Jan. 8, 1929. 1,698,652

J. F. PETERSEN

DOOR OPERATING MECHANISM

Filed July 26, 1927 2 Sheets-Sheet 1

Fig. 1.

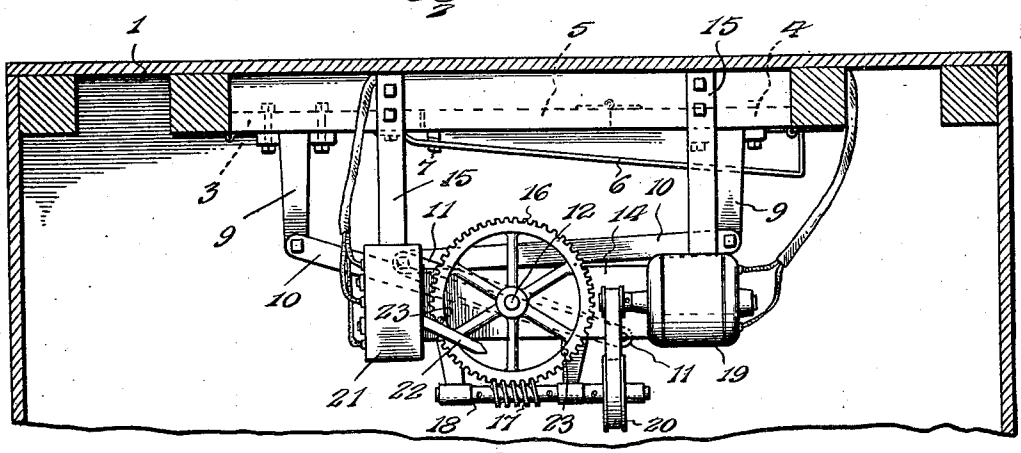
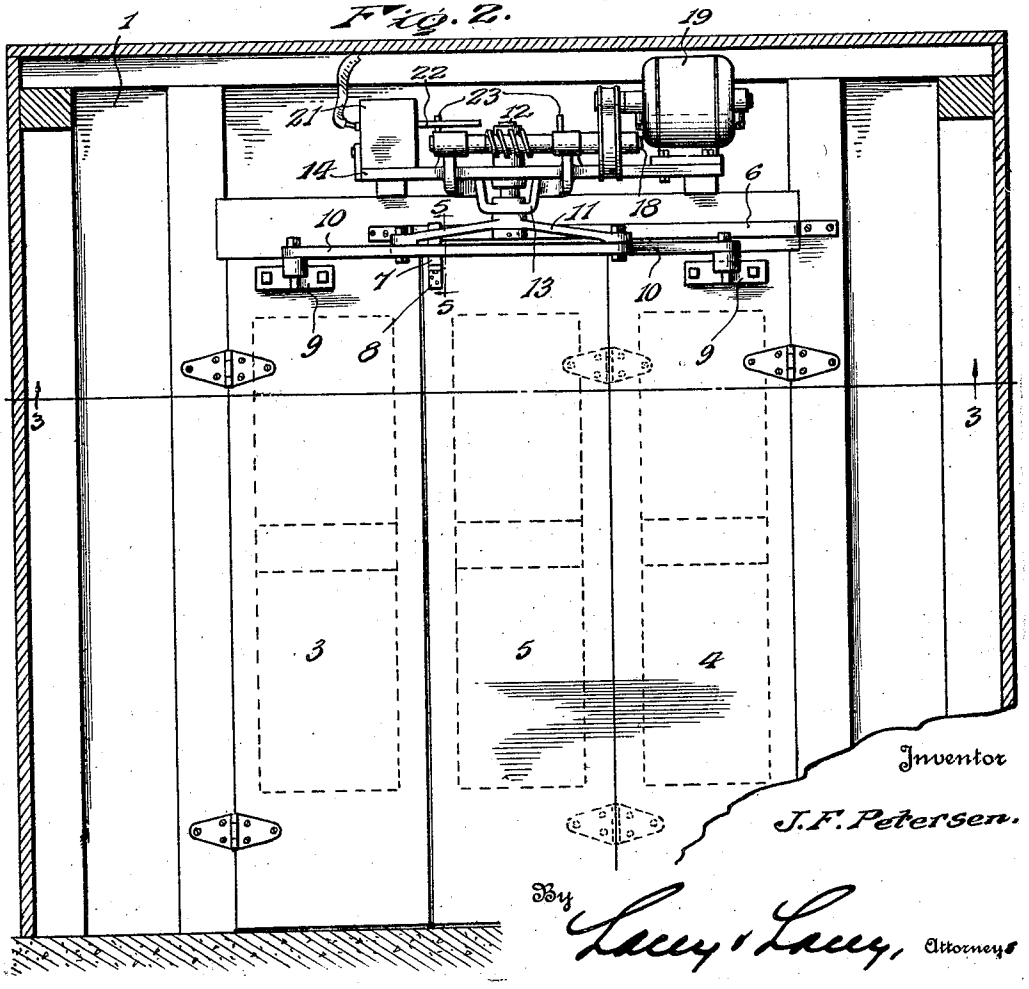


