Means for Supporting and Concealing Folding Beds

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This invention relates to improvements in means for supporting and concealing folding beds, one of the objects being to conceal a folding bed without using ordinary closets which, in addition to being expensive, occupy valuable space and sometimes produce unsightly offsets in the interior of a building. Furthermore, ordinary closets require large spaces to conceal their contents, and we prefer to eliminate such doors. More specifically stated, an object is to produce a folding bed and a support therefor adapted to be moved into and out of a hollow wall.

Another object is to provide supporting means whereby the bed is pivotally balanced to swing freely from an upright position to a horizontal position, and a counterbalancing device permitting free vertical movement of the bed and its pivotal support. The bed may be pivotally connected to the counterbalancing device whereby it is supported and permitted to swing freely in an arc of a circle, without moving the counterbalancing device, and when the bed occupies a horizontal position the counterbalance becomes effective to permit free vertical movement of the bed and its pivot. When the bed occupies its upright position, the pivotal support is in an elevated position remote from the floor, and the bed can freely swing on the pivot to a horizontal position. The bed and its pivotal support can then be lowered until the bed rests upon the floor.

A further object is to provide an improved means for detachably securing the bed to its support, so as to permit the bed to be shifted to any desired location remote from the support.

With the foregoing and other objects in view, the invention comprises the novel construction, combination and arrangement of parts hereinafter more specifically described and illustrated in the accompanying drawings, wherein is shown the preferred embodiment of the invention. However, it is to be understood that the invention comprehends changes, variations and modifications which come within the scope of the claims hereunto appended.

Briefly stated, the specific structure herein shown comprises a folding bed movable in a straight line from a concealed position in a hollow wall to an exposed position in the passageway between two rooms. During such movement, the bed occupies an upright position and it is moved edgewise through a narrow, vertical opening in the jamb at one side of said passageway. The bed is pivoted to a horizontally movable carriage whereby it is carried from the interior of the wall to said passageway, and when located in the passageway the bed can swing freely on its pivotal support to a horizontal position partly within the passageway and partly within the two rooms on opposite sides thereof. After the bed has been turned from its upright position, it can be readily raised and lowered in the passageway, the pivotal support being suspended from a counterbalancing device to permit free vertical movement of the bed and its pivot. When in a horizontal position the bed can be detached and withdrawn from the passageway to any desired position in either of the rooms.

Fig. I is a side elevation showing a portion of a hollow wall and a bed located in a passageway in the wall, the concealed position of the bed being indicated by dot and dash lines.

Fig. II is a vertical section taken approximately on the line II—II in Fig. I.

Fig. III is a horizontal section showing the carriage from which the bed is suspended.

Fig. IV is a fragmentary side elevation showing the locking device mounted in the carriage to lock the counterbalancing device.

Fig. V is a vertical section showing the legs at one end of the bed and portions of the headboard, or footboard, extending upwardly from the legs.

Fig. VI is a side elevation, partly in section, showing approximately one-half of the bed, and also showing a portion of the hollow wall in which the bed may be concealed.

Fig. VII is a section taken approximately on the line VII—VII in Fig. VI.

Fig. VIII is an enlarged section taken approximately on the line VIII—VIII in Fig. VI, showing the headboard, or footboard, in the position it occupies when folded toward the body of the bed.

Fig. IX is an enlarged side elevation showing a portion of one of the side rails of the bed, and a portion of the means whereby motion may be transmitted from the head to the foot of the bed.

Before describing the bed structure, we will point out the bed compartment and the
movable support whereby the bed is carried into and out of the compartment.

The hollow wall comprises wall members 1 separated from each other to provide a narrow bed compartment between them. A transverse passageway A is formed through the wall, so as to provide communication between the rooms at opposite sides of the wall. At one of the vertical sides of this passageway, jambs members 2 are separated from each other to form an elongated vertical entrance to the narrow bed compartment in the hollow wall.

