(No Model.) 2 Sheets—Sheet 1.

H. A. HOUSE & H. A. HOUSE, Jr.

COMBINED DOOR SPRING AND BUFFER.

No. 367,634. Patented Aug. 2, 1887.

Fig 1.

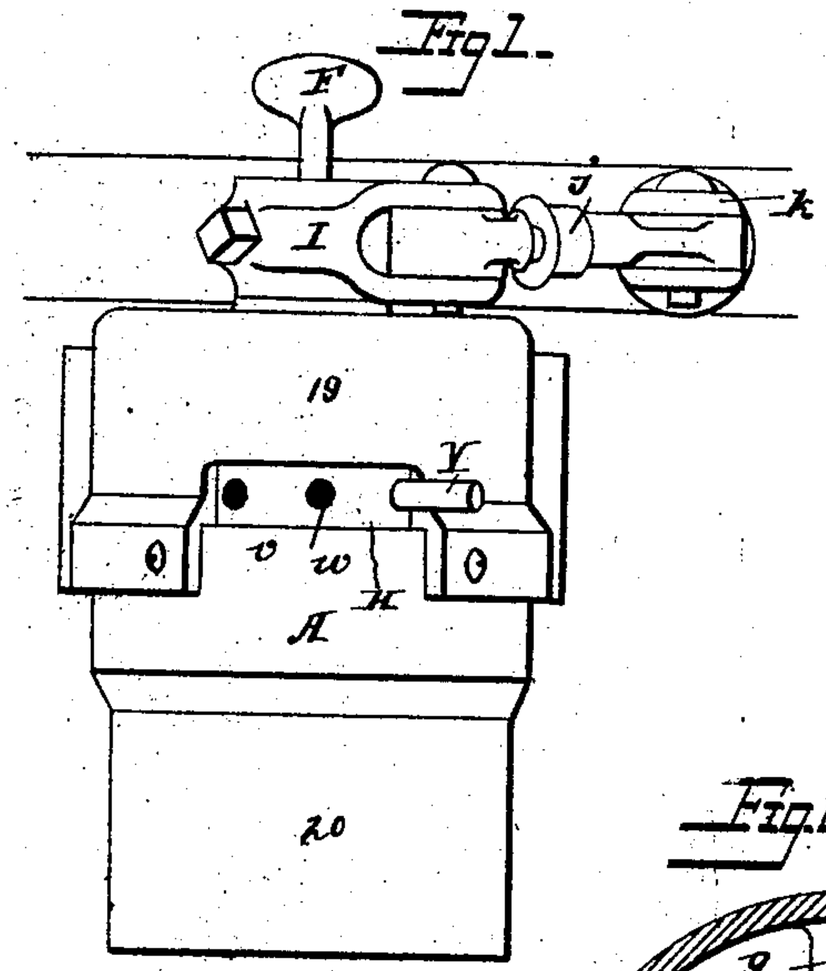


Fig 7.

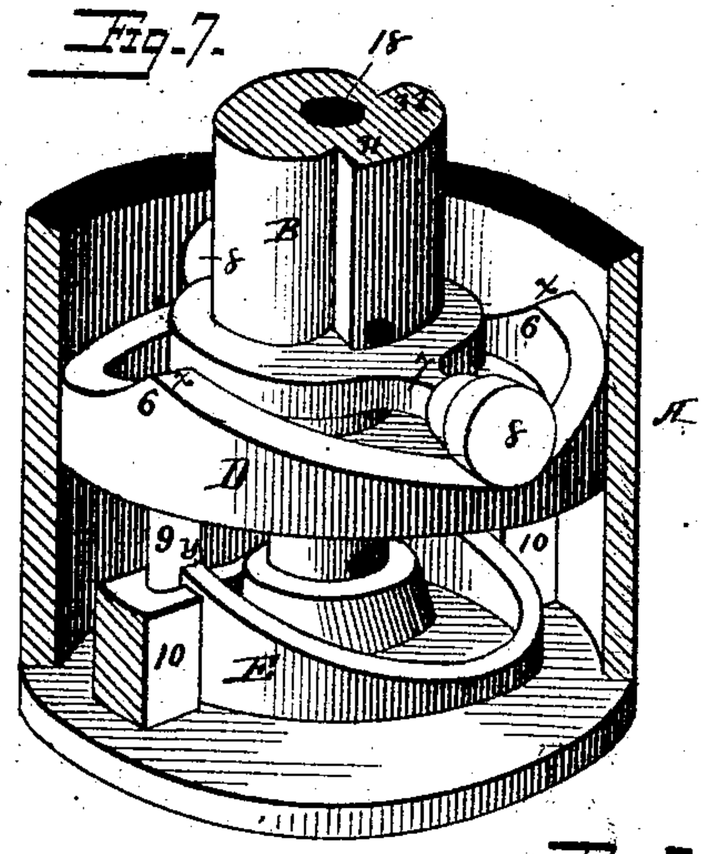


Fig 6.

