The present invention relates to beds that are adapted to be swung between an upright idle position and a horizontal position for use, and has for its object to produce a simple and novel supporting mechanism which will permit easy operation of the bed without the use of heavy counterweights or counterpoising means of any kind other than a comparatively small spring or springs.

In its various forms my invention is applicable to beds mounted on a stationary base or on a base provided with casters that will permit the bed to be moved about with the base when in its elevated position. When a bed is mounted so as to permit it to be moved about from place to place it is highly desirable that the total weight be reduced to a minimum. Therefore, viewed in one of its aspects, the present invention may be said to have for its object to produce a simple and novel bed construction of very little greater weight than an ordinary bed, in which the bed proper may be swung into an upright position and be moved about from place to place while in that condition.

The various features of novelty whereby my invention is characterized will hereinafter be pointed out with particularity in the claims; but, for a full understanding of my invention and of its objects and advantages, reference may be had to the following detailed description taken in connection with the accompanying drawings, wherein:

Figure 1 is a side view of one of my improved beds occupying its horizontal position for use as a bed; Fig. 2 is a central vertical section through the bed swung into its vertical position; Fig. 3 is a section taken on line 3—3 of Fig. 1; Fig. 4 is an edge view of a fragment of the connecting rod by means of which portions of the head and foot of the bed are shifted; and Fig. 5 is a schematic view illustrating a modified form of mechanism.

Referring to Figs. 1 to 4 of the drawings, 1 represents a bed frame having a foot end 2 and mounted at the head end on a wheeled base 3. There are two pairs of swinging supports between the frame and the base, corresponding supports being geared together so that when the foot end of the frame is raised or lowered, one pair of supports swings faster than the other pair. Tension springs are arranged between each support and the corresponding support of the other pair, tending to draw them together. Therefore, when the foot end of the bed is lifted, the springs assist this lifting operation, making it easy to swing the frame into an upright position. When the bed is again lowered, the tension of the springs is increased, largely by the action of gravity on the bed frame. In other words, the disposition of the parts is such that through the employment of comparatively small tension springs a substantially balanced structure is obtained, permitting the bed to be swung up and down with very little effort. One pair of supports consists of two arms 4 and 5 underneath opposite sides of the frame; the upper ends of the arms being pivoted to the frame as indicated at 6, and the lower end of each arm being fixed to or forming part of a gear segment 7 rotatably mounted on the base as indicated at 8. The other pair of supports consists of two arms 9 and 10 placed at opposite sides of the base and each fixed to a gear segment 11 mounted on the base to oscillate or rotate, as indicated at 12. The free ends of the arms 9 and 10 are connected to the frame by links 13. Between the arms 4 and 9 and between the arms 5 and 10 are springs 14 that are under more or less tension when the two sets of arms are approximately parallel as they will be when the bed is swung into a vertical position as shown in Fig. 2. The gear segments 7 are of larger radius than the segments 11 so that, since each of the segments 7 meshes with the corresponding segment 11, an angular movement of the segments 7 is accompanied by a more rapid angular movement of the segments 11. Consequently, when the bed is swung down from the vertical position shown in Fig. 2 the arms 4 and 5 must swing backward and the arms 9 and 10 forward, stretching the springs 14. Then, when it is desired again to raise the bed, the tendency being to swing the frame about the pivotal connection 6 between the frame and the arms 4, and to pull up on the ends of the arms 9 and 10 by means of the links 13, the springs 14 are permitted to apply the energy stored up therein to swing the arms 9 and 10 in the directions in which they tend to go, therefore assisting in lifting the bed. In other words, each of the arms 9 and 10, with the corresponding link 13, forms a toggle that is straightened as the bed swings up, partly through the direct lifting action of the bed and partly through the action of the springs. Since the arms 9 and 10 are geared to the arms 4 and 5, the latter must swing forward as the arms 9 and 10 swing back. Therefore the pivotal supporting axis of the
bed is drawn forward on the base as the bed moves to a vertical position, and is again swung back when the bed is swung down. Therefore the base lies entirely underneath the bed when the latter is in its horizontal position and, in the act of raising the bed, it is swung forward on the base so as to be brought over the center of the same and give stability to the structure when it is pushed about on its casters.

Beds of this type should have as little depth as possible when they are raised, and to this end I have provided means for holding in a portion of the foot end of the bed and also a portion of the head. The foot end or section of the bed is made in two parts, the lower part 16 being hinged, as indicated at 17, to the lower end of the upper part for swinging movements about a horizontal axis. Extending along the inner side of one of the side members of the bed frame is a connecting rod 18 slideable in the direction of the length of the bed, and connected to the swinging foot section by means of a link 19. When the connecting rod is moved in one direction, it swings the part 16 underneath the bed.