3 designates straight horizontal tracks located within the hollow wall and extending from the bed compartment to points above the transverse passageway A in the hollow wall. The bed-supporting carriage comprises a horizontal frame including end members 4 connected together by means of bars 5, which are shown most clearly in Fig. III. This carriage is provided with rollers 6 mounted on the means 3 to guide the carriage in a straight horizontal line. A shaft 7 is rotatably mounted in the end members 4 of the carriage, and cams 8 are secured to the ends of this shaft. 9 designates suspension chains depending from the cams 8 and having their lower ends secured to suspension rods 10. The chains 9 are secured to the cams 8 and adapted to engage the peripheral faces thereof. As shown in Fig. II, each chain 9 may pass between guide members 11 and 12 on the carriage, the member 12 being in the form of a roller. 13 and 13' designate pivots extending from a bed (Figs. I and VI), and secured to the suspension rods 10, as will be hereafter described, to form a pivotal support for the bed.

The counterbalancing device comprises a spring 14 surrounding the shaft 7 (Figs. I and III) and having one of its ends secured to a collar 13, the latter being rigidly secured to the shaft. The other end of the spring is secured to a worm gear 16, loosely mounted on shaft 7 and meshing with a worm 17, said worm being rotatably mounted in bearings extending from one of the end members 4, as shown in Figs. I and III.

A vertical stem 18 (Fig. I), depending from the worm 17, may be engaged by a suitable tool to rotate the worm 17, thereby rotating the worm wheel 16 which is secured to one end of the counterbalancing spring 14. The wheel 16 is loosely mounted on shaft 7, and it can be thus rotated to vary the tension of spring 14. The means for locking the spring is self-locking, for the worm screw 17 can impart motion to the wheel 16, but said wheel cannot impart motion to the screw.

Under certain conditions to be hereafter pointed out, it is desirable to prevent rotation of the shaft 7 to which one end of the spring is secured. The means for locking this shaft comprises a disk 19, rigidly secured to the shaft, (Figs. I, II and III), and a bolt 20 adapted to be projected through the disk, the latter having an opening at 21 (Fig. II) to receive the bolt. This bolt is guided by one of the end members 4 and also by a bracket 22 extending from a side member 5 of the carriage, as shown in Fig. III. 23 designates a spring interposed between the bracket 22 and a collar 23 on the rod 20. This spring tends to project the bolt through the disk 19 so as to lock the shaft 7 and the counterbalancing spring 14. The means for unlocking the bolt comprises a bell crank lever 25 (Figs. I and IV) pivotally connected to one of the frame members 5 of the carriage, said lever having a short arm connected to the bolt and a long arm connected to a depending operating cord which can be pulled to withdraw the bolt from the disk 19, thereby unlocking the shaft and counterbalancing spring. It will now be understood that when the opening in the disk 19 registers with the bolt 20, the spring 23 will project the bolt through the opening, so as to lock the disk as shown in Fig. IV. The worm 16 can then be turned to adjust the counterbalancing spring, or if desired, the bed can be disconnected from the carriage, as will be hereafter pointed out.

The bedstead comprises side rails 27, brackets 28 secured to the ends of the side rails, legs 29 in the form of tubes extending downwardly from the ends of the side rails, and end frames extending upwardly from the legs, one of said frames being a footboard 30 and the other being a headboard 31. Each leg 29 is rigidly secured to a segmental gear 32 pivoted at 33 to one of the side rails 27, and each of the end frames 30—31 is rigidly secured to a segmental gear 34 pivoted at 35 and meshing with one of the gears 32, as shown most clearly in Fig. VI. The footboard, headboard and legs are thus pivotally connected to the bed frame, and they can be moved on their pivots from an upright position to an approximate horizontal position, as suggested in Fig. VI.

