

June 16, 1953

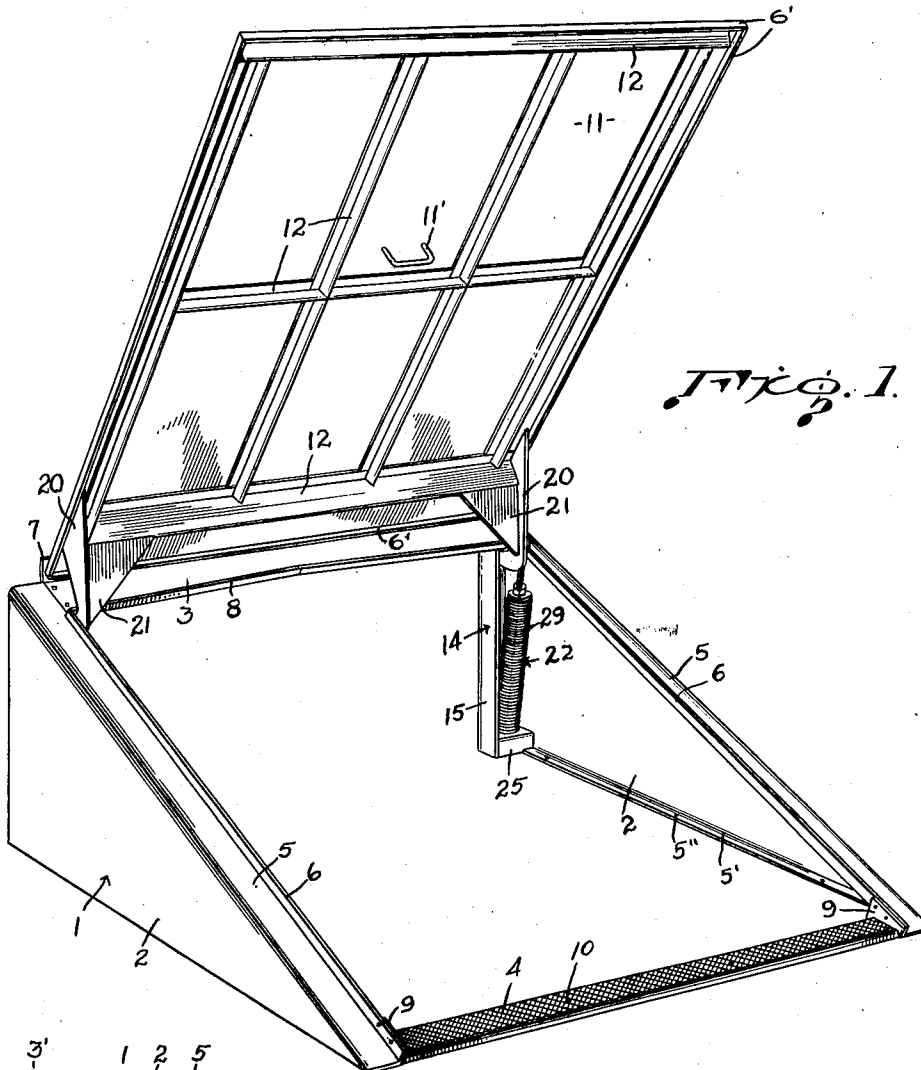
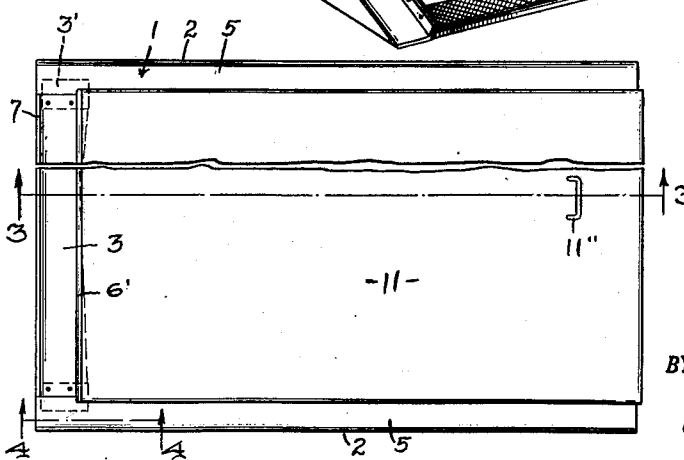
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COUNTERBALANCING SPRING HINGE