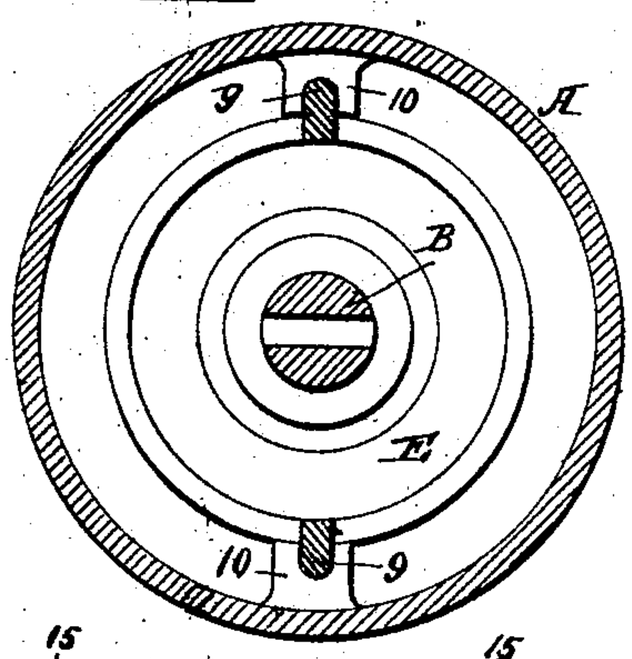


Fig 8.

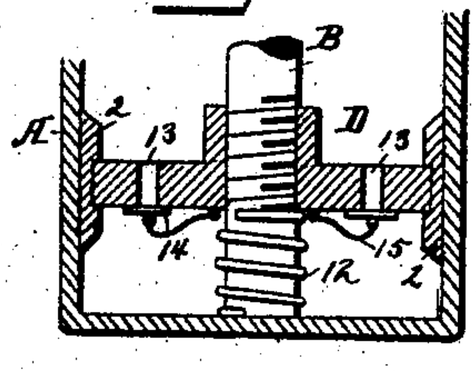


Fig 9.

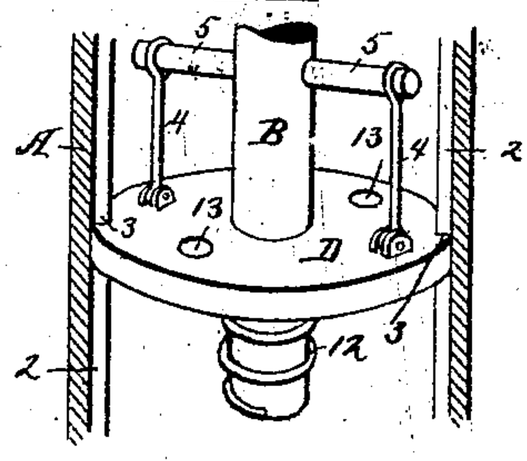


Fig 10.

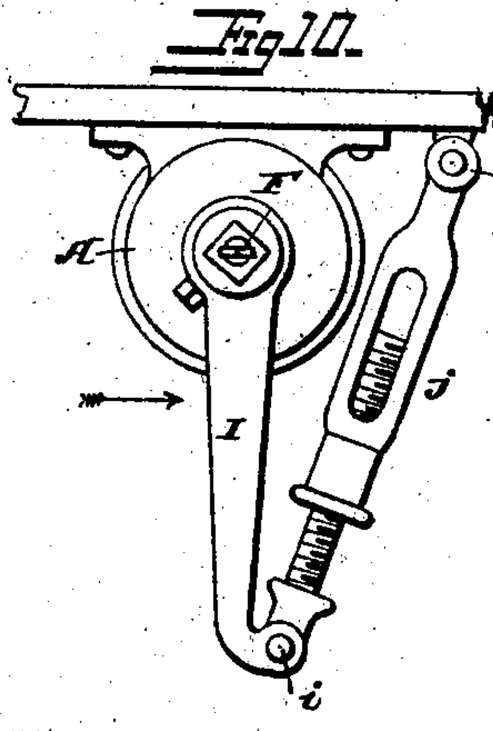
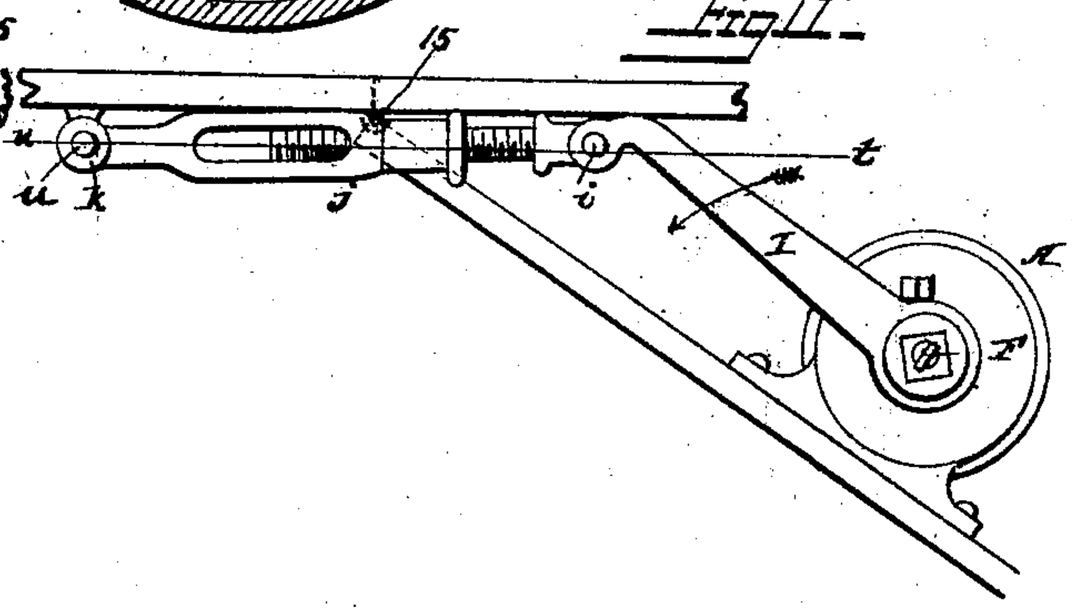