Motion is transmitted from the foot to the head of the bed through the medium of a small lever 33 (Figs. II, VI and IX) pivoted at 36 to one of the side rails 27 and having its ends pivoted to connecting bars 37. 38 designates pivots connecting the respective bars 37 to gears 32 at opposite ends of the bed, as shown by Figs. II and VI. By means of the connecting device just described and the gears 32 and 34, motion can be transmitted from any one of the legs to all of the other legs, and also to the footboard 30 and headboard 31; or, motion can be transmitted from either of these boards to the other board and also to all of the legs. In other words, when any one of these members is folded or unfolded, a corresponding
motion is imparted to all of the other members, so as to simultaneously fold or unfold the legs 29 and boards 30 and 31.

When the legs and the boards 30 and 31 are folded, the boards are pressed upon the bed clothes (not shown) to secure the same, and they are locked in their folded positions through the medium of a ratchet device as shown in Figs. V, VI, VII and VIII.

The brackets 28 adjacent to the footboard 30 are provided with internal ratchet teeth 39 adapted to be engaged by dogs 40 secured to springs 41 arranged within the footboard 30 and having their lower ends secured thereto. The free upper end of each spring 41 (Figs. V and VI) extends through a bar 42, and these bars are connected together through the medium of an operating lever 43 (Fig. V) pivoted to the footboard 30 and having its ends pivoted to the respective members 42. This lever 43 can be moved about the axis of its pivot to move the bars 42 away from each other, thereby moving the springs 41 to release the dogs 40 from the ratchet teeth 39. When the footboard, headboard and legs are folded, the footboard 30 occupies the approximately horizontal position shown in Fig. VI, so as to engage the bed clothes, and it is then locked through the medium of the dogs 40 cooperating with ratchet teeth 39. Since the footboard is connected to the legs and headboard, it will be understood that the dogs 40 and ratchet teeth 39 serve as means for locking all of these parts. Before unfolding the parts, the lever 43 (Fig. V) is operated to release the dogs 40.

The brackets 28 at the ends of side rails 27 serve as housings for the segmental gears 34, as shown by Figs. V and VI, and each of these housings is provided with a closure 44 adapted to move from the position shown by full lines in Fig. VI to the position shown by dot and dash lines. In this view it will be noted that the closure 44 is pivoted at 45 to the footboard 30, and that its lower edge is movable over the lower portion of bracket 28 in response to the folding and unfolding motions of the footboard.

We will now describe the means whereby the footboard, headboard and legs are locked when the bed is unfolded and supported on the floor. The footboard 30 comprises a pair of tubular side members (Figs. V and VI) aligned with the legs 29 immediately beneath the same. 46 designates locking arms, each having a locking head 46' arranged partly within the upper end of a leg 29 and partly within the lower end of footboard 30. Each locking arm 46 is pivoted to a bracket secured to one of the side rails 27, as shown in Fig. VI. Each leg 29 at the foot of the bed contains a vertical, slidable locking rod 47 having its upper end engaged with a locking arm 46 and provided with a caster at its lower end. When the parts are positioned as shown in Figs. V and VI, the foot of the bed is supported on the casters at the lower ends of rods 47, and the load is transmitted through these rods to the casters. It will therefore be understood that the rods 47 cooperate with locking arms 46 to retain the heads 46' in the lower ends of the footboard 30, and the heads 46' then cooperate with the footboard 30 to retain the legs, footboard and headboard in their upright positions. In Fig. VI, note that the footboard 30 is pivoted at 31, and that the head 46' prevents the footboard from moving about the axis of the pivot.

When the bed is lifted from the floor, the locking arms 46 drop by gravity to release the locking heads 46' from the footboard, thereby unlocking the footboard, as well as the headboard and legs, these parts of the bed being operatively connected together, as previously pointed out.

