One end of each spring is secured, as at 71, to panel 52, and the other end secured to a plate 72 mounted on a collar 73.

Lead screw 65 is formed with threads 74 which terminate at point 75, the remaining portion of the shaft being unthreaded, as shown at 76. An internally-threaded collar 80 is carried on the threaded portion 74 of this shaft. A sleeve 81 is pivotally mounted, as at 82, on such collar, and within this sleeve a rod 83 is carried, such rod having a pivoted or universal connection 84 with the lower surface of one end of upper cushion element 11.

When upper cushion element 11 is in the position of Figs. 1, 4 and 5, the threaded collar 80 occupies a position to the left of the terminal 75 of the threads on lead screw 65, when viewed as in Fig. 3. When it is desired to move the rear cushion element 11 to the inclined position of

Fig. 6, such movement being aided by springs 70, it is drawn forwardly at its lower end, and such forward movement also permits sleeve 73 to engage collar 80 and move the same to the right, when viewed as in Fig. 3, until such collar engages the threads of lead screw 65. Springs 70 continue to urge collar 80 into engagement with these threads. Accordingly, when the lead screw is rotated, as by means of crank 67, the threads of the lead screw engage the internal threads in collar 80, thus moving the same to the right and elevating the cushion element 11.

When the screw has been rotated to a point that collar 80 occupies the position shown in Fig. 3, upper cushion element 10 occupies the position shown in Fig. 7, and lower cushion element 10 is then moved rearwardly, such movement causing bracket 47 to move rearwardly and accordingly raise the lower cushion element to the horizontal position shown in Fig. 8. This movement further causes links 57 and 60 to move panel 52 to its rearward, elevated position, thus also raising the rear edge of upper cushion element 11 to its horizontal position. Rod 83 is extensible with reference to sleeve 81 to adjust, if eventually necessary, the height of the front edge of upper cushion element 11 when in its horizontal position.

It will be seen that effective support is afforded for one end of the upper berth. In a bed of this character a ladder is, of course, an essential element, and such ladder 86 is employed to effectively support the opposite end of upper cushion element 11. The ladder has a lower extension 88 which is received within a recess 87 in portion 14 of the front wall 13. The ladder also has an inner extension 89 at its upper end which is received within a recess 90 on the lower surface of the frame 9 of upper cushion element 11. The ladder further has an upward extension 91 which effectively prevents the person from falling out of the upper berth. This upper extension 91 also aids the occupant of the upper berth in climbing into and out of the same. In order to insert the ladder in place, extension 89 may first be placed in recess 90, and the upper berth slightly raised in order to permit inner extension 88 to slide into recess 87.

It will be noted that there is considerable area within the lower portion of the housing, which is of ample size to receive the ladder during daytime use. This area may also serve to receive blankets, sheets and pillows. This area may also be used for the storage of luggage, which is particularly convenient for steamship use. Access to this area may be achieved by moving the lower cushion element to the position of Fig. 2, or its forward edge may be raised upwardly from its position of Fig. 1. After the upper berth has been moved to the position of Fig. 3, the front wall of panel 52 and the mechanism shown in Fig. 3 may be covered by means of a suitable flap (not shown) secured at its upper end to the rear edge of upper cushion element 11, and at its lower end to the rear edge of lower cushion element 10.

While one form or embodiment of the invention has been shown and described herein for illustrative purposes, and the construction and arrangement incidental to a specific application thereof have been disclosed and discussed in detail, it is to be understood that the invention is limited neither to the mere details or relative arrangement of parts, nor to its specific embodiment shown herein, but that extensive devia-

tions from the illustrated form or embodiment of the invention may be made without departing from the principles thereof.