Fig. 2.



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Fig. 3.

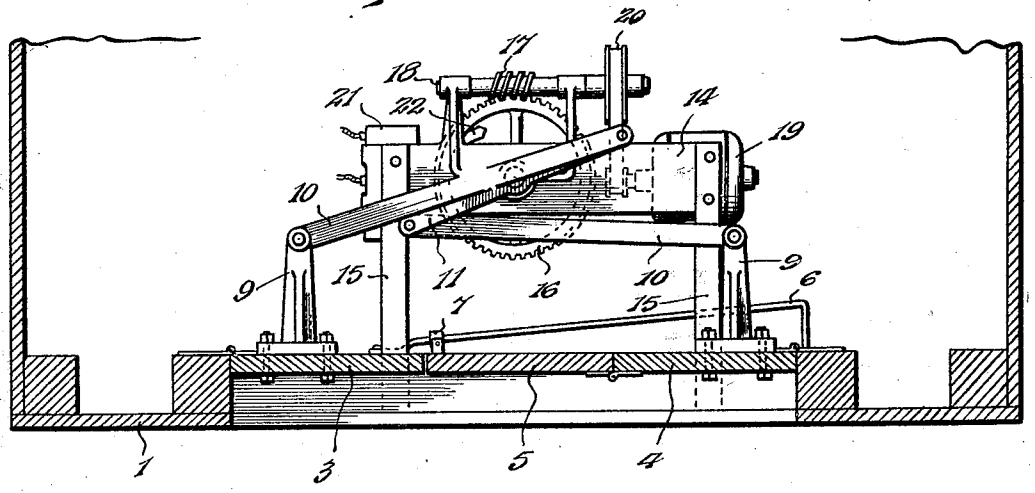
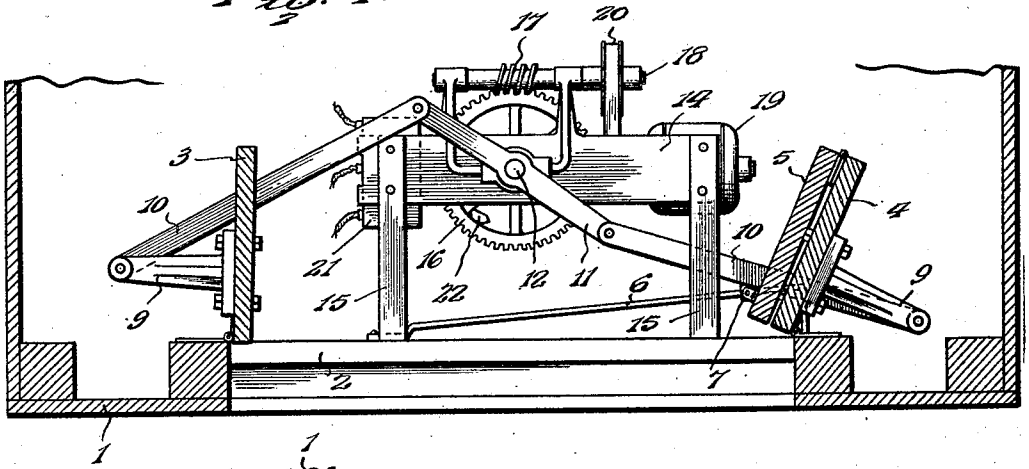


