L. C. NORTON.

DOOR CONTROLLING DEVICE.

APPLICATION FILED DEC. 8, 1919.

1,385,389.

Patented July 26, 1921.

2 SHEETS—SHEET 1.

Fig. 1.

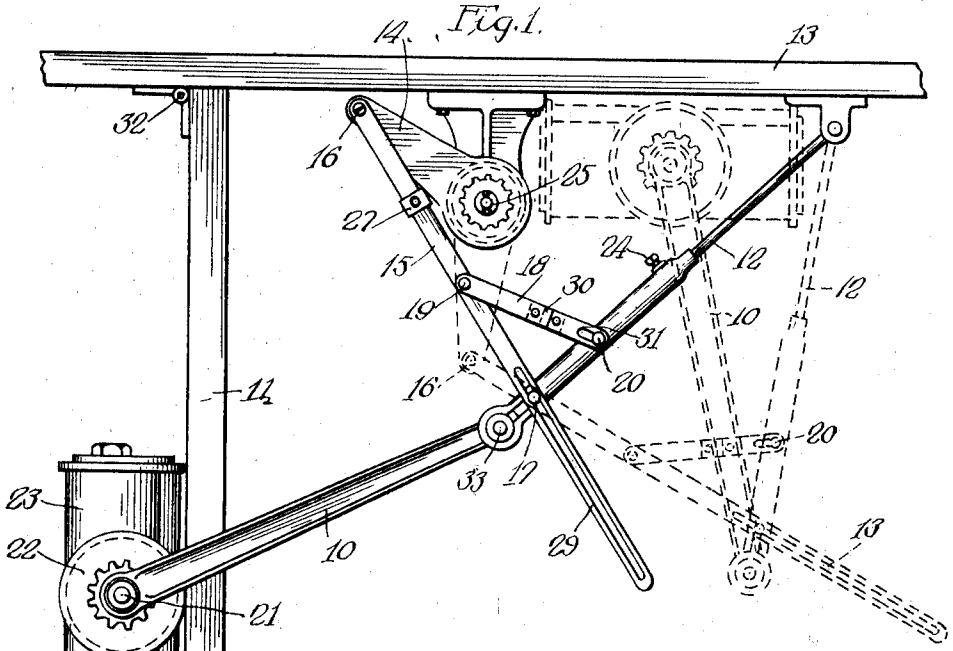


Fig. 2.

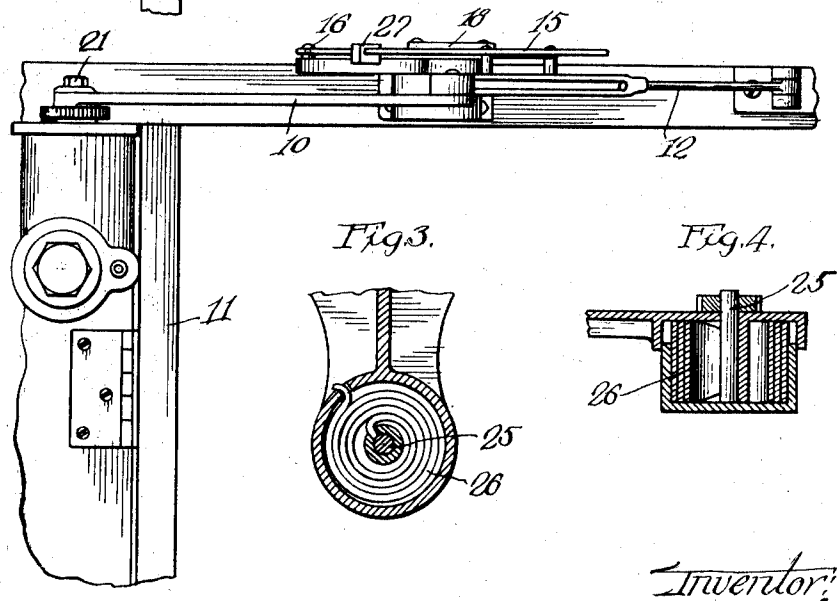


Fig. 3.

Fig. 4.

