May 29, 1956 W. D. DRIVER 2,747,202

FOLDING BEDS

Filed Aug. 17, 1953 3 Sheets-Sheet 1

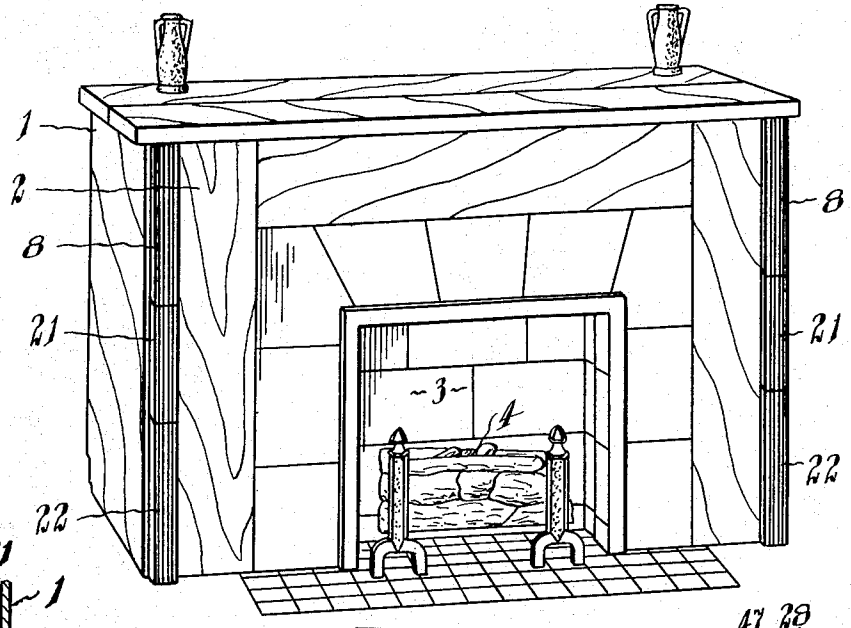


Fig. 1.

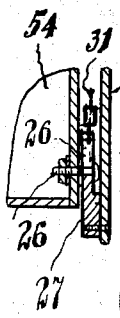


Fig. 12.

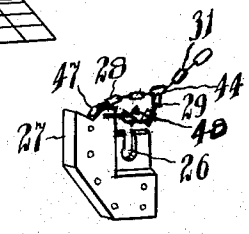


Fig. 11.

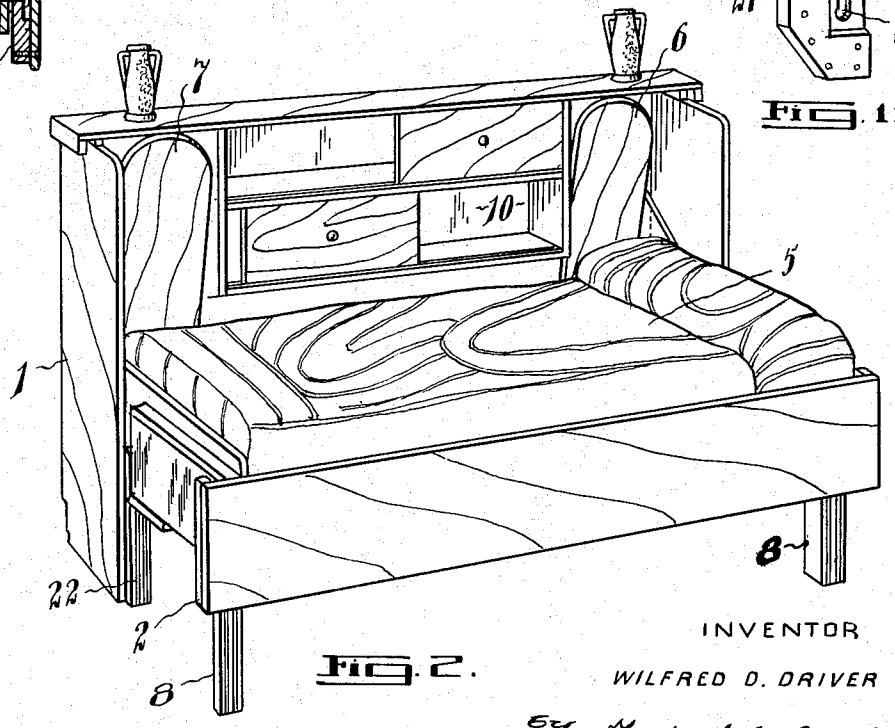


Fig. 2.