Fig. 4.



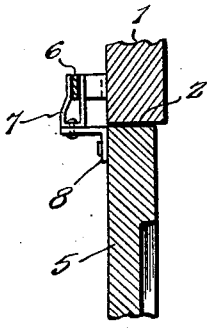


Fig. 5.

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UNITED STATES PATENT OFFICE.

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DOOR-OPERATING MECHANISM.

Application filed July 26, 1927. Serial No. 208,652.

The primary object of this invention is to obviate the impact, noise and jar incident to the closing of a door and provides means whereby the door or closure mounted to swing or slide initially moves by a slow movement which is accelerated, then gradually reduces as the closure comes to rest either in the opening or the closing movement.

The invention provides means for imparting a variable movement to a door, or like part, from a prime operator having a constant movement, so that the final travel of the door is slow and ceases gently without any perceptible impact or jar.

The invention contemplates a prime operator, such as a reversible electric motor, having a constant movement, a reversible switch for controlling the current to the motor, a leverage connection between the motor and door, or closure, for operating the door by a variable speed which is initially slow, then accelerated and finally retarded to cease gently and without jar, and tripping means for automatically throwing the switch and cut off the current to the motor as the closure comes to rest in either direction of its travel.

While the drawings illustrate a preferred embodiment of the invention, it is to be understood that in adapting the means to meet specific needs and requirements, the design may be varied and such other changes in the minor details of construction may be resorted to within the scope of the invention as claimed, without departing from the spirit thereof.

For a full understanding of the invention and the merits thereof, reference is to be had to the following description and the drawings hereto attached, in which,—

Figure 1 is a top plan view of a door operating mechanism embodying the invention, a portion of the structure provided with the door opening being shown in section.

Figure 2 is an elevational view of the jar and the door operating mechanism, the structure in which the door opening is formed being shown in section.

Figure 3 is a sectional view on the line 3—3 of Figure 2, looking upwardly as designated by the arrows and showing the position of the parts when the door is closed.

Figure 4 is a view similar to Figure 3, showing the relation of the parts when the door is open.

Figure 5 is a detail sectional view on the line 5—5 of Figure 2.

Corresponding and like parts are referred to in the following description and designated in the several views of the drawings by like reference characters.

The numeral 1 designates a structure in which is formed a door opening 2 adapted to be closed by means of a door of any kind, and mounted in any usual or determinate way. In the present instance the structure 1 represents part of a garage or barn, and the door is shown as comprising a plurality of wings, leaves or sections, designated by the numerals 3, 4 and 5. The leaves 3 and 4 are hinged to the posts at opposite sides of the door opening 2 and the leaf 5 is hinged to the leaf 4. As a result the leaves 3 and 4 swing in opposite directions, and the leaf 5 swings towards and away from the leaf 4. When the door is open, as indicated in Figure 4 of the drawings, the leaf 5 is folded against the leaf 4. As the leaf 4 swings from an open into a closed position the leaf 5 gradually moves away from the leaf 4 and is directed in its movements by a guide 6, and a slide 7, the latter being connected to a bracket 8 by means of a swivel joint, as indicated most clearly in Figure 5. The bracket 8 is attached to the upper outer corner of the leaf 5. The guide 6 consists of a flat bar disposed at the top of the door opening 2 and inclines to the plane thereof. The slide 7 embraces opposite sides of the guide 6, as indicated most clearly in Figure 5, thereby positively directing the leaf 5 in its opening and closing movement.