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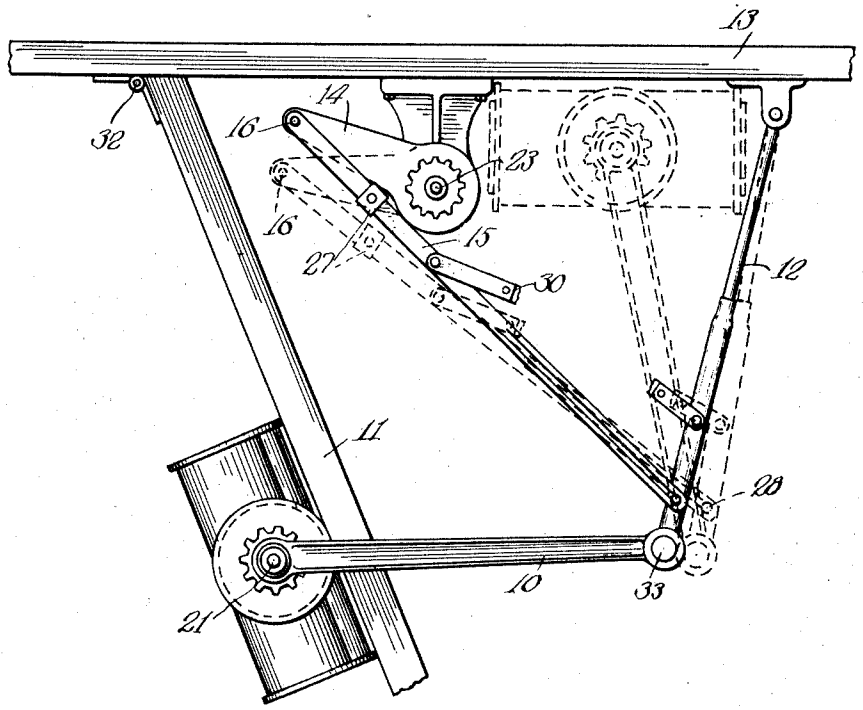
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2 SHEETS—SHEET 2.

Fig. 5.



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UNITED STATES PATENT OFFICE.

LEWIS C. NORTON, OF CHICAGO, ILLINOIS, ASSIGNOR TO NORTON DOOR CHECK COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF WEST VIRGINIA.

DOOR-CONTROLLING DEVICE.

1,385,389. Specification of Letters Patent. Patented July 26, 1921.

Application filed December 8, 1919. Serial No. 343,337.

To all whom it may concern:

Be it known that I, LEWIS C. NORTON, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented new and useful Improvements in Door-Controlling Devices, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawing, forming a part of this specification.

My invention relates to door controlling devices. More specifically it relates to door controlling devices in which means are provided for automatically closing the door when opened, for automatically holding the door open after it has been opened to a certain predetermined extent, and for automatically closing the door when it is held open, in case of fire.

One of the objects of my invention is to provide such a construction which will be efficient and reliable in operation.

A further object of my invention is to provide such a construction in which the means which are normally used for holding the door in open position are used in case of fire to assist in closing the door.

Further objects will appear from the detailed description to follow and from the appended claims.

In the drawings in which an embodiment of my invention is shown—

Figure 1 is a plan view showing a door controlling construction applied to a door;

Fig. 2 is an elevation of the parts shown in Fig. 1;

Fig. 3 is a horizontal section through a spring housing;

Fig. 4 is a vertical section through the spring housing shown in Fig. 3; and

Fig. 5 is a view similar to Fig. 1, but showing the parts in the position they assume in case of fire.

I will outline briefly the main features of the construction shown, before giving a detailed description.

The construction shown comprises a mechanism for closing a door, including a spring actuated arm 10 mounted on the door 11, and a link 12 pivotally connected to the arm 10 at one end, and pivotally connected at the other end to the door frame 13, and a mechanism for holding the door in open position comprising a spring pressed arm 14, mounted on the door frame, a link 15 having a pivotal connection at 16 with the arm 14, and having a lost motion connection at 17 with the arm 12, and a fusible link 18 pivotally connected to the link 15 at 19, and pivotally connected to the link 12 at 20.

In the normal operation of the door, the fusible link 18 serves to connect the link 15 with the arm 12. When, however, the link 18 is fused, the link 15 which has the lost motion connection at 17 with the arm 12, serves to connect the arm 12 with the arm 14.

The spring tensions acting on the arms 10 and 14, are so adjusted, and the arms and links are so proportioned, that on opening the door, during the initial part of the opening, the arms 14 and 10 will both exert a door closing effect (that is, tending to resist opening of the door) and such that after a certain point in the opening of the door has been passed, the arm 14 will exert a door opening effect, while the arm 10 still continues to exert a door closing effect. The door closing effect of the arm 10, however, is greater than the door opening effect of the arm 14, until just before the final extreme open position of the door is reached, when the door opening effect of the arm 14 becomes greater than the door closing effect of the arm 10 and the door is thus held in open position.

