

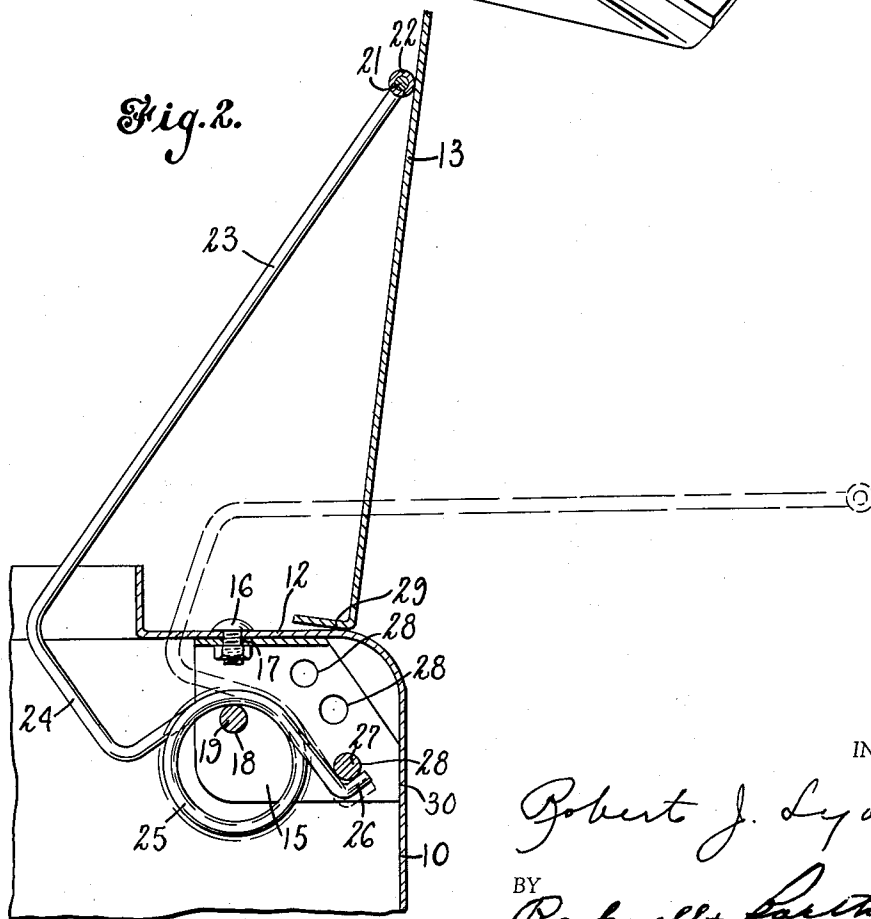
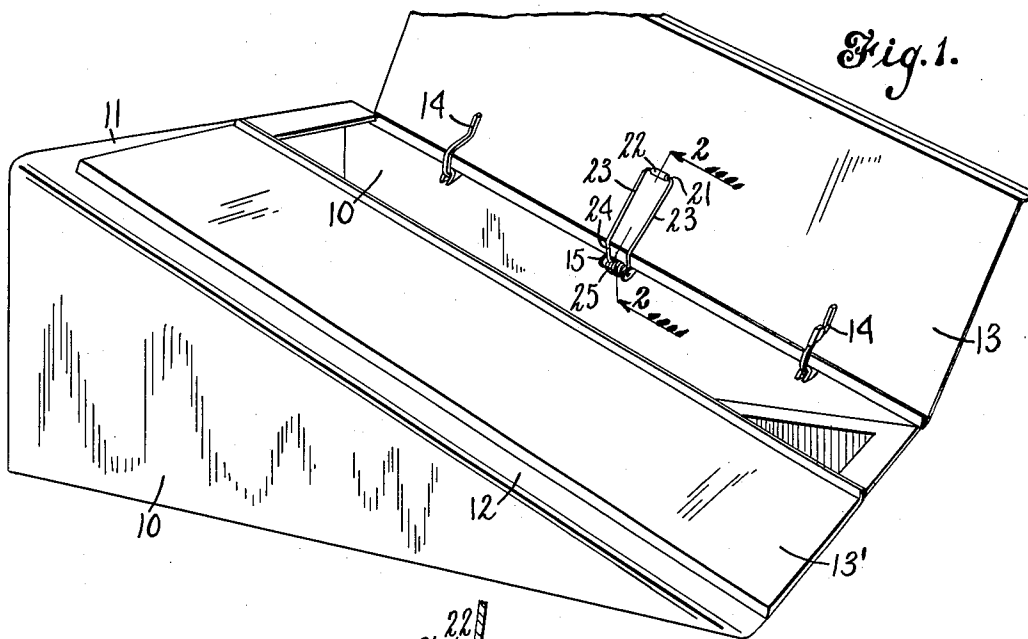
April 24, 1956