What we claim is:

1. A sofa-bed comprising a seat cushion, a base frame having forwardly inclined portions on which said seat cushion is slidably supported for forward and rearward movement for day-time use, arms pivotally secured to the cushion and extending rearwardly therefrom, said arms being provided with rack teeth on their lower edges, plates pivoted on the base frame and formed with sleeves which slidably receive portions of the arms, a shaft journalled at its terminals on said pivoted plates and being provided with pinions keyed thereto which engage said rack teeth, and brackets pivotally mounted on the base frame aud being normally forwardly inclined, releasable means on the cushion which connect the cushion with the upper ends of the brackets and move them rearwardly to a generally upright position on rearward movement of the cushion to move said cushion into a horizontal position for night-time use, a back cushion, a flat support therefor, a pivotal connection between the support and the cushion at their upper ends, a vertical pin-and-slot connection between the frame and the flat support at its upper end, levers pivotally mounted on the base frame at one end thereof and pivotally connected with the flat support at the other end, links connecting the brackets with the intermediate sections of the levers so as to move the lower end of the flat support upwardly and rearwardly upon rearward movement of the brackets, a lead screw journalled horizontally in the base frame, a threaded collar carried on the lead screw and being movable thereon as the screw is rotated, and an arm connecting the collar and back cushion to raise and lower the latter as the screw is rotated in the proper direction respectively.

2. A sofa-bed comprising a seat cushion, a base frame provided with means slidably supporting said seat cushion thereon with its front edge higher than its rear edge for day-time use, arms pivotally secured to the cushion and extending rearwardly therefrom, plates pivoted on the base frame and formed with sleeves which slidably receive portions of the arms, and brackets pivotally mounted on the base frame and being normally forwardly inclined, releasable means on the cushion which connect the cushion with the upper ends of the brackets and move them rearwardly to a generally upright position on rearward movement of the cushion to move said cushion into a horizontal position for night-time use, a back cushion, a flat support therefor, a pivotal connection between the support and the cushion at their upper ends, means connecting the frame with the upper end of the flat support and which allows vertical movement of the latter relating to the former, levers pivotally mounted on the base frame at one end thereof and pivotally connected with the flat support at the other end, links connecting the brackets with the intermediate sections of the levers so as to move the lower end of the flat support upwardly and rearwardly upon rearward movement of the

brackets, and an arm connecting the frame and the back cushion to support the latter in horizontal position for night-time use.

3. A sofa-bed comprising a seat cushion, a base frame having forwardly inclined portions on which said seat cushion is slidably supported for forward and rearward movement, arms pivotally secured to the cushion and extending rearwardly therefrom, plates pivoted on the base frame and formed with sleeves which slidably receive portions of the arms, and brackets pivotally mounted on the base frame and being normally forwardly inclined, releasable means on the cushion which connect the cushion with the upper ends of the brackets and move them rearwardly to a generally upright position on rearward movement of the cushion to move said cushion into a horizontal position for night-time use, a back cushion and a support therefor, means slidably and pivotally connecting the upper end of the support with the frame, levers pivotally mounted on the base frame at one end thereof and pivotally connected with the support at the other end, links connecting the brackets with the intermediate sections of the levers so as to move the lower end of the support upwardly and rearwardly upon rearward movement of the brackets.

4. A sofa-bed comprising a seat cushion, a base frame having forwardly inclined portions on which said seat cushion is slidably supported for forward and rearward movement, arms pivotally secured to the cushion and extending rearwardly therefrom, said arms being provided with rack teeth on their lower edges, plates pivoted on the base frame and formed with sleeves which slidably receive portions of the arms, a shaft journalled at its terminals on said pivoted plates and being provided with pinions keyed thereto which engage said rack teeth, and brackets pivotally mounted on the base frame and being normally forwardly inclined, releasable means on the cushion which connect the cushion with the upper ends of the brackets and move them rearwardly to a generally upright position on rearward movement of the cushion to move said cushion into a horizontal position for night-time use, a back cushion slidably and pivotally connected to the upper end of the frame, links connecting the brackets with the lower ends of the back cushion so as to move said lower end rearwardly upon rearward movement of the brackets.

ROBERT C. READ.
FRANK J. GREGOR.

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