If now the door is held in open position and a fire occurs, and the link 18 is fused, the door is temporarily released from the door opening effect of the arm 14, and immediately starts to close under the influence of the door closing arm 10. However, the arm 12 is not entirely free from connection with the arm 14 as it has a lost motion connection with this arm at 17 through the link 15. Therefore, when this lost motion is taken up, the arm 14 again comes into action, and exerts a force tending initially to resist closing of the door. However, the door has acquired considerable momentum by the time this lost motion is taken up, and the relative location of the links and levers is such that the door closing effect exerted by the arm 10 is sufficient to continue the closing movement of the door. Thereafter, in the closing movement of the door, a point is used at which the effect of the spring pressed arm 14 changes from a force tending to hold the door open to a force tending to

hold the door closed, so that at the final closing movement of the door, both of the spring pressed arms 10 and 14 are exerting a force tending to close the door. This double effect is very desirable in case of fire, as there may be a strong draft in case of fire which would resist the closing of the door, and would require a strong force to overcome it and close the door.

Referring now to the construction in detail, the spring pressed arm 10 is secured on a shaft 21, which shaft is subjected to the action of a coil torsion spring inclosed in the housing 22, so that the arm 10 has a tendency to rotate in a clockwise direction as seen in Figs. 1 and 5. The action of the spring pressed arm may be further controlled by a dashpot construction inclosed in the casing 23 in any usual or suitable manner. The arm 12 may, as is usual, be made in two telescopic sections, adjustably held by means of a set screw 24.

The arm 14 is mounted on a shaft or pin 25 (Figs. 3 and 4) which pin 25 is subject to the action of a coil torsion spring 26, so that the normal tendency of the arm 14 is to rotate in a clockwise direction as seen in Figs. 1 and 5. The movement of the arm 14 under the action of the spring 26 is limited by means of an adjustable stop 27 mounted for sliding adjustment on the link 15, this stop engaging the edge of the arm 14 as shown in Fig. 1, to limit the movement of the arm 14.

The lost motion connection 17 between the link 15 and the arm 12 comprises a pin 28 mounted on the arm 12, which pin engages in a slot 29 in the arm 15.

The fusible link 18 is made in two separable sections united at 30 by a fusible element which fuses under the influence of the heat, and permits the parts to separate as indicated at Fig. 5. In order that the fusible link 18 may not be subjected to undue strain a slight lost motion connection is provided at 31 between the fusible link and the arm 12, so that the link 30 will not be subjected to the shock which would result if it had to receive the strain of suddenly stopping the door 11 when the adjustable stop 27 engages the arm 14. This lost motion connection at 31 permits the door to move a little after the stop 27 is engaged with the arm 14, so that the full strain does not come on the fusible link.

I will now point out some advantageous arrangements and constructions of the various links and levers. Considering first the construction and operation when the fusible link 18 is intact as shown in Fig. 1, the arrangement is such that when the door is closed, both of the spring pressed arms 14 and 10, are exerting a force tending to keep the door closed. This has an advantage in that it gives a positive closing movement to the door, preventing any uncertainty as to whether or not the door will be closed. The arm 14 exerts a comparatively powerful closing effect when the door is closed, even when the fusible link 18 is intact, due to the positions of the arms 10 and 12 and the line of pull between the pivotal points 16 and 20.

As the door is opened, there is a point at which the force exerted by the arm 14 changes from a force tending to close the door to a force tending to open the door. This critical point is the point at which the pivotal point 21 passes a line connecting the pivotal point 32 of the door 11, and the pivotal point 33 of the connection between the arms 10 and 12. This door opening effect of the arm 14 continues to increase as the door opens farther due to the change in the angle between the arm 10 and the door 11 and also due to the change in the effective lever arm of the arm 14. This effective lever arm is the perpendicular distance from the pivotal point 25 of the arm 14 to a line connecting the pivotal points 16 and 20. When the door is moved to its final open position as shown in Fig. 1, this effective lever arm is very short, as the line of pull between 16 and 20 approaches close to the pivotal point 25 of the arm 14. This results in a very powerful action of the arm 14, sufficient to hold the door in its final open position against the door closing effect of the arm 10.

I will now point out certain advantageous features of the construction and operation in case the fusible link 18 is disconnected as shown in Fig. 5.

