F. TROYER.

TRAP DOOR LIFTER.

APPLICATION FILED OCT. 8, 1912.

1,073,003. Patented Sept. 9, 1913.

Fig. 1

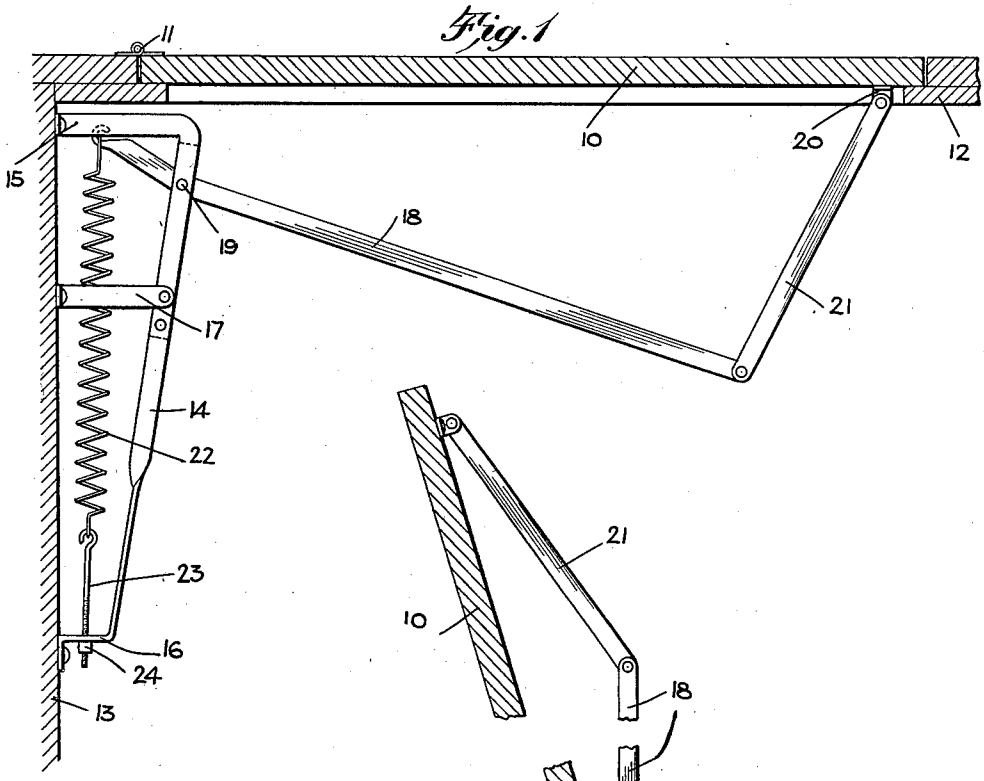


Fig. 2.

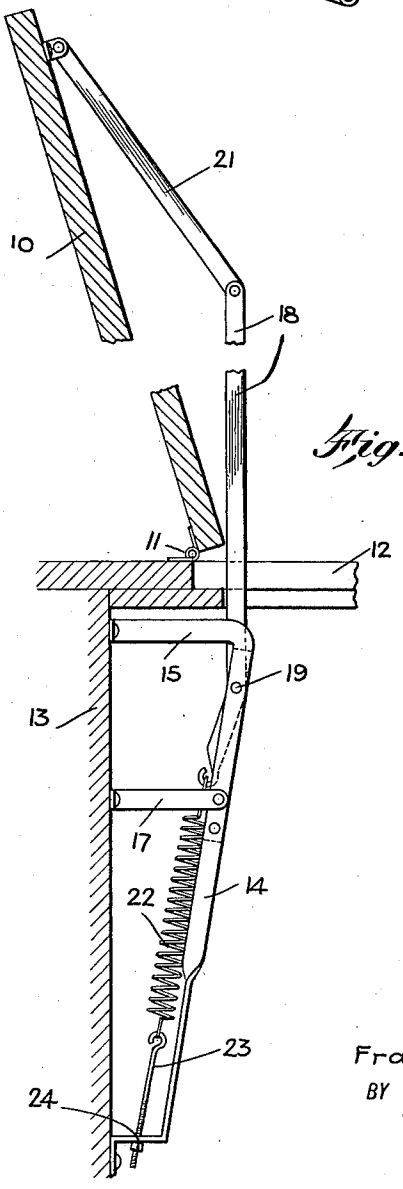
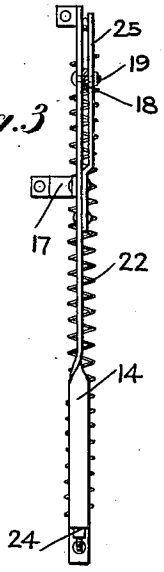


Fig. 3



WITNESSES

F. D. Smith

Geo. L. Beale

INVENTOR

Frank Troyer

BY Munn & Co

ATTORNEYS

UNITED STATES PATENT OFFICE.