The door operating mechanism includes similar or like brackets 9, which are attached to the upper ends of the respective leaves 3 and 4. Links 10 are pivotally connected at one end to the outer ends of the brackets 9 and the opposite end is pivoted to the ends of a lever 11 which is pivoted intermediate its ends to turn about a vertical axis. The lever 11 is secured to the lower end of a vertical shaft 12 which is mounted in a bearing 13 forming part of a cross piece 14 attached to brackets 18 projecting outwardly from the structure 1 above the door opening. A worm wheel 16 is fast to the upper end of the vertical shaft 12, and its teeth are in mesh with the worm 17 forming part of a shaft 18 to which the operating power for opening and closing the door is applied. The operating

power is derived from an electric motor 19 which is of the reversible type. The shaft of the motor 19 is connected to the shaft 18 and each of the shafts is provided with a pulley, power being transmitted by means of a belt 20, which passes around the pulleys applied to the motor shaft and the shaft 18. It is observed that the movement of the motor is constant. The motor 19 is included in an electric circuit containing a double throw switch 21 which may be of any conventional type, so long as it serves to reverse the current which is essential to effect an opening and a closing of the door. The numeral 22 designates the switch operating lever, which extends across the path of pins 23 projecting from the worm wheel 16. The lever 22 extends between the pins 23 and moved in one direction by one of said pins and in the opposite direction by the other one of said pins. The elements 22 and 23 constitute a trip mechanism for automatically throwing the switch when the door reaches its extreme movement, both when closing and opening. It is observed that the motor circuit, in addition to the automatically operated reversing switch 21, includes a circuit closing device, not shown, whereby the circuit may be closed to start the motor, when it is required to either open or close the door.

On reference to Figures 3 and 4 of the drawings it is observed that the effective leverage for operating the door varies throughout the movement of the door incident to its opening or closing. In either extreme movement of the door, that is, when closed, as indicated in Figure 3, or open as shown in Figure 4, the effective leverage is at a minimum, hence the initial movement of the door from either position is slow. As the door continues to move after being started from either extreme position, the leverage for operating the same increases and in consequence the movement is accelerated, and is greatest when the door reaches a position midway between its extreme positions. After the door passes the midway position the effective leverage for operating the same decreases and as a result the final movement of the door is gradually retarded, with the result that when the door reaches the limit of its movement in either direction the final closing or opening is slow, and gentle, with the result that the door closes without any appreciable impact or jar.

So far as the nature of the invention is concerned the door or closure may be of any type and mounted in any preferred way. The force for operating the door may be derived from any prime mover, so long as the power developed is constant. The gist of the invention resides in means whereby the constant force is applied to effect a variable movement of the door, both in its opening and closing movements, the initial movement of the door being slow, then accelerated and finally retarded to bring the door to rest by a gentle movement without any appreciable impact or jar.

Having thus described the invention, I claim:

1. The combination with a structure having a door opening, and a guide on the structure opposite the door opening and inclined to the plane thereof, of a closure for the door opening including a main leaf hinged to the structure and a supplemental leaf hinged to the main leaf, a lever rotatable at a constant speed, a link connecting the lever with the main leaf and an element slidable on the said guide and connected with the supplemental leaf by means of a swivel joint.

2. The combination with a structure having a door opening, and a guide on the structure opposite the door opening, and inclined to the plane thereof, of main leaves hinged to the structure at opposite sides of the door opening, a supplemental leaf hinged to one of the main leaves, a connection slidable on the said guide and swiveled to the supplemental leaf, a rotary member adapted to be driven at a constant speed, a lever connected with the rotary member, and links connecting the said lever with the main leaves.

In testimony whereof I affix my signature.

JOHN F. PETERSEN. [L. S.]