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3 Sheets-Sheet 1



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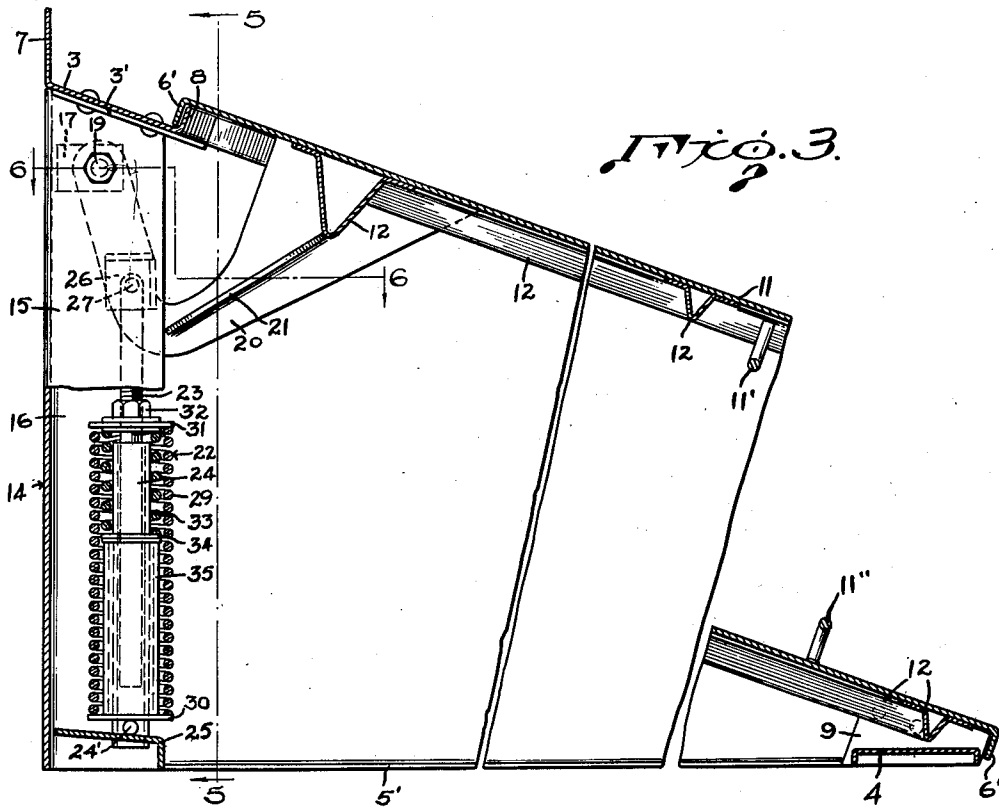
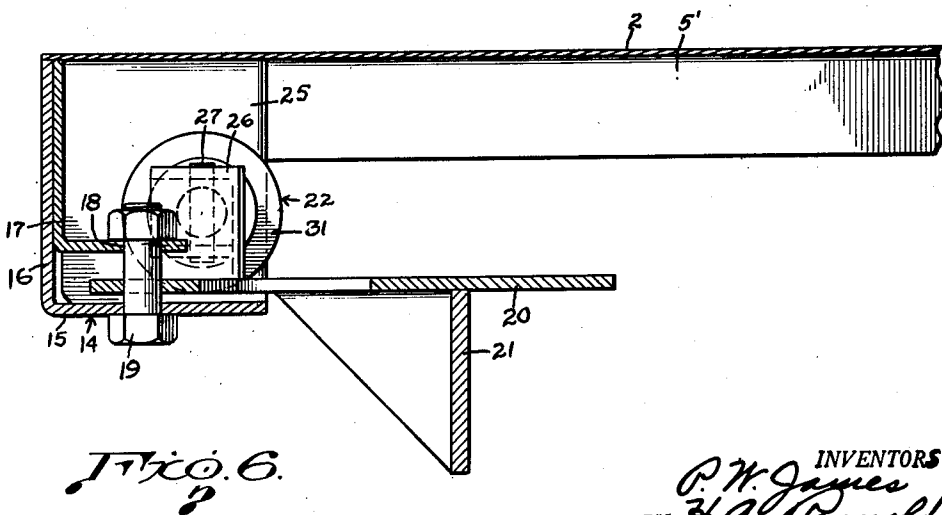
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3 Sheets-Sheet 2