FRANK TROYER, OF NAMPA, IDAHO.

TRAP-DOOR LIFTER.

1,073,003. Specification of Letters Patent. Patented Sept. 9, 1913.

Application filed October 8, 1912. Serial No. 724,559.

To all whom it may concern:

Be it known that I, FRANK TROYER, a citizen of the United States, and a resident of Nampa, in the county of Canyon and State of Idaho, have invented a new and Improved Trap-Door Lifter, of which the following is a full, clear, and exact description.

This invention relates to operating devices for horizontal gates or doors, such as trap doors for elevators, dumb-waiters or the like, which are adapted to be lifted and swung around on horizontal hinges.

A purpose of the invention is to provide an operating means of the character set forth which will render the operation of the door exceedingly easy and which will serve to practically counterbalance the weight of the door throughout its entire path of movement, the effectiveness of the motive means varying substantially in accordance with the variation in the effective weight of the door during its swinging operation.

The invention consists in the construction and combination of parts to be more fully described hereinafter and particularly set forth in the claim.

Reference is to be had to the accompanying drawings forming a part of this specification in which like characters of reference indicate corresponding parts in all the views, and in which—

Figure 1 is a transverse section of a door showing the operating means therefor in elevation; Fig. 2 is a similar view, but with the parts in the position assumed when the door is open; and Fig. 3 is a front elevation of the operating device, the lever being in section.

Referring particularly to the drawings, I have indicated at 10 a door hinged at 11 to a floor or other foundation 12 adapted to be swung around the axis of said hinge in opening. It is to be understood that while I am referring to the term "door" for convenience, I am not to be limited in this or any other respect unnecessarily. The space below the door 10 may be regarded as a cellar or elevator shaft having a side wall 13. At 14 is shown a suitable form of bracket extending substantially vertically and adjacent said wall 13, and adapted to be secured thereto by means of upper and lower feet 15 and 16. At 17 also is indicated an auxiliary fastening means or brace which may be used, if necessary, to steady the middle portion of the frame. As indicated in Fig. 3, the brace 17 is slightly offset from the plane of the frame, whereby a stiffer bracing effect is realized. A lever 18 of the first class is pivoted on the frame 14 at 19, the forward or longer end of which lever is connected to the forward edge of the door at a bracket 20 by means of an intermediate link 21. It will be noted that the pivot 19 is but little beyond the vertical plane passing through the pivot of the hinge 11, said pivots being horizontal. The inner or shorter arm of the lever has connected permanently to it a suitable motive means in the form of a spiral spring 22, the opposite end of which is adjustably connected through a tension device 23 to the lower portion or foot 16 of the frame. The effective force of said motive means may be varied by adjustment of the nut 24. The offstanding position of the brace 17 provides free movement space for said spring, and the bracket as a whole constitutes a substantial guard or housing for the spring.

By reference especially to Fig. 1, it will be noted that when the door is shut, the position of the lever 18 will be such as to cause the maximum tension to be applied to the spring 22, and, furthermore, said tension of the spring will be more effective upon the lever at this time for the reason that it will be operative substantially tangential to the arc described by the shorter arm of the lever around the pivot 19. It will be noted in this connection, moreover, that the effective weight of the door is at the maximum when it is substantially horizontal or when the center of mass is the farthest removed from the pivot 11; hence, the spring will be most effective at the time the weight of the door is the greatest. The force of the spring at this time will tend to lift the door and swing it around its hinge 11 by operation of the lever 18, pushing upward on the link 21. As the door is elevated, its effective weight decreases and in substantially the same proportion the effective force of the spring is decreased as the shorter arm of the lever 18 approaches the line of pull of the spring or as it varies from the tangential and approaches the radial direction as indicated in Fig. 2. It will be apparent, therefore, that the tension member 23 may be adjusted very delicately, whereby the door may be almost counterbalanced in effect by the spring, and the coun-

terbalancing may remain substantially constant. The pivot 19 for the lever is also shown as extending through a plate 25 secured to the frame 14, which plate constitutes a keeper for said lever. Said keeper is preferably so arranged as to constitute a stop for the shorter end of the lever 18, limiting the upward swing of the door in conjunction with the coöperation between the lever and the door directly.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:—

The herein described trap door apparatus comprising the combination with a horizontal trap door having a horizontal hinge at one end, of a substantially vertical frame secured below the door hinge, said frame including a pair of horizontal securing feet at its upper and lower ends, a lever of the first class pivoted to the frame adjacent the uppermost foot, means pivotally connecting one end of the lever to the edge of the door opposite the hinge, a spring connected to the opposite end of the lever at one end and at the other end to the lowermost frame foot, said spring being arranged substantially vertically and housed within the frame, and a bracket extending diagonally from the intermediate portion of the frame and constituting a brace for the frame and a guard for the spring.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

FRANK TROYER.

Witnesses:
FRANK G. STEPHENS,
BESS H. COOK.