The bed is pivotally connected to the horizontally movable carriage through the medium of pivots 13 and 19' extending through the lower ends of suspension rods 10 and the pivots are located approximately midway between the ends of the bed so as to approximately equalize the weight at opposite sides of the pivots. The counterbalance spring 14 tends to rotate the shaft 7 and its cam 8 on which the suspension chains 9 are mounted, and the power transmitted from the spring tends to lift the bed. Consequently, the bed can be very readily lifted from the floor, and when the pivots 13—19' are high enough, the bed can be easily moved in an arc of a circle about the axis of the pivots to a vertical position in alignment with the bed compartment in the hollow wall, as shown by dot and dash lines in Fig. II. The bed is then aligned with the narrow entrance to the bed compartment, and since it is supported by the horizontally movable carriage, it can be easily moved in a horizontal line parallel with the axis of its pivots 13, so as to pass into the bed compartment.

When the bed is located in the horizontal position shown by full lines in Fig. II, it lies partly within the transverse passageway in the wall and partly within the two rooms at opposite sides of the passageway. However, the bed can be readily disconnected from its suspension members and moved on its casters to any desired position in either of the rooms.

To disconnect the bed, it is necessary to lock the counterbalancing device, and this requires an excess downward movement of one of the suspension members. In Figs. VI and VII, 48 designates a lever pivoted at 49 to a wing 50 secured to one of the side rails 27, and the pivot 13 extends from this lever. After the bed is supported on
the floor, the lever 48 is moved downwardly to impart a downward movement to the suspension rod 10 above the pivot 13, thereby imparting motion to the shaft 7 and its locking disk 19 so as to align the opening in said disk with the spring-pressed locking bolt 20. The bolt then enters the opening in the disk so as to lock the shaft and the counterbalance spring. The suspension rods 10 then hang loosely from the overhead carriage and they can be readily removed from the pivots 13 and 17, so as to disconnect the bed from the carriage.

In restoring the bed, the suspension members 10 are applied to the pivots and the lever 48 is again moved downwardly to eliminate friction between the locking bolt 20 and disk 19. The cord 20 is then pulled downwardly to withdraw the locking bolt 20 from the disk, thereby permitting the counterbalancing device to act upon the bed.

The counterbalancing spring 14 is wound around the spring in response to vertical movements of the bed, and during the unwinding operation the force of the spring gradually becomes weaker. To compensate for these variations in the spring, the peripheral faces of cams 8 (Figs. II and III) are so formed that the lines of contact between the suspension chains and the cams gradually approach the axis of shaft 7 when the bed is moved upwardly. By winding the chains onto the cam, the effect of the counterbalancing device is to approximately balance the weight of the bed when the latter is located at different elevations relative to the floor.

Closure plates 60 and 61 are secured to the respective ends of the carriage by means of depending brackets 62, as shown in Figs. I and II. When the bed occupies its concealed position, the vertical plate 60 clotes the entrance to the bed compartment, and when the bed is exposed, this entrance is closed by the plate 61.

The lever 48 is normally locked to the bed as shown by Figs. VI and VII, a small locking lever 63 being pivoted to said lever 48 and provided with a locking pin 64 adapted to be projected through the wing 50. 63 designates a spring (Fig. VII) acting upon lever 63 to yieldingly retain the locking pin 61 in the wing 50. Before detaching the bed, the small lever 63 is actuated to unlock the lever 48, and the latter is then moved downwardly relative to the bed, so as to lock the counterbalancing device, as previously pointed out.

We claim:

1. In a bed structure adapted to be received in a hollow wall having an entrance at one side of a passageway between two rooms, a bed support movable through said entrance so as to pass from the interior of said wall to a position in said passageway, and a folded bed carried by said bed support, said bed being movable with said support from an upright position in said wall to an upright position in said passageway, and said bed being movable relative to said support from the last mentioned position to a horizontal position partly within said passageway and partly within said two rooms.

2. The combination of a bed support adapted to lie in a compartment having a narrow elongated vertical entrance, a bed provided with foldable head and foot members, said bed being arranged in an upright folded position so as to conform approximately to the width of said entrance, and a pivotal connection securing said bed to said support, the axis of the pivotal connection being between said head and foot members, a horizontal track whereby said bed support is guided to carry the folded bed through said narrow entrance, said bed being movable on said pivotal connection to a horizontal position across said narrow entrance, and the axis of said pivotal connection being parallel with said narrow track.