The first effect of the fusing of this link is to permit the door 11 to start to close under the action of the spring pressed arm 10. This closing movement continues until pin 18 has moved along in the slot 29 to the outer end of the slot. Thereafter, further closing movement of the door is influenced by the spring pressed arm 14. However, the line of pull between the spring pressed arm 14 and the arm 12 is different after the link 18 is fused from what it was before this link was fused. The line of pull is farther from the axis of the arm 14 so that the holding effect of the arm 14 is less, or to put it the other way about, the pull exerted by the arm 12 on the link 15 has a greater leverage on the arm 14 after the link 18 is fused than it had before. Furthermore, in addition to the more advantageous line of pull, the door 11 has gained considerable momentum by the time the pin 28 has reached the end of the slot 29, and this momentum together with the more advantageous line of pull, is ample to continue the closing movement of the door.

At a certain point in the closing movement of the door, the effect of the spring pressed

arm 14 changes from the force tending to hold the door open, to a force tending to hold it closed. This critical point is the same as the point previously mentioned in the opening movement of the door, to wit, the point when the pivotal point 21 passes the line connecting the pivotal points 32 and 33. From this point on, in the closing movement of the door, the arm 14 works with the arm 10 in closing the door. This closing effect of the arm 14 increases rapidly, on account of the change in the effective lever arm of the arm 14, and also on account of the change in the angle between the arm 10 and the door 11.

As shown in Fig. 5, when the door is closed, as indicated in dotted lines, the effective lever arm of the arm 14, which is the perpendicular line from the pivotal point 25 to the line connecting the pivotal points 16 and 28, is comparatively short, so that the line of pull is very advantageous for exerting a powerful pull on the pin 28.

The springs for the arms 10 and 14 may each be provided with a ratchet adjustment for getting the desired tension in the springs.

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

1. The combination of a door, a mechanism tending to close the door, a second mechanism which tends to hold the door open when the door is open and which tends to hold the door closed when the door is closed, and heat-controlled means whereby in case of fire, said second mechanism releases the door to permit it to close under the action of said first mechanism, and whereby said second mechanism will assist said first mechanism in the final closing movement of the door.

2. The combination of a door, a mechanism tending to close the door, a second mechanism which tends to hold the door open when the door is open and which tends to hold the door closed when the door is closed, and means whereby in case of fire, said second mechanism releases the door to permit it to close under the action of said first mechanism, and whereby said second mechanism will assist said first mechanism in the final closing movement of the door, said second mechanism including a fusible link.

3. The combination of a door, a mechanism tending to close the door, a second mechanism which tends to hold the door open when the door is open and which tends to hold the door closed when the door is closed, and means whereby in case of fire, said second mechanism releases the door to permit it to close under the action of said first mechanism, and whereby said second mechanism will assist said first mechanism in the final closing movement of the door, said second mechanism having a lost motion connection with said first mechanism.

4. The combination of a door, a mechanism tending to close the door, a second mechanism which tends to hold the door open when the door is open and which tends to hold the door closed when the door is closed, and means whereby in case of fire, said second mechanism releases the door to permit it to close under the action of said first mechanism, and whereby said second mechanism will assist said first mechanism in the final closing movement of the door, said second mechanism including a fusible link connecting it with said first mechanism.

5. The combination of a door, a mechanism tending to close the door, a second mechanism which tends to hold the door open when the door is open and which tends to hold the door closed when the door is closed, and means whereby in case of fire, said second mechanism releases the door to permit it to close under the action of said first mechanism, and whereby said second mechanism will assist said first mechanism in the final closing movement of the door, said second mechanism including a fusible link connecting it with said first mechanism, and having also a lost motion connection with said first mechanism.

6. The combination of a door, a mechanism tending to close the door, a second mechanism which tends to hold the door open when the door is open and which tends to hold the door closed when the door is closed, and means whereby in case of fire, said second mechanism releases the door to permit it to close under the action of said first mechanism, and whereby said second mechanism will assist said first mechanism in the final closing movement of the door, said second mechanism comprising a pivoted arm, and a fusible link connecting said arm with said first mechanism.

7. The combination of a door, a mechanism tending to close the door, a second mechanism which tends to hold the door open when the door is open and which tends to hold the door closed when the door is closed, and means whereby in case of fire, said second mechanism releases the door to permit it to close under the action of said first mechanism, and whereby said second mechanism will assist said first mechanism in the final closing movement of the door, said first mechanism comprising a pivoted arm, and a link pivoted to said arm and having a lost motion connection with said first mechanism.