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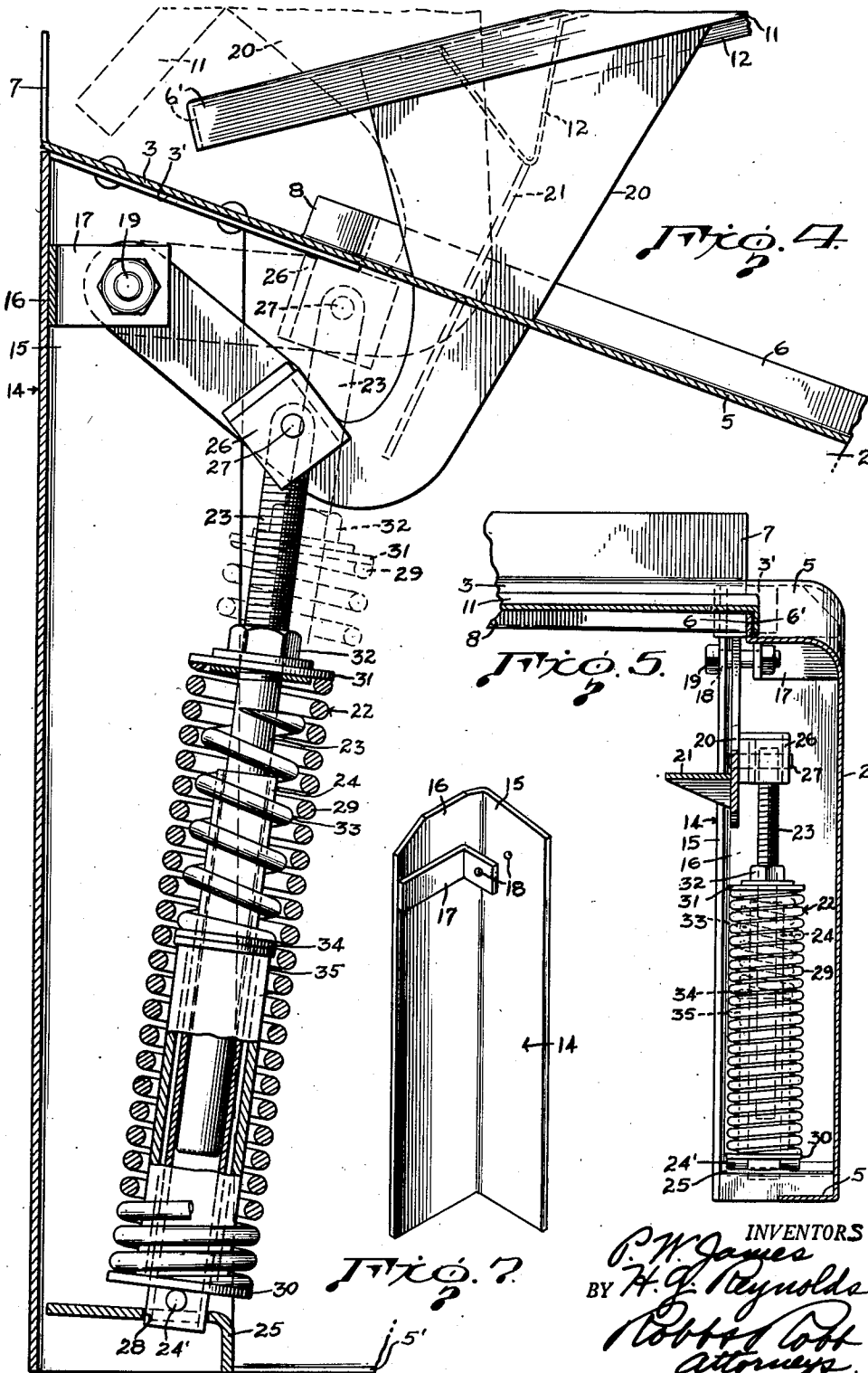
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UNITED STATES PATENT OFFICE