3. In a bed structure adapted to be received in a hollow wall having a narrow elongated vertical entrance at one side of a passageway between two rooms, a bed provided with foldable head and foot members, said bed being arranged in an upright folded position to lie in said hollow wall with its upright edges aligned with said narrow entrance, a bed support adapted to be secured in said hollow wall and pivotally connected to said bed, and a horizontal track whereby said bed support is guided to carry the bed through said narrow entrance and into said passageway, said bed being movable on the pivotal connection to a horizontal position partly within said passageway and partly within said two rooms, and the axis of said pivotal connection being parallel with said track.

4. In a bed structure adapted to be received in a hollow wall having a narrow vertical entrance at one side of a transverse passageway through the wall, a folded bed arranged in an upright position to locate its upright edges in alignment with said entrance, a horizontal track secured above the bed so as to extend over said transverse passageway, a carriage supported by said horizontal track, suspension members depending from said carriage and located at opposite sides of said bed, pivots connecting said bed to said suspension members, said carriage being movable in a straight horizontal line along said track to carry the upright bed, suspension members and pivots through said narrow entrance to points in said passageway, the axis of said pivots being parallel with said horizontal line, and said bed being movable on the pivots from an upright position in said passageway to a horizontal
position wherein it extends entirely through said passageway.

5. In a bed structure adapted to be received in a hollow wall having a narrow vertical entrance at one side of a transverse passageway through the wall, a folded bed arranged in an upright position to locate its upright edges in alinement with said entrance, a horizontal track secured above the bed so as to extend over said transverse passageway, a carriage supported by said horizontal track, suspension members depending from said carriage and located at opposite sides of said bed, pivots connecting said bed to said suspension members, said carriage being movable in a straight horizontal line along said track to carry the upright bed, suspension members and pivots through said narrow entrance to points in said passageway, the axis of said pivots being parallel with said horizontal line, said bed being movable on the pivots from an upright position in said passageway to a horizontal position wherein it extends entirely through said passageway, said pivots being located approximately midway between the ends of the bed to permit free pivotal movement of the bed, and a counterbalancing device carried by said carriage and cooperating with said suspension members to permit free vertical movement of the bed.

6. The combination of a bed, a pivotal support therefor, said pivotal support being near the middle of the bed so as to approximately equalize the weight at opposite sides of the pivotal support, the bed being movable about the axis of the pivotal support to swing from a horizontal position to a vertical position, a counterbalancing device acting upon said pivotal support and tending to lift both the bed and the pivotal support, and a carriage supporting said counterbalancing device and pivotal support, said carriage being guided in a straight horizontal line parallel with said axis.

7. The combination of a bed, a carriage above the bed, suspension members depending from said carriage and pivotally connected to the sides of the bed, the axis of the pivotal connection being approximately midway between the ends of the bed so as to approximately equalize the weight at opposite sides of said axis, the bed being movable about said axis to swing from an upright position to a horizontal position, and a counterbalancing device acting upon said suspension members and tending to move said bed and pivotal connection toward said carriage.

8. The combination of a bed, a carriage above the bed, suspension members depending from said carriage and pivotally connected to the sides of the bed, the axis of the pivotal connection being approximately midway between the ends of the bed so as to approximately equalize the weight at opposite sides of said axis, the bed being movable about said axis to swing from an upright position to a horizontal position, a shaft carried by said carriage and operatively connected to said suspension members, and a counterbalancing spring tending to rotate said shaft so as to transmit power to said suspension members.

9. The combination of a bed, a carriage above the bed, suspension members depending from said carriage and pivotally connected to the sides of the bed, the axis of the pivotal connection being approximately midway between the ends of the bed so as to approximately equalize the weight at opposite sides of said axis, the bed being movable about said axis to swing from an upright position to a horizontal position, rotary cams carried by said carriage and secured to said suspension members, said cams having peripheral cam faces engaging said suspension members, and a counterbalancing spring tending to rotate said cams.