8. The combination of a door, a mechanism tending to close the door, a second mechanism which tends to hold the door open when the door is open and which tends

to hold the door closed when the door is closed, and means whereby in case of fire, said second mechanism releases the door to permit it to close under the action of said first mechanism, and whereby said second mechanism will assist said first mechanism in the final closing movement of the door, said second mechanism comprising a pivoted arm, a fusible link connecting said arm with said first mechanism, and a second link having a pivotal connection with said arm, and having a lost motion connection with said first mechanism.

9. The combination of a door, a mechanism tending to close the door, a second mechanism which tends to hold the door open when the door is open and which tends to hold the door closed when the door is closed, and means whereby in case of fire, said second mechanism releases the door to permit it to close under the action of said first mechanism, and whereby said second mechanism will assist said first mechanism in the final closing movement of the door, said second mechanism comprising a fusible link having a lost motion connection with said first mechanism.

10. The combination of a door, a mechanism tending to close the door, a second mechanism which tends to hold the door open when the door is open and which tends to hold the door closed when the door is closed, and means whereby in case of fire, said second mechanism releases the door to permit it to close under the action of said first mechanism, and whereby said second mechanism will assist said first mechanism in the final closing movement of the door, said second mechanism comprising a pivoted arm, and a fusible link having a connection with said arm and a pivotal connection with said first mechanism, and a second link having a pivotal connection with said arm, and a lost motion connection with said first mechanism, the pivotal point of connection of said fusible link with said first mechanism being spaced from the lost motion connection of said second link with said first mechanism, whereby when said fusible link melts the line of connection between said first mechanism and said second mechanism will be changed.

11. The combination of a door, a mechanism tending to close the door, a second mechanism which tends to hold the door open when the door is open and which tends to hold the door closed when the door is closed, and means whereby in case of fire, said second mechanism releases the door to permit it to close under the action of said first mechanism, and whereby said second mechanism will assist said first mechanism in the final closing movement of the door, said first mechanism comprising an arm pivotally mounted on the door and a second arm mounted to swing about a fixed axis, said second arm being pivotally connected with said first arm.

12. The combination of a door, a mechanism tending to close the door and a second mechanism which tends to hold the door open when the door is open and which tends to hold the door closed when the door is closed, said second mechanism comprising a pivoted arm and a link pivoted thereto, and means whereby in case of fire, said second mechanism releases the door to permit it to close under the action of said first mechanism, said link having a lost motion connection with said first mechanism, whereby the effective lever arm of said pivoted arm becomes shortened to give a powerful final closing movement to the door.

13. The combination of a door, a mechanism tending to close the door and a second mechanism which tends to hold the door open when the door is open and which tends to hold the door closed when the door is closed, said second mechanism comprising a pivoted arm, a link pivoted thereto, and means whereby in case of fire, said second mechanism releases the door to permit it to close under the action of said first mechanism, said link having a lost motion connection with said first mechanism whereby the effective lever arm of said pivoted arm becomes shortened to give a powerful final closing movement to the door, and an adjustable stop on said link to govern the effective lever arm of said pivoted arm.

14. The combination of a door, a mechanism tending to close the door, a second mechanism which tends to hold the door open when the door is open and which tends to hold the door closed when the door is closed, said second mechanism comprising a pivoted arm, a link pivoted thereto, and to said first mechanism whereby when said door is opened, the effective lever arm of said pivoted arm becomes shortened to give a powerful final opening movement of said door, and an adjustable stop on said link to govern the effective lever arm of said pivoted arm.

15. The combination of a door, a mechanism tending to close the door, a second mechanism which tends to hold the door open when the door is open and which tends to hold the door closed when the door is closed, said second mechanism comprising a pivoted arm, a link pivoted thereto, and to said first mechanism whereby when the door is opened, the effective lever arm of said pivoted arm becomes shortened to give a powerful final opening movement of said door, and an adjustable stop to govern the effective lever arm of said pivoted arm.

16. The combination of a door, a mechanish tending to close the door, a second mechanism which tends to hold the door

open when the door is open and which tends to hold the door closed when the door is closed, said second mechanism comprising a pivoted arm, a link pivoted thereto, and to said first mechanism whereby when the door is opened, the effective lever arm of said pivoted arm becomes shortened to give a powerful final opening movement of said door, and a stop to govern the effective lever arm of said pivoted arm.

In witness whereof, I have hereunto subscribed my name.

LEWIS C. NORTON.