R. J. LYONS  
DOOR OPERATOR

2,742,662

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2 Sheets-Sheet 1



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2 Sheets-Sheet 2

Fig. 3.

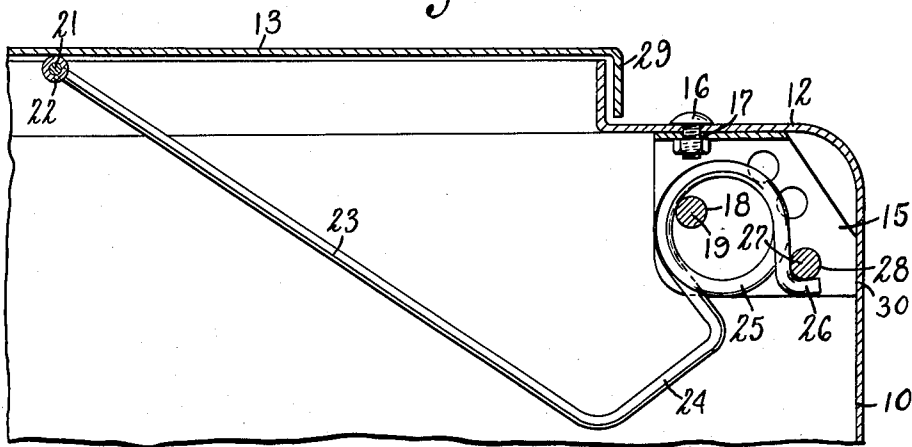


Fig. 4.

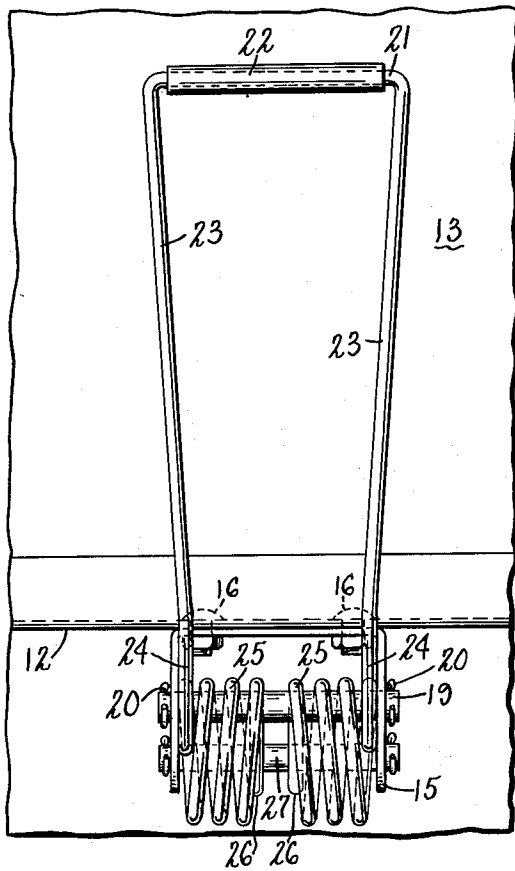
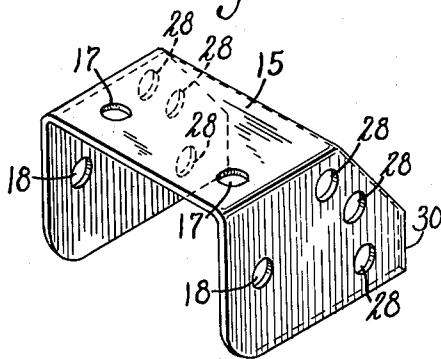


Fig. 5.



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**DOOR OPERATOR**

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2 Claims. (Cl. 16—1)

This invention relates to a door operator, and more particularly to a spring mechanism for hinged, cellar or trap doors to enable such doors to be opened with less exertion than is normally the case.

In cellar or trap door constructions such as bulkhead doors, for example, it is usual to provide a pair of doors hinged at their outer edges, the doors being swung upwardly about their hinges to open position against the force of gravity and remaining closed under the force of gravity. As these doors are sometimes made of metal, they are of considerable weight, and in such case it requires a considerable exertion to swing them to open position. This is particularly true during the first part of the opening movement of the door where the effective weight of the door acts at a point farthest from the hinge in a horizontal direction so that the weight acts through the greatest leverage.

It is contemplated by the present invention to provide spring mechanism to counterbalance the weight of the door to a considerable extent and assist in the opening thereof, the spring mechanism being so arranged that it will exert its greatest force at the beginning of the opening movement.

The mechanism is, however, so constructed that the weight of the door will maintain it in closed position as is desirable but the spring will assist in raising or opening it to such an extent that very much less exertion will be required for this purpose.

One object of the present invention is to provide a device for assisting the opening of a trap or cellar door, which device is of economical construction and which may be readily applied to the door.

A further object of the invention is to provide a door check and opening mechanism which will not only assist in the opening of the door but will also serve to check the closing movement thereof so that the operator will be required to exert less effort in either opening it or closing it and so that there will be less danger of the door slamming to its closed position.

A still further object of the invention is the provision of a spring door check of the class described which will assist in holding the door in open position once it has been moved to this position.

To these and other ends the invention consists in the novel features and combinations of parts to be hereinafter described and claimed.

In the accompanying drawings:

Fig. 1 is a perspective view of a bulkhead door in open position to which my invention has been applied;

Fig. 2 is a sectional view on line 2—2 of Fig. 1;

Fig. 3 is a view similar to Fig. 2 showing the door in closed position;

Fig. 4 is a front elevational view of my improved door check shown in the position occupied when the door is open; and

Fig. 5 is a detail perspective view of the bracket used to secure the check in place.

To illustrate a preferred embodiment of my invention

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I have shown in the drawings a bulkhead construction comprising a frame consisting of triangular vertically disposed side members 10, a header 11 extending between such side members, and inclined edge rails 12. Doors 13 and 13' are hinged one to each of the edge rails by hinges 14 such that each of the doors may swing from the closed position occupied by the door 13' to the open position occupied by door 13 in Fig. 1.

As it requires considerable effort to raise the doors from their closed position, I have provided means to assist in this operation. For this purpose I have provided the door check or operator shown in the drawings, which device comprises a spring secured to each of the edge rails 12, the spring having a bight portion to engage the under surface of the door.

The device is secured in place by means of a U-shaped bracket 15, shown in Fig. 5, the base of which is secured to the under side of the edge rail 12 by any suitable means such as bolts 16 passing through openings 17 in the bracket and registering openings in the edge rail. The legs or side flanges of the bracket are provided with openings 18 which receive a spring-supporting rod 19, the rod being held in place by cotter pins 20 at each end thereof. It may also be noted that, as shown in Figs. 2 and 3, the side flanges of the bracket are extended rearwardly and provided with end portions 30 abutting against the side members 10, thus bracing the structure and holding the bracket against movement or play.

The spring which performs the useful work of the check comprises a member bent into U-shaped form, as shown in Fig. 4, so that the bight portion 21 of the spring bears against the under side of the door. A sleeve or tubular roller 22 may be loosely mounted on this portion of the spring to engage the door and reduce friction between the latter and the spring.

The leg portions 23 of the body of the spring extend downwardly and are turned inwardly, as shown at 24, and then each end is wound into a coil 25 which loosely receives the rod 19 so as to hold the spring in place.

The extreme end 26 of each of the two coils 25 is turned outwardly, as shown more especially in Figs. 2 and 3, and engages below a second rod 27 carried by the leg members of the bracket 15. For this purpose these bracket members are provided with a plurality of openings 28 so that the rod 27 may be positioned in any registering pair thereof in order to adjust the position of this rod with respect to the rod 19 and the spring.

The spring is tensioned to occupy the position shown in dotted lines in Fig. 2 when the rod 27 is in the lowermost of the openings 28 and when no load is placed upon the spring. When the door is in open position, as shown in this figure and the spring bears against the under side thereof, it will be under slight tension and will tend to maintain the door in this position. Any form of stop may be provided to limit the opening of the door or, as shown, its rear edge 29 may rest against the upper surface of the edge rail 12 and the opening movement limited by this contact.

It will be apparent also that when the door is closed and the spring occupies the position shown in Fig. 3, there will be a greater tension upon the spring due to the fact that the movement of the bight portion 21 from the position shown in Fig. 2 to the position shown in Fig. 3 will tend to wind the coils of the spring as the ends 26 are held against movement by the rod 27. Thus as the door is moved from open to closed position the spring will exert a gradually increasing raising force upon the door, and thus will serve as a door check to ease the closing movement and will exert its greatest effort at the time of having to resist the greatest weight. It is understood, however, that it will permit the door to fully close.

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It will be seen that as the door is raised from the position shown in Fig. 3 to that shown in Fig. 2, the spring will assist in the raising movement and will exert its greatest force at the beginning of the operation and a gradually decreasing force as the door moves to the position shown in Fig. 2. As doors are of different sizes and, therefore, of different weight, it is desirable to provide means for adjusting the tension of the spring. This is effected by moving the bar 27 from one of a pair of openings 23 to another pair. It will be seen that when the bar 27 is in the lowermost of the openings 23, as shown in the drawings, the spring will be under the greatest tension. When the spring is mounted upon a door of lesser weight, the bar will be moved into one of an upper pair of openings, and thus the spring will be under less tension.

It will be apparent that the door check or operator illustrated is of very simple construction and may be applied to the door with a minimum amount of work. The spring is supported entirely by having its coils loosely hung upon the rod 19 and by having its two ends engaged below the adjusting rod 27. Moreover, the spring is of one-piece construction, being made of a single rod or wire, the body of which is bent into U-shaped form, as shown, and the ends of which are formed into coils to provide the spring action.

While I have shown and described a preferred embodiment of my invention, it will be understood that it is not to be limited to all of the details shown, but is capable of modification and variation within the spirit of the invention and within the scope of the claims.

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What I claim is:

1. In a counter-balancing means for a door hinged to a frame to swing upwardly, a spring comprising a wire bent into U-shaped form with the end of each of the leg portions formed into a coil, means for securing said spring to the frame with the bight portion of the spring extending toward and acting against the under surface of the door to urge the latter toward open position, said means comprising a bracket adapted to be secured to the under side of the frame having depending side flanges, a pair of space-apart rods extending between said flanges, one of which is loosely received in said coils to support the spring between the flanges, and the ends of the spring being engaged with said second rod to prevent movement of said ends.

2. A door construction as in claim 1 wherein said side flanges are each provided with a plurality of openings arranged in pairs, and said second rod is adapted to be supported in any one of said pairs of openings to adjust the tension of the spring.

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