10. The combination of a bed, a pivotal support therefor, said pivotal support being near the middle of the bed so as to approximately equalize the weight at opposite sides of the pivotal support, the bed being movable about the axis of the pivotal support to swing from a horizontal position to a vertical position, suspension members carrying said pivotal support, rotary winding cams secured to said suspension members, said cams having peripheral cam faces engaging said suspension members, and a counterbalancing spring tending to rotate said cams.

11. The combination of a folding bed, a counterbalancing device therefor, suspension members connecting said bed to said counterbalancing device, said bed being movable from an upright position to a horizontal position, said counterbalancing device being effective when the bed reaches its horizontal position, said bed being detachable from said suspension members, and locking means for rendering said counterbalancing device ineffective while the bed occupies its horizontal position.

12. The combination of a folding bed, a counterbalancing device therefor, suspension members connecting said bed to said counterbalancing device, said bed being movable from an upright position to a horizontal position, said counterbalancing device being effective when the bed reaches its horizontal position, said bed being detachable from said suspension members, and locking means for rendering said counterbalancing device ineffective while the bed occupies its horizontal position, said locking means being responsive to movements of said suspension members.

13. The combination of a folding bed, a counterbalancing device therefor, suspension
members connecting said bed to said counterbalancing device, said bed being movable from an upright position to a horizontal position, said counterbalancing device being effective when the bed reaches its horizontal position, said bed being detachable from said suspension members, locking means for rendering said counterbalancing device ineffective while the bed occupies its horizontal position, said locking means being responsive to excess motion of one of said suspension members, and a lever whereby such excess motion is imparted to the suspension member.

15. The combination of a bed, a carriage above the bed, suspension members depending from said carriage and pivotally connected to the sides of the bed, the axis of the pivotal connection being approximately midway between the ends of the bed so as to approximately equalize the weight at opposite sides of said axis, the bed being movable about said axis to swing from an upright position to a horizontal position, a shaft carried by said carriage and operatively connected to said suspension members, a counterbalancing spring tending to rotate said shaft so as to transmit power to said suspension members, an automatic lock to prevent rotation of said shaft, said lock being responsive to excess motion of one of said suspension members, and a lever whereby such excess motion is imparted to the suspension member, said pivotal connection being detachable to release the bed from the suspension members when said lock is effective.

16. The combination of a bed, a pivotal support for said bed, said pivotal support being located intermediate of the head and foot of the bed so as to approximately equalize the weight at the opposite sides of the pivotal support, the bed being movable about the axis of the pivotal support and the pivotal support being movable upwardly to swing said bed from a horizontal position to a vertical position and said pivotally mounted head and foot members being capable of independent pivotal movement, and a carriage supporting said pivotal support.

17. The combination of a bed having pivotally mounted head and foot members, a pivotal support for said bed, said pivotal support being near the middle of the bed so as to approximately equalize the weight at the opposite sides of the pivotal support, the bed being movable about the axis of the pivotal support to swing from a vertical position to a horizontal position and said bed being detachable from said pivotal support, a counterbalancing device acting upon said pivotal support and tending to lift both the bed and the pivotal support, a carriage supporting said counterbalancing device and pivotal support, said carriage being guided in a straight horizontal line, and means for rendering said counterbalancing device ineffective while the bed occupies its horizontal position.

18. The combination of a bed adapted to lie in an upright position in a compartment, said bed having pivotally mounted head and foot members including legs which serve to support the bed on a floor, a carriage to which said bed is pivotally connected, said pivotal connection being intermediate of the head and foot of said bed and said carriage being adapted to carry the bed into and out of said compartment, the bed being movable about the pivotal connection to a horizontal position outside of said compartment, said pivotal connection being movable vertically to raise and lower the bed relative to said carriage, and said pivotal connection being detachable to release the bed from said carriage.

In testimony that we claim the foregoing we hereunto affix our signatures.

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