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COUNTERBALANCING SPRING HINGE

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3 Claims. (Cl. 16—135)

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The present invention relates to closures and improved hinge means therefor, and more particularly to closures of the type utilized as cellar doors, bulkhead doors, or other hatchway doors, and to an improved spring hinge assembly therefor which is adapted to balance the weight of such closure members to facilitate opening and closing thereof.

Ordinarily, closures of the above-mentioned type are bulky and heavy, and require the exertion of considerable force to open or close the same. This is extremely disadvantageous when they are being opened from within, since, in many instances, closures of this type assume a substantially horizontal position when closed, and must be approached on an inclined stairway, making it quite awkward or impossible for a person to apply any substantial lifting force at the extreme free end of the closure, where the advantage of leverage is greatest.

It is an object, therefore, of the present invention to provide a hinge assembly for closures which substantially balances the dead weight of the closure.

Another object is to provide an improved spring hinge assembly for closures, which substantially balances the dead weight of the closure throughout the entire arc of swing of the closure from a fully closed position to a fully opened position.

A further object is to provide an improved spring-hinge assembly for cellar doors, bulkhead doors, hatchway doors, and the like, which tends to urge the door continually from a fully closed position to a fully opened position, and which requires a minimum of physical exertion to effect initial opening of the door from a fully closed position.

Still another object is to provide an improved spring-hinge assembly for closures, including a plurality of springs which are adapted to successively exert increasing pressure against the door tending to open the same as the door is closed, thereby compensating for the increasing mechanical advantage of leverage gained by the door as it is closed.

Other objects and advantages of the invention will be hereinafter described and the novel features thereof defined in the appended claims.

In the drawings:

Figure 1 is a perspective view of a cellar door or hatchway assembly made in accordance with the present invention, the closure being shown in a fully opened position;

Figure 2 is a top plan of the cellar door assem-

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bly of Figure 1, with the closure in a fully closed position;

Figure 3 is an enlarged view in vertical section, as taken on the line 3—3 of Figure 2, with a portion of the spring-hinge assembly broken away for clarity;

Figure 4 is an enlarged fragmentary view in vertical section, as taken on the line 4—4 of Figure 2, with certain of the parts shown in elevation;

Figure 5 is a fragmentary view in vertical section, as taken on the line 5—5 of Figure 3;

Figure 6 is an enlarged fragmentary view in horizontal section, as taken on the line 6—6 of Figure 3; and

Figure 7 is a detail view in perspective of one of the hinge pin supporting members of the assembly.