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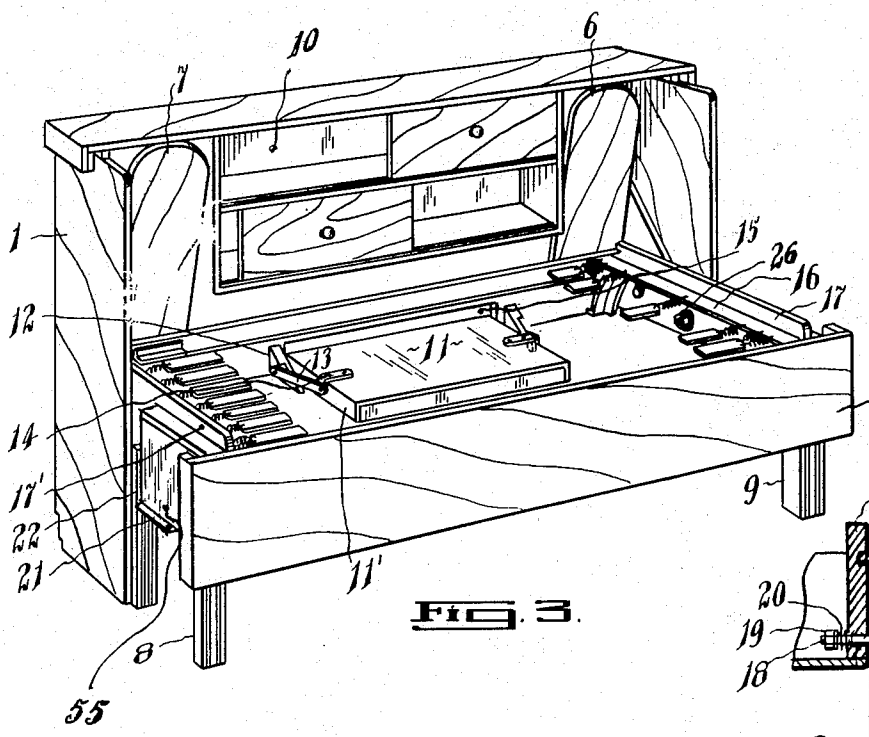


Fig. 3.

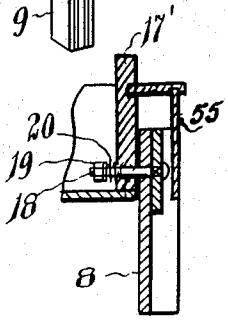


Fig. 10.

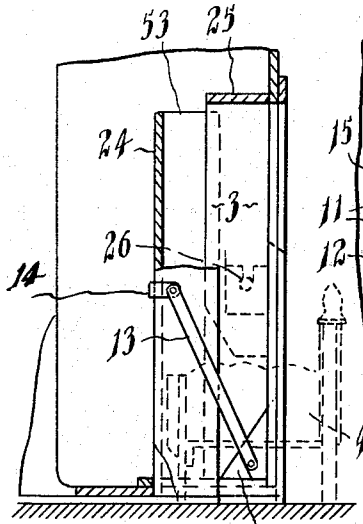


Fig. 4.

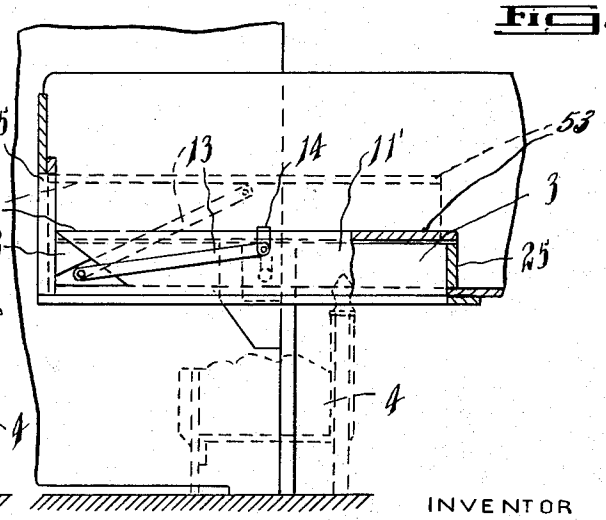


Fig. 5.

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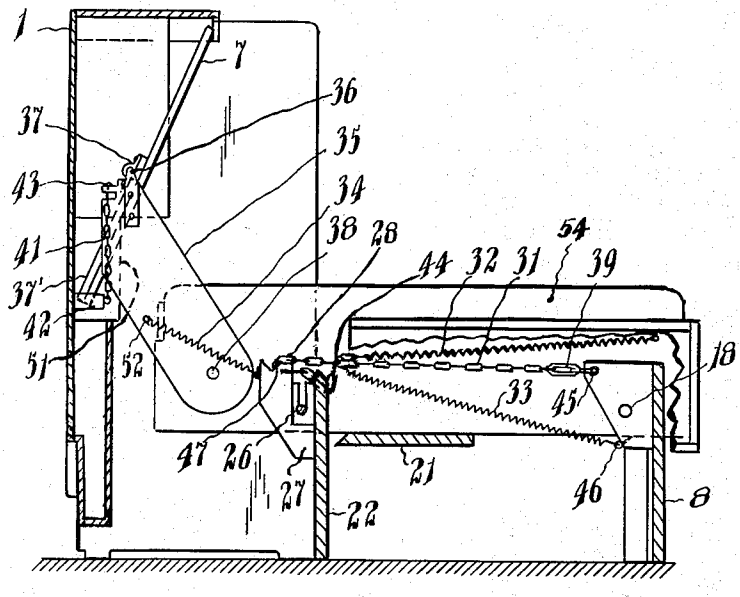


Fig. 6.

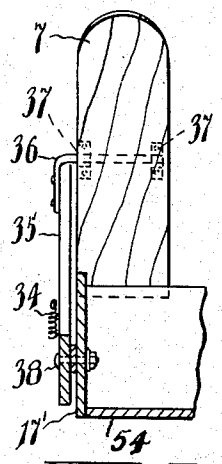


Fig. 9.

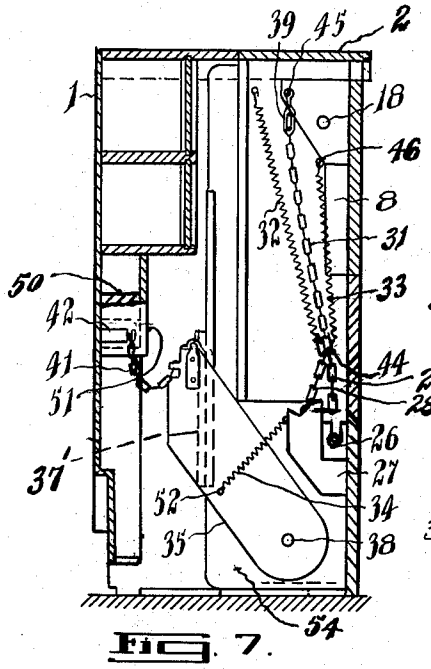


Fig. 7.

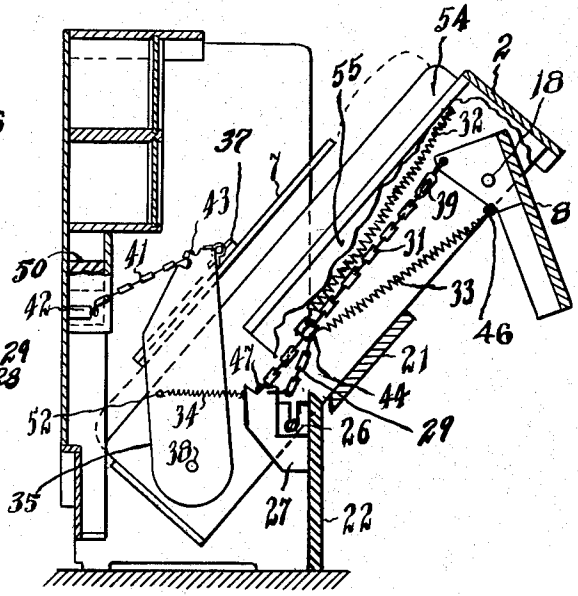


Fig. 8.

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United States Patent Office 2,747,202 Patented May 29, 1956

2,747,202

FOLDING BEDS

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Application August 17, 1953, Serial No. 374,702

4 Claims. (Cl. 5—2)

My invention is directed to improvement in bed structures of the type which can be retracted from an attitude suitable for use as a bed to another attitude in which the bed and its supports are concealed and, together with surrounding accessories forms part of another useful piece of furniture other than a bed.

There are two principal or generic types of retractable bed structures; one of these is arranged to slide into an alcove without changing its attitude with respect to a supporting floor; the other type is usually hinged in some way so as to fold into a comparatively shallow alcove or shell in which it resides in a substantially vertical attitude for storage and/or concealment.

The first of these types affords a simple and easy means for providing a "disappearing" bed and does not present much manufacturing difficulty, but suffers from the very serious defect that a large floor area is required for storing the bed during the daily period of non-use.

The second type possesses the advantage that the bed can be stored in a compact shell which uses the height of a room rather than a large floor dimension, but prior art constructions of this type suffer from the disadvantage that the means for folding the bed (usually some sort of hinge arrangement) has not been reliable, and frequent failure of the mechanism has constituted a continual cause for annoyance.

The present invention relates to bed structures of the folding type and a principal object is to provide in such a structure a reliable folding mechanism.

It is a further object to provide in co-operation with said folding mechanism an improved arrangement for restraining the mattress and bedding from being displaced when the bed is folded.

A further object is to provide means for positioning the bed in its attitude for use without disturbing essential accessories forming part of the decor associated with the said other useful piece of furniture which is the means for concealment of the bed in its attitude of non-use.

Still another object is to provide a folding bed structure of the kind indicated which is hinged along its lesser dimensions so that the bed folds into a recess of practical height in a room and wherein means is provided for preventing the concealing shell from tipping forward or backward when the centre of gravity of the system changed during the actuation of the folding mechanism.

It is to be understood of course that the folding mechanism is a two way organization, that is, it facilitates the folding or the unfolding of the bed depending upon what attitude is required in its field of utility.

According to my teachings, in a folding bed structure, a folding and restraining mechanism includes a group of interlocked lever systems comprising means for pivoting the bed structure at points on its minor dimensions such as to make the said bed structure behave as a cantilever

about said pivot, supporting feet pivoted lever fashion at the outer ends of the bed structure, a pair of blanket restraining pressure plates positioned one adjacent each end of said bed structure, and for the purposes of this specification, called paddles, support means for said paddles, each having means at one end for pivoting a said paddle in cantilever fashion and at the other end, means for being itself pivoted leverwise about points adjacent an inner end of said bed structure, a shell or concealing alcove having rigidly positioned side panels arranged to lie adjacent to the ends of the bed when in folded attitude, a receptacle in each said side panel designed to receive a corresponding pivot of said bed structure, a link joining the upper arm of each said supporting foot to a point adacent the receptacle postioned to receive the pivot on the corresponding end of said bed structure, tension means co-acting with the lower arm of each said supporting foot positioned to urge the arm inwardly against the urge of a corresponding said link, tension means co-acting with each said paddle support positioned to urge the paddle forward toward the bed surface when the latter is in the folded attitude, link means co-acting with each paddle support and having one end fixed to a rear portion of said shell and its other end attached to the outer end of a said paddle support, the link being dimensioned to limit the outward movement of said paddle when the bed structure is being lowered to the attitude of use, and tension means positioned to urge the bed structure when in closed attitude to shift its equivalent centre of mass inwardly to maintain itself in closed attitude.

In a further aspect the invention may include means for recessing a part of the concealing decor in an aperture at least one of whose dimensions is variable to provide an expandable chamber which allows a decor piece to nest underneath the bed structure when the latter is in use but which chamber is expanded in its said dimension when the bed is concealed, to present a simulation including the said decor as part of a said other useful article of furniture.

In a still further aspect the invention may include means incorporated in the structure of the said shell for maintaining a low centre of gravity of the assembly so that when the bed portion is extended for use, the said shell remains in a fixed attitude while the movable portion of the assembly is changing its attitude.

These teachings will now be more intimately disclosed in the following description of a practical and preferred embodiment of the invention, the text being aided by reference to the accompanying drawings wherein:

Figure 1 depicts a perspective view of a bed and shell in the closed attitude, the concealment being in the form of a simulated fireplace and showing a simulated grate and andirons as a concealing decor piece.

Figure 2 depicts, in perspective, the bed structure of the invention in open attitude.

Figure 3 depicts the attitude of Figure 2 with the bedding and most of the bed spring removed to show details of a cavity having a variable dimension which expands to accommodate a simulated grate assembly.

Figure 4 is a fragmentary end view of the embodiment described showing the bed mechanism (partly in section) in closed attitude.

Figure 5 is a fragmentary end view showing the bed mechanism in the open attitude for use.

Figure 6 is a skeleton end view showing somewhat diagrammatically the mechanical system for restraining and actuating the folding bed arrangement according to my teachings and depicts the system in open attitude.

Figure 7 depicts the arrangement shown in Figure 6 in the closed attitude.

Figure 8 is a view corresponding to Figures 6 and 7 but depicting the bed in transit from the closed to the open attitude.

Figure 9 is a fragmentary depiction of a paddle and its actuating lever referred to a line normal to that from which it is viewed in Figure 6.

Figure 10 is a sectional view of a supporting foot and shows details of a pivoting means therefor.

Figure 11 depicts a pivot block assembly for supporting the bed and providing a link anchorage.

Figure 12 is a fragmentary section showing a bed, pivot, pivot block and link anchorage in assembled relation.

Referring now to these drawings, **1** is a shell designed to receive a bed structure which is covered on one side by a structure **2**, **3** designed to simulate a fireplace, and to partly contain in its recessed portion an imitation fire grate **4** with accessory decorative andirons and/or the like.

A decorative molding trims each of the two vertical front corners of the "fireplace" but is divided in three parts **8**, **21** and **22**. **8** is a leg piece designed to support the bed when in open attitude, **21** is a brace attached to the end-board of the bed and **22** is a permanent corner moulding on the edge of a containing side of the shell **1**. The portion shown in Figure 1 as the face of the fireplace may be decorated to simulate brick, tile or the like, or may even actually be of such materials overlaying a timbered wall which forms part of the framework supporting the bed-spring frame **16**.

When the bed is open for use the moldings **8**, **8** appear as front supports for the bed and the interior of the shell above the bed level may contain conveniences such as shelves, recesses such as **10** or drawers or the like as part of its content.

In each end of the shell are situated the "paddles" **6**, **7** which are so controlled by a mechanism of the invention (to be described) as to press against the bedding when the bed is folded for concealment, and thus prevent the bedding **5** from being displaced in the closing and closed attitudes.

Nested beneath the bed-spring assembly **16** is a tray-shaped member which forms a recess having a back wall **11** attached to side walls **11'** and hinged by mechanisms **12**, **13** and **14** at each side wall **11'** so that it can move freely between forward and rearward positions. The opening **15** in the back rail of the bed frame limits rearward movement of the tray. When the bed assembly is folded for concealment this tray is moved backward automatically by gravitation. In this way the fireplace recess is increased in depth to give the impression of a deep hearth, but when the bed is down, the tray falls forward and downward with the bed frame and thus increases the clearance between its back **11** and the bed-spring **16** so as to allow the springs to sag without fouling against the back **11**. This arrangement of a hearth aperture having in effect a telescoping rear portion enables the whole structure to be made more shallow in depth than would otherwise be possible. Each hinge block **12** may have an abutment to engage hinge link **13** when the tray is in rear vertical attitude so as to limit its movement backwardly, thereby not relying wholly upon the limits of aperture **15** to act as a stop. Ample clearance is provided for the fire grate **4** in either positions of the bed assembly as will be gathered from an inspection of Figs. 4 and 5. The pivot points of link **13** cause the tray to drop back by gravity.

The fireplace front of the assembly is integral with the side rails of the bed, one of which forms part of a mantle top when the bed is folded. The remaining portion of the mantlepiece is the top rail of the shell **1**.

Up to this point the main feature of novelty disclosed is that of the telescoping hearth. The rest of the aspect somewhat resembles similar folding beds of the prior art. At this point, however, similarity to prior art ends and the featured means for actuating the bed through its attitudes from closed to open and back again is now discussed.

It is desirable to have a structure of this type so designed that the operation of opening and closing the bed can be performed easily by a small or weak person without undue expenditure of effort, and with a minimum of operations.

In prior art concepts various ropes, cables, and/or counterweights have been employed to aid in insuring a smooth operation of the opening and closing mechanisms. These devices frequently fail and moreover often jam for the reason that they involve unequal strain efforts upon the framework, and these strains are usually on top portions and/or ends or corners so that they tend to pull the assembly out of shape after a time and the user has trouble opening and closing the assembly.

According to the present invention these ropes, pulleys and moving counterweights have been replaced by cantilever systems, that is, by the use of pivot mountings which are positioned to balance the moving parts, sometimes with the aid of compensating springs where an exact balance is desirable.

In a further aspect, this cantilever arrangement is supplemented by a toggle action whereby the cantilever system can be locked in the closed attitude without the use of latching devices, and whereby they unlock themselves as soon as the system is urged to move outwardly toward the position of use as a bed. These features will become evident by inspection of the drawings, particularly Figures 6 to 12 inclusive.

In Figures 6, 7 and 8 it is seen that the bed framework including the portion forming the front of the fireplace is pivoted at **26** on a forward portion of each of the wings or side wall extensions of the shell **1**.

When the bed is nearly closed the cantilever formed by the two parts of the bed lying on each side of the pivot and the spring arrangement are substantially in balance, but as the bed swings outward this balance tends to become impaired for the reason that the pivot is not at the centre of the gravity of the assembly when in the horizonal attitude. The pivot block **27** has an L-shaped portion and at **28** and **29** a spring linkage is fixed and acts as a tether for a chain linkage **31** (about which more will be said later) and a spring **32** is attached to this tether by way of a selected link in the chain **31**. The other end of the tension spring **32** is fastened to a point on the end rail of the bed near the outer end. Inspection of Figures 6, 7 and 8 in turn will disclose that when the bed is closed the spring and tether act like a toggle and helps to open the bed for the reason that the force of the tension spring **32** is acting from a point above and outwardly of the pivotal point.

A foot member **8** is pivoted at **18** and when associated with spring **33** and chain **31** also becomes part of a centilever system. The length of the chain **31** is adjustable by a turn knuckle **39**. As the bed swings outwardly the cantilever system **45**, **18**, **46** swings about its pivot under the control of chain **31** and spring **33** so that by the time the bed frame has reached a horizontal attitude, the support foot **8** has reached an attitude normal to that which it presented when the bed was in the closed attitude.

Owing to the tolerances which it is necessary to countenance when manufacturing an article, it is desirable to allow the leg member **8** a small amount of controlled side play. Figure 10 shows a section through a leg **8** and a fragment of the bed frame to which it is pivoted. The pivot bolt **18** and nut **19** are not tightened up firmly but are restrained by spring **20**. An edge of the leg member **8** is set in past the side wall of the shell **1** to make a neat fit of the molding effect shown in Figure 1 and the slight easement of the pivot action provided by the spring **20** enables the leg **8** to seat itself in the side

wall even if, over a period of time, the woodwork of the casing changes its dimension slightly, as these constructions usually do in spite of careful selection and preparation of raw materials.

It will be noted in Figure 11 that the seat of the pivot **26** is slightly offset. This is done merely to assure that the pivot seat has an ample bearing surface. This seat is slotted to facilitate assembly.

An advantageous feature of the slotted seat is that the bed frame can be readily removed from the shell as occasion may require. Obviously it also facilitates assembly of the bed frame in the shell.

My invention also contemplates means for preventing the bed clothing from becoming displaced when the bed is folded away for concealment.

When the bed is "made up" after use and presents the appearance such as that depicted in Figure 2, there is usually a blanket folded at one end and there may be a pillow set (not shown) at another end. These articles as well as the bed coverings and even the mattress itself will tend to crumple up when the bed frame is folded unless some means is provided for restraining them. This means should desirably function automatically in synchronism with the folding action, and to achieve this object it must be integrated with the chosen arrangement for moving the bed structure from one attitude to another.

In the present case the bed is pivoted to act like a cantilever and a means has been devised which functions dependently upon the position of the inner arm of the lever to move a paddle so as to cause the latter to press against the end of the bed coverings while the bed is being folded and to retain this pressure while it is folded. It is further devised that when the bed is unfolded, the paddle retains pressure against the bedding until after the bed has reached an angle whereat the risk of the bedding crumpling is removed and then, as the bed falls to its final horizontal attitude, the paddle retracts into a recess in the shell.

The paddles, one at each end of the bed are shown in retracted position at **6, 7** in Figure 2 and details of the actuating mechanism for the paddles are evident from inspection of Figures 6, 7, 8 and 9.

Looking now at one of these paddle systems we have a paddle **7** supported crosswise of the bed and hinged at **37** on a transverse axis intermediate of its length. The hinge has a pintle **36** on which paddle pivots. An actuating arm **35** carrying the hinge pivot or pintle **36** at its outer end, is pivoted on the end rail of the bed about half way between the pivot **26** and the inner edge of the bed frame. One end of paddle **7** is weighted as at **37'** so that the paddle will swing on the pivot **36** to a substantially vertical position as the bed is pulled down for use.

Spring **34** is positioned above the pivot and has one end fastened at point **52** and the other fixed to a point on the block **27** near the anchor point **47**.

A chain anchor block **42** is mounted on the rear side part of the shell **1** about half way up from the bottom, and a motion limiting leash **41** attached between anchor **42** and point **43** on the paddle support arm **35** limits the forward motion (as shown in Fig. 8) of the arm **35** and at this point in the downward movement of the unfolding bed, the paddle leaves the surface of the bedding while the bottom arm of the cantilever, that is, the rear portion of the bed, moves upward carrying paddle support arm **35** with it. This shifts the relation between the anchor points of spring **34** and the pivot **38** so that the chain leash **41** now starts to urge the arm **35** backward into the recess of shell **1** and the paddle **7** then nests itself within the shell as shown in Figs. 2, 3 and 6.

When the bed starts to fold, the back portion of the bed recedes downward until the position of Fig. 8 is again reached whereupon the paddle is pulled forward by spring **34** to the limits of chain leash **41**. Further movement to close the bed causes tension on spring **34** to increase and press the paddle **7** against the bed clothes. As the bottom portion of the bed drops to the final position for a vertical attitude, the spring **34** remains tense but the chain **41** relaxes and the paddle conforms to the surface of the bedding holding it firmly in place.

It will be evident that a similar toggle action takes place in the case of the paddle support arm as was noted in the case of the bed frame counter-balancing, and these two toggles work simultaneously being interlocked in their action because they have one common contributing change in motion—that invoked by the cantilever pivoting of the bed and the "double joint" present in the joint action of the two pivots **26** and **38**. Pivot **38** may be said to rotate about pivot **26**.

Figure 9 shows an end view of the paddle **7**, support and actuating arm **35** and the end rail **17'** of the bed and the means **38** for pivoting the arm **35** on the rail **17'**.

The mechanism shown in Figures 6, 7 and 8 and 9 are of course also duplicated on the other end of the bed and they operate in unison.

A part of the recess in shell **1** may desirably contain a weight mass **50** in the region **51**. This steadies the shell and tends to prevent it from tipping forward when the bed is being unfolded. The weight mass **50** may be made up of ordinary house bricks or other suitable weighting material.

An important feature of a fireplace whether real or simulated is the hearth aperture. This should be as deep as possible in order to enhance realism. However since the bed spring must be given space in which to sag with the weight of an occupant, a fire hearth to be associated with the present construction, or one similar to it, must be capable of being telescoped in some way if the closed attitude of the assembly is to avoid being made unwieldy.

Figures 4 and 5 more clearly show how this telescoping action has been achieved in the present construction. The fire place is comprised of two main parts, and this arrangement was briefly described earlier in the specification, but it will be noted that the moveable section generally denoted by the numeral **53** and earlier described as a tray is approximately in line with pivot **26** so that as the bed swings one way or the other the tray **53** can oscillate about the links **13** cantilever-fashion and can telescope on fireplace frame **25** under the action of gravity. It will be gathered that since the upper pivot points of links **13** are located rearwardly of dead centre of the lower pivot points of the links at all times, the tray **53** automatically swings backward when the bed is raised on pivots **26**. Since grate assembly **4** is desirably a moveable object (to facilitate house cleaning) it may not always be ideally located and the freedom provided by the double jointed mounting of the tray **53** is therefore an important feature in the construction since it always insures that the inner tray part **53** will always telescope when the bed is lowered so as not to foul the bed spring and will always return again to a deep cavity attitude when the bed is raised to its closed position.

It will be evident from what has already been said about the cantilever structure of the bed frame that the bed may be lowered and raised with little effort on the part of the user. This is brought about by the novel arrangement at each end of the bed of the chain **31**, springs **32, 33** and **34** as well as the leash **41**. In the unfolding operation of the bed, the bed frame (denoted as a whole by the numeral **54**) is pulled down manually to swing on the pivots **26**. As the bed is swung away from its vertical closed position the springs **32** and **33** function to aid in counteracting the downward gravitational stress of the bed in the down movement.

In functioning, the springs **32** and **33** shift their points of stress from the short chain loop **29** to the long stretch of chain **31** including the section **28**. Section **28** is the part of chain **31** which extends from the connecting

point 44 of chain loop 29 to the point 47 at which this chain is fastened to the top of the L-part of block 27. Connecting point 47 is above and at the inner side of pivot axis 26. Chain loop 29 is also connected to the L-part of block 27 but at a point 48 which is lower and nearer to the pivot axis 26 than point 47. This arrangement has the advantage that the springs do exert an opening force on the bed in its fully closed position. In the lowering of the bed the legs 8 are swung to unfolded positions by the action of the chains 31. The spring 34 also comes into action to aid in balancing the lowering of the bed when the leashes 41 are pulled taut. The unfolding action of the bed is simple and positive and the cantilever system allows the bed to rest firmly on the floor. It might be mentioned at this time that panels 55 are attached to the ends of the bed frame to conceal the springs 32, 33 and the chain 31 as well as the upper part of legs 8.

It should now be evident that my invention provides a folding bed having advantageous new features wherein the pivotal points of the system are philosophically shifted with each change in centre of gravity as the attitude of the bed is changed, yet the physical positions of the actual pivots are firm in their respective fittings, affording a very practical article of manufacture which is completely self adjusting and automatic in use; every necessary function connected with the folding and concealing and the unfolding for use is effected by the application to the system of one single urging force.

Minor modifications of the described construction will occur to those skilled in the art and the exemplified embodiment is not to be regarded as limiting the scope of my teachings as defined in the appended claims.

What is claimed is:

1. A folding bed arrangement of the character described comprising an upright shell having enclosing walls and a frontal opening, said walls defining a storage chamber for a bed when the bed is swung from a normal horizontal attitude to a vertical storage position, said frontal opening serving to admit the bed, said bed including a bed support structure, a mattress, and bed clothing; said bed support structure being pivoted in said shell rearwardly of the central vertical plane of the horizontal bed whereby said bed supporting structure assumes the form of a cantilever having an inner short arm and an outer long arm, said inner short arm being swingable inwardly and said outer long arm being swingable outwardly when said bed is swung from its vertical closed position to its open horizontal position, said pivotal connection of the bed supporting structure forming a part of a folding and restraining mechanism comprising a tensioned coil spring having an outer end attached to said bed supporting structure at a point on said outer long arm of the cantilever remote from said pivotal connection and at the inner side of a vertical plane containing the pivot axis of the bed when the bed is closed, said spring extending inwardly to terminate in an inner end short of said pivotal connection, a first flexible element connecting said inner end of the spring to said shell at a point inwardly of and slightly above said pivotal connection, and a second flexible element connecting said inner end of the spring to said shell at a point slightly above said pivotal connection and substantially in a vertical plane containing the pivotal axis of this connection, whereby in the lowering of the bed the direction of the moment of the spring force exerts an initial opening force and then counters the major portion of the opening movement of the bed.

2. A folding bed arrangement of the character described comprising an upright shell having enclosing walls and a frontal opening, said walls defining a storage chamber for a bed when the bed is swung from a normal horizontal attitude to a vertical storage position, said frontal opening serving to admit the bed, said bed including a bed support structure, a mattress, and bed clothing; said bed support structure being pivoted in said shell rearwardly of the central vertical plane of the horizontal bed whereby said bed supporting structure assumes the form of a cantilever having an inner short arm and an outer long arm, said inner short arm being swingable inwardly and said outer long arm being swingable outwardly when said bed is swung from its vertical closed position to its open horizontal position, said pivotal connection of the bed supporting structure forming a part of a folding and restraining mechanism comprising a tensioned coil spring having an outer end attached to said bed supporting structure at a point on said outer long arm of the cantilever remote from said pivotal connection and at the inner side of a vertical plane containing the pivot axis of the bed when the bed is closed, said spring extending inwardly to terminate in an inner end short of said pivotal connection, a first flexible element connecting said inner end of the spring to said shell at a point inwardly of and slightly above said pivotal connection, a second flexible element connecting said inner end of the spring to said shell at a point slightly above said pivotal connection and substantially in a vertical plane containing the pivotal axis of this connection, whereby in the lowering of the bed the direction of the moment of the spring force exerts an initial opening force and then counters the major portion of the opening movement of the bed, a leg pivoted to the distal end of said outer long arm of the bed support structure to swing between folded and unfolded positions, and a flexible member connecting said leg to at least one of said flexible elements and operative to unfold said leg while the bed is being lowered for use.

3. A folding bed arrangement of the character described comprising an upright shell having enclosing walls and a frontal opening, said walls defining a storage chamber for a bed when the bed is swung from a normal horizontal attitude to a vertical storage position, said frontal opening serving to admit the bed, said bed including a bed support structure, a mattress, and bed clothing; said bed support structure being pivoted in said shell rearwardly of the central vertical plane of the horizontal bed, whereby said bed supporting structure assumes the form of a cantilever having an inner short arm and an outer long arm, a paddle arranged transversely of said bed to overlie said bed coverings, an upright actuating arm pivoted at a lower end to said short arm of said bed supporting structure, said actuating arm extending upwardly from said pivoted connection and being hingedly connected to the medial section of said paddle, resilient means pressing said actuating arm toward said longer arm of said bed support structure to cause the paddle to bear on the bed coverings, and restraining means having a connection with said shell for reversely turning said actuating arm about its pivot as said bed is swung down to horizontal attitude.

4. A folding bed arrangement of the character described comprising an upright shell having enclosing walls and a frontal opening, said walls defining a storage chamber for a bed when the bed is swung from a normal horizontal attitude to a vertical storage position, said frontal opening serving to admit the bed, said bed including a bed support structure, a mattress, and bed clothing; said bed support structure being pivoted in said shell rearwardly of the central vertical plane of the horizontal bed, whereby said bed supporting structure assumes the form of a cantilever having an inner short arm and an outer long arm, a paddle arranged transversely of said bed to overlie said bed coverings, an upright actuating arm having a lower end pivoted to said short arm of said bed supporting structure to swing in a plane transversely of said bed to and away from the centre line of said bed, a hinge bar carried by the upper end of said actuating arm to overlie said bed coverings, means hingedly connecting said hinge bar to the medial portion of said

paddle, resilient means pressing said actuating arm toward said longer arm of said bed supporting structure to cause said paddle to bear on said bed coverings, and restraining means connected to said shell for reversely turning said actuating arm about its pivot as said bed is swung down to horizontal attitude.

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