Fig 11.



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(No Model.) 2 Sheets—Sheet 2.

H. A. HOUSE & H. A. HOUSE, Jr.

COMBINED DOOR SPRING AND BUFFER.

No. 367,634. Patented Aug. 2, 1887.

Fig 2.

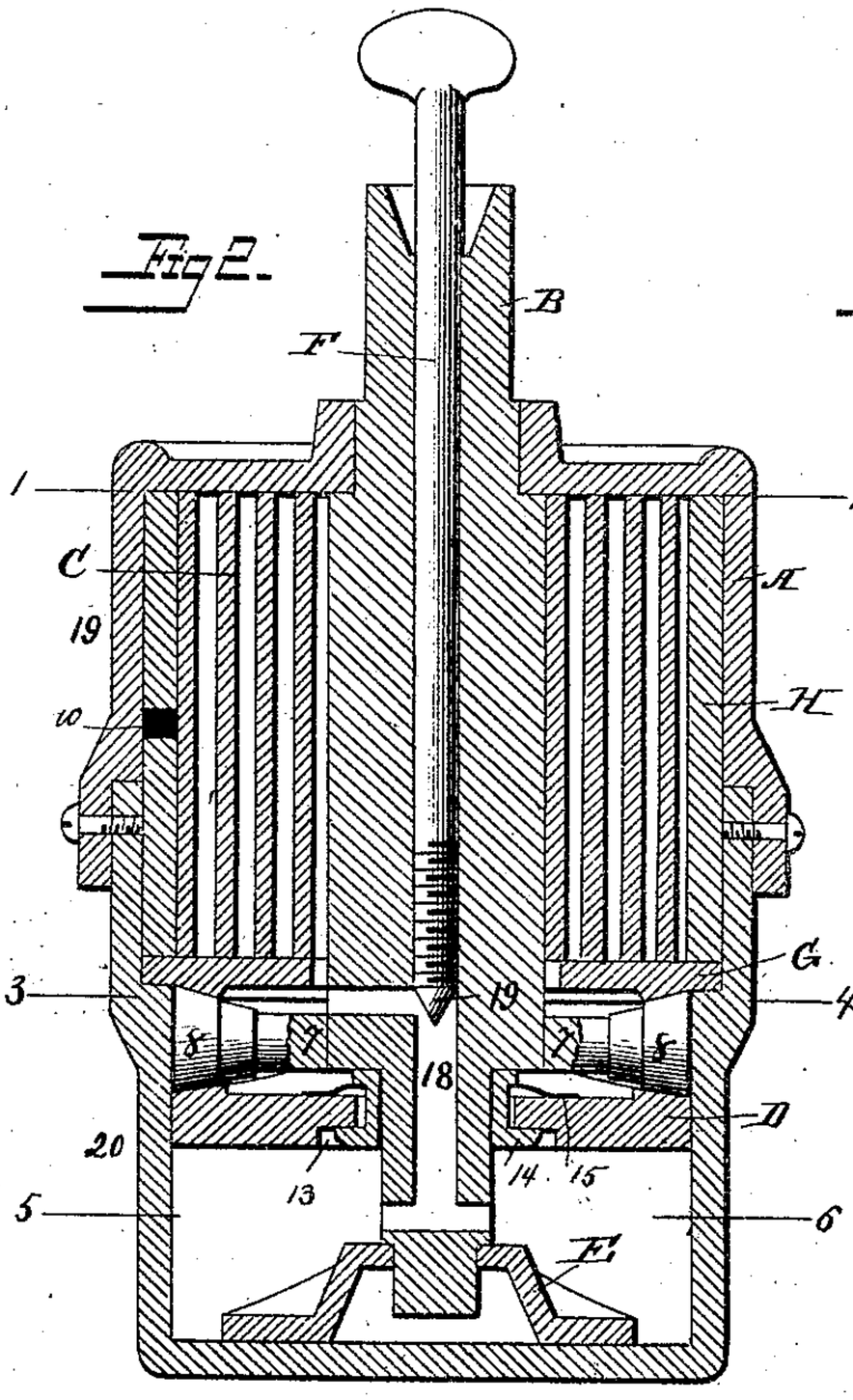


Fig 3.

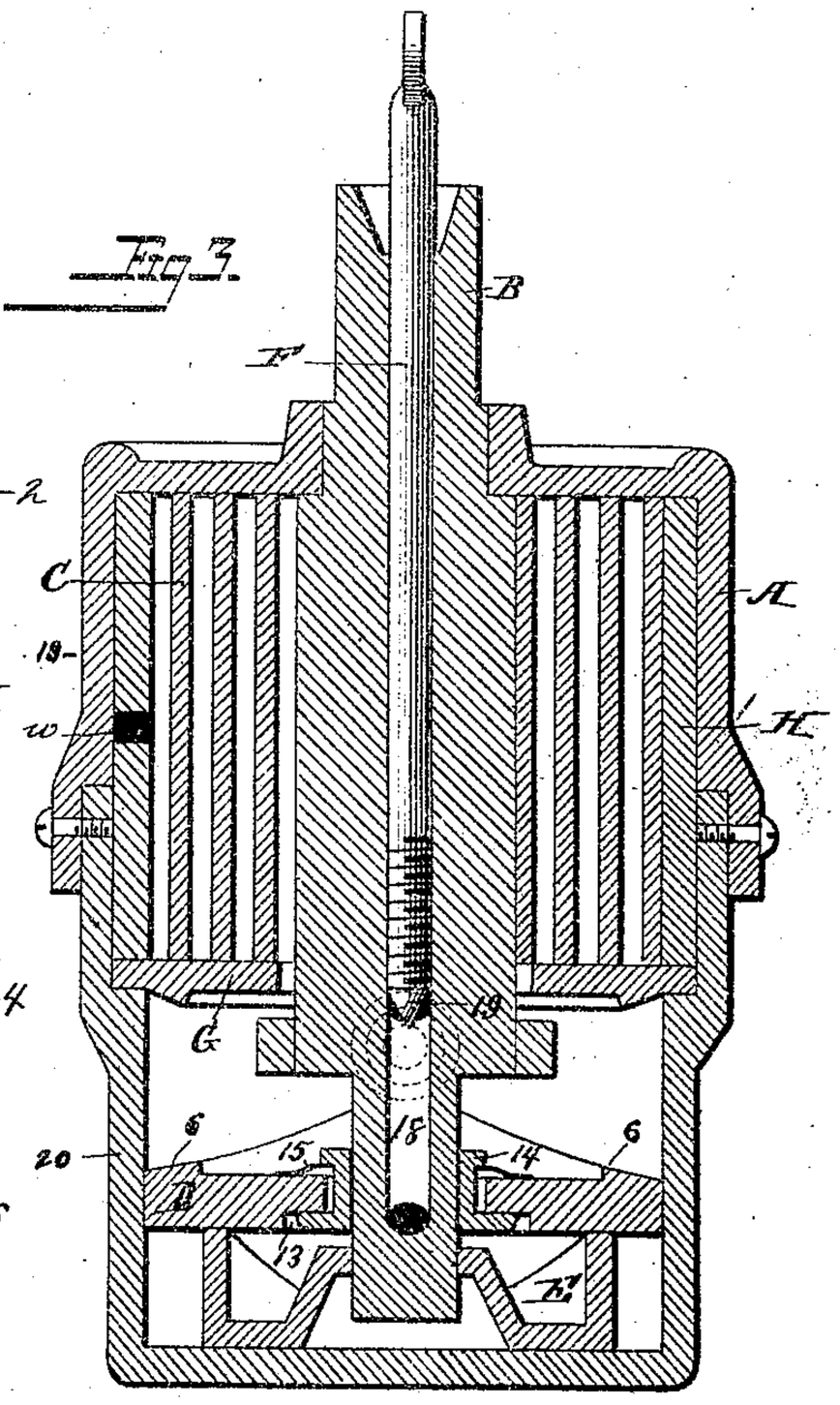


Fig 4.