Like reference characters designate corresponding parts in the several figures of the drawings, wherein 1 generally denotes a frame of a cellar or hatchway door assembly made in accordance with this invention, said frame comprising a pair of generally triangular-shaped vertical side walls 2, and transversely extended header and sill plates, respectively designated 3 and 4. The upper edges of the side walls 2 are turned laterally towards each other, as at 5, and thence upwardly to form a marginal flange 6 thereon. The base of each side 2 is provided with an inwardly directed flange 5' adapted by means of a plurality of fastener-receiving holes 5'' for attachment to a suitable supporting structure (not shown). The header 3 interconnects the rear ends of the sides 2 of the frame 1, and is secured thereto at its opposite ends by means of a connecting plate 3' which is secured to the header 3 by means of a number of rivets, bolts or the like, and for purposes of assembly, is spot welded or otherwise suitably secured beneath the section 5 of the side walls 2. The rear edge of the header 3 is provided with a vertically disposed flange 7 for abutment with the building structure (not shown) with which the cellar door assembly 1 is to be associated, and the forward edge of the header is provided with a second flange 8 disposed at right angles to the header and diverging outwardly towards the sides 2 of the frame where the flange 8 abuts the flanges 6 at its opposite ends. The sill 4 interconnects the forward ends of the side walls 2, and is connected thereto at its opposite ends by means of vertical end plates 9. This sill is preferably of inverted channel section, and is suitably roughened on its upper face to prevent a person pass-

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ing through the doorway from slipping thereon. The sill 4 is also provided with a plurality of fastener-receiving holes 10 for securing the complete assembly 1 to the supporting structure (not shown).

A closure member 11 for the opening defined between the respective sides 2 and the header and sill plates 3, 4 of the frame is pivotally connected to the frame by an improved hinge assembly hereinafter particularly described in detail. This closure member 11 is preferably made of sheet metal on the order of approximately 16-gauge, and on its inner and outer faces is provided with suitable handles as at 11' and 11''. A number of transversely and longitudinally extended reinforcing ribs 12 are suitably secured to the inner face of the closure 11, and the marginal edges of the closure are turned downwardly at right angles, as at 6', for overlapping the flanges 6 and 8 about the open frame 1, thereby effecting a seal or shed against ingress of rain, water, wind and the like.

Passing now to the hinge assembly, a vertically extended, L-shaped supporting member 14 is suitably secured, as by welding, at the rear edge of each of the side walls 2 of the frame 1, with one side 15 of member 14 disposed in parallel, spaced relation to its adjacent side 2. The other side 16 of the supporting member 14 is provided with an L-shaped bracket 17 fixed thereto adjacent the upper end thereof, a portion of the bracket 17 being disposed in parallel spaced relation to the side 15 of the support 14 as best shown in Figure 6. The opposed portions of the bracket 17 and the side 15 are provided with horizontally aligned openings 18 for mounting a hinge pin or bolt 19 therethrough. A substantially U-shaped hinge arm or bar 20 is pivotally mounted at one of its ends on the pin 19, and at its opposite end, the hinge arm 20 is secured to the door or closure 11 and to the adjacent end of the rearmost reinforcing member 12, as by means of welding or the like, the rearmost member 12 serving to maintain the portion of the door or closure 11 to which the hinge arm 20 is attached, substantially rigid and inflexible. A strengthening plate or gusset 21 is preferably welded in the angle between the reinforcing member 12 and the hinge bar 20 for affording additional support and rigidity to the connection.

Resilient means generally designated at 22 is provided for urging the closure 11 away from the opening in the frame 1. This resilient means 22 includes a screw-threaded rod 23 which is telescopically engaged by a sleeve 24, this telescopic rod and sleeve assembly 23, 24 being pivotally mounted between the hinge bar or arm 20 and an abutment plate 25 fixed at the lower end of the supporting member 14. The rod 23 is pivotally connected to the hinge arm 20 by means of a laterally extended bracket 25 and a pivot pin 27, and the lower end of the sleeve 24 is passed through an opening 28 in the abutment 25 and is pivotally positioned in said opening by means of a transversely extended pin 24' of sufficient length to span the opening 28 so as to rest upon the upper face of the plate 25.

An outer resilient compression spring 29 surrounds the telescopic assembly 23, 24 and is interposed between a pair of spaced seats 30, 31. The seat 30 is operatively positioned against the transverse pin 24' in the sleeve 24, and the seat 31 is adjustably positioned on the rod 23 by means of an adjusted nut 32. A second inner

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resilient compression spring 33 also surrounds the telescopic assembly 23, 24 in coaxial relation to the first spring 29, and is preferably supported at one of its ends by means of an intermediate or third spring seat 34, which is carried by one end of an outer sleeve 35 surrounding the inner sleeve 24 of the telescopic assembly 23, 24. The end of the sleeve 35 remote from the third seat 34 is supported on the spring seat 30. The second spring 33 is preferably of such length that it is compressible between the seats 31, 34 only when the closure 11 is moved past a predetermined point towards the opening in the frame 1. Thus, the spring 33 is only effective for a portion of the movement of the closure 11 away from the opening in the frame and is inactive or spent for the remainder of this movement, but the first spring 29 is continually effective throughout the movement of the closure 11 in either direction.

The relative position of the seats 30, 31 may be adjusted experimentally by means of the adjuster nut 32, and, by using outer sleeves 35 of varying lengths, the relative position of the seats 31, 34 may be varied, thereby varying the combined expansive force of the springs 29, 33 to suit the requirements for closures of different sizes and weights. Then, if desired, these parts may be "frozen" in adjusted position by spot welding or the like.

The operation of the hereinbefore described cellar door construction and hinge is as follows:

Assuming the closure 11 to be in a fully closed position, as in Figures 2, 3 and 5, it will be seen that both the first and second springs 29, 33 are compressed between the opposed seats 30, 31 and 31, 34, respectively. Therefore, the combined force of these springs tends to urge the closure 11 away from the opening in the frame 1. As best seen in Figure 3, when the closure 11 is in a fully closed position, the axial center line of the telescopic members 23, 24, and thus the center line of thrust of the springs 29, 33, is at an angle slightly forward of the dead-center line between the pivot pin 24' and hinge pin 19. Accordingly, the springs 29, 33 are exerting their full force against the closure tending to urge it open, but the expansive force is preferably so adjusted, as hereinbefore described, that the dead-weight of the closure slightly overbalances the force of the springs. Thus, it requires only a slight physical effort on the part of a person opening the door, in addition to the force of the springs 29, 33, to move the closure 11 away from the opening in the frame. Due to the fact that the springs progressively gain a mechanical advantage of leverage as the closure 11 is moved away from the opening in the frame 1, the inner or second spring is only needed for the first portion of this opening movement of the door, and, as seen in Figure 4, the spring 33 is fully spent and no longer engages the seat 31 when the door 11 reaches the position shown in full lines in this figure. However, only substantially the same physical effort is still required on the part of a person opening the closure 11 to its fully open position represented in broken lines in Figure 4, since the outer spring still has sufficient force to substantially balance the closure due to the aforementioned mechanical advantage. It is therefore readily apparent that the physical effort required to move the closure towards or away from the opening in the frame 1 is virtually constant throughout the entire arc of swing of the closure.

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While the specific details of an illustrative embodiment of the invention have been herein shown and described, alterations and changes may be resorted to without departing from the spirit thereof as defined in the appended claims.

We claim:

1. A hinge assembly for pivotally attaching a closure to a frame having an opening therein, comprising a supporting member adapted to be attached within the frame, a hinge pin carried by said supporting member, a hinge arm pivotally mounted at one end on said hinge pin, the opposite end of said hinge arm being adapted for connection with the closure for said frame, whereby said closure may be swung open or closed, an abutment also carried by said supporting member, and resilient means interposed between said abutment and said hinge arm for urging said closure to an open position, wherein said hinge assembly includes a pair of telescopic members, one of said telescopic members being pivotally connected to said hinge arm and the other of said telescopic members being pivotally mounted on said abutment, a spring seat carried by each of said telescopic members, a support disposed about one of said telescopic members and engaged at one end with the spring seat on the latter telescopic member, said support having a spring seat at its other end disposed intermediate the spring seats on the respective telescopic members, and said resilient means comprises a pair of compression springs adapted to exert a combined force on the closure for a portion of its opening swing, while only one of said springs remains active upon the closure for the remainder of the opening swing of said closure, one of said springs being disposed between the spring seats on the respective telescopic members and the other of said springs seating on the seat on said support and extending towards the spring seat on one of the telescopic members for engagement therewith.

2. A spring hinge assembly for entrance-ways which include a frame having an opening and a closure for said opening, said hinge assembly being adapted to connect said closure to said frame and comprising a supporting member adapted to be mounted within said frame, a hinge pin carried by said supporting member, a hinge arm pivotally mounted at one end on said hinge pin and adapted to be connected at its opposite end to said closure, an abutment carried by said supporting member in spaced relation to said hinge arm, a pair of telescopic members pivotally mounted between said hinge arm and said abutment, a spring seat carried by each of said telescopic members in spaced relation to each other, a compression spring disposed between said seats for continually urging said closure away from said opening, a third spring seat intermediate the spring seats aforesaid, and a second compression spring disposed between said third spring seat and one of the first-mentioned spring seats for urging said closure away from said opening for a predetermined part of the arc of its pivotal movement while remaining inactive for the remainder of the pivotal movement of said closure, said telescopic members comprising a rod pivotally connected at one end to said hinge arm and a pair of coaxial, inner

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and outer sleeves slidable over the free end of said rod, one of the spring seats carried by said telescopic members being mounted on said rod and being adjustable lengthwise thereon, another of said spring seats being mounted on the inner of said sleeves at the end thereof remote from said rod, the intermediate spring seat being mounted at one end of the outer of said sleeves, and the opposite end of said outer sleeve seating on the spring seat mounted on said inner sleeve.

3. A spring hinge assembly for entrance-ways which include a frame having an opening and a closure for said opening, said hinge assembly being adapted to connect said closure to said frame and comprising a supporting member adapted to be mounted within said frame, a hinge pin carried by said supporting member, a hinge arm pivotally mounted at one end on said hinge pin and adapted to be connected at its opposite end to said closure, an abutment carried by said supporting member in spaced relation to said hinge arm, a pair of telescopic members pivotally mounted between said hinge arm and said abutment, a spring seat carried by each of said telescopic members in spaced relation to each other, a compression spring disposed between said seats for continually urging said closure away from said opening, a third spring seat intermediate the spring seats aforesaid, and a second compression spring disposed between said third spring seat and one of the first-mentioned spring seats for urging said closure away from said opening for a predetermined part of the arc of its pivotal movement while remaining inactive for the remainder of the pivotal movement of said closure, said telescopic members comprising a rod pivotally connected at one end to said hinge arm and a pair of coaxial, inner and outer sleeves slidable over the free end of said rod, one of the spring seats carried by said telescopic members being mounted on said rod, another of said spring seats being mounted on the inner of said sleeves at the end thereof remote from said rod, the intermediate spring seat being mounted at one end of the outer of said sleeves, and the opposite end of said outer sleeve seating on the spring seat mounted on the inner sleeve, and the second spring seating at one of its ends on said intermediate spring seat and being of a lesser length than the distance between said intermediate spring seat and the opposed spring seat mounted on said rod when the closure is moved away from said opening beyond the predetermined portion of said movement aforesaid.

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References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
389,450	Devore et al.	Sept. 11, 1888
2,219,824	Schonitzer	Oct. 29, 1940
2,257,791	Edmister	Oct. 7, 1941
2,279,992	Jackson et al.	Apr. 14, 1942

FOREIGN PATENTS

Number	Country	Date
714,826	Germany	Dec. 8, 1941