Above the head end of the bed is a head portion consisting of a stationary lower section 20 and an upper section 21 hinged to the lower section, as indicated at 22, for swinging movements about a horizontal axis. A lever 23 is hinged between its ends to one side or end of the head section 20. One end of this lever is joined to the connecting rod 18 by means of a link 24. There is a slot 25 extending lengthwise of the lever arm toward its free end. A pin 26 on the swinging head section 21 extends through the slot 25. The arms are so proportioned that when the connecting rod is moved in one direction, it swings the movable head rest section into a position parallel with the bed frame, namely at right angles to the stationary head section. This movement of the head section is synchronous with that of the foot section. Furthermore, all of the elements are so co-ordinated that the swinging of the movable head and foot sections into positions parallel with the bed frame occurs during the upward swinging movement of the bed, these sections being returned to their normal positions at right angles to the plane of the bed frame when the bed frame is lowered; this being brought about by introducing between the connecting rod 18 and one of the links 19 a link or strut 30, one end of which is pivoted to the connecting rod, as indicated at 31, while the other end is provided with a pin 32 extending into a slot 33 elongated in the direction of the length of the link 13. Consequently, when the bed is swung up, the connecting rod is drawn toward the head end, causing the movable foot section and the movable head section to be swung inwardly, until ultimately they occupy positions parallel to the bed frame as shown in Fig. 2. It will be seen that space is left between the bed frame and the movable head section, when the bed is upright, to accommodate the bedding.

In the construction heretofore described, the bed is shifted backwards bodily, head end first, as it is lowered. This is advantageous, in the case of a roll away bed, in that the wheeled base or truck is carried well underneath the bed when the latter is opened; but, in the event that it is desired to mount the bed on a stationary base as, for example, in a closet, a bodily shifting movement of the bed in the opposite direction is required, so as to carry the bed out of the closet when it is opened; and return it to the closet when it is raised.

In Fig. 5 I have illustrated a modification of my improved supporting means, whereby the proper shifting movements may be obtained in cooperation with a bed adapted to be housed in a closet or the like when not in use. Referring to this figure, 40 represents the bed frame, and 41 and 42 represent supporting arms corresponding respectively to the arms 4 and 9 or the arms 5 and 10 of the other form. Both of these arms are jour-nelled on the same shaft 43, thereby swinging about the same axis instead of about axes spaced apart from each other. The arm 41 has fixed thereto a gear segment 44, whereas the arm 43 has on it a gear segment 45; both of these segments having their centers at the pivotal axis of the arms. The segment 44 is of greater radius than the segment 45 and meshes with a toothed wheel or segment 46 fixed to a shaft 47 parallel with the shaft 45. Also fixed to the shaft 47 is a second segment or toothed wheel 48 of larger radius than the member 46 and meshing with the segment 45.

It will thus be seen that if either the arm 41 or the arm 42 is moved angularly, the other arm must also move angularly but at a different speed.

The arm 42 is connected to the frame by a link 49, while the arm 41 is pivoted directly to the frame, as indicated at 50. A tension spring, 51, extending between the arms serves the same purpose as the springs 14 in the other form.

It will be seen that if the bed is horizontal as shown in full lines as Fig. 5 and its right hand end is lifted, there is a tendency to swing the arm 42 up, this tendency being aided by the spring 51. However, as the arm 42 rises, the arm 41 must swing toward the left, causing the entire bed to be swung bodily toward the left so that when it reaches its vertical position, the bed lies well toward the left of the position occupied by the head end when the bed is horizontal.

In this form of my invention, as in the other, the supporting arms are geared together so that when one moves angularly the other must also move, but at a different speed;
the counterpoising of the bed being effected by a spring or springs, adding but little to the weight of the structure.

While I have illustrated and described with particularity only two preferred forms of my invention, I do not desire to be limited to the exact structural details thus illustrated and described; but intend to cover all forms and arrangements which come within the definitions of my invention constituting the appended claims.

I claim:

1. The combination with a bed adapted to be swung between a horizontal position and an upright position, of two swinging arms at one end of the bed, the arm farthest from the opposite end being pivoted to the bed, a link between the other arm and the bed, gearing between said arms causing the latter arm to swing faster than the other arm when the free end of the bed is raised or lowered, a support for said arms and a tension spring between said arms.

2. In combination, a member to be supported, a support, two swinging arms on said support one of said arms being pivoted to said member, a link between the other arm and said member, and a gear connection between said arms.

3. In combination, a member to be supported, a support, two swinging arms on said support, one of said arms being pivoted to said member, a link between the other arm and said member, and gearing between said arms proportioned to cause them to swing at different angular speeds when either is moved.

4. In combination, a member to be supported, a support, two swinging arms on said support, one of the arms being pivoted to said member, a link between the other arm and said member, a gear connection between said arms proportioned to cause them to swing at different angular speeds when either is moved, and a spring between said arms tending to draw them together.

5. In combination, a bed having a supporting means at one end, two swinging arms at the other end of the bed, a support for swinging arms, one of the arms being pivoted to the bed, a link between the second arm and the bed, gearing between said arms causing them to swing relatively toward each other when the first end of the bed is raised, and a spring between said arms tending to draw them together.

6. The combination with a bed adapted to be swung between a horizontal and an upright position, of supporting and counter-balancing means for one end of the bed comprising a support, two swinging elements mounted on said support and geared together, connections between said swinging elements and the bed, and a tension spring between said elements.

In testimony whereof, I sign this specification.

CHARLES LEE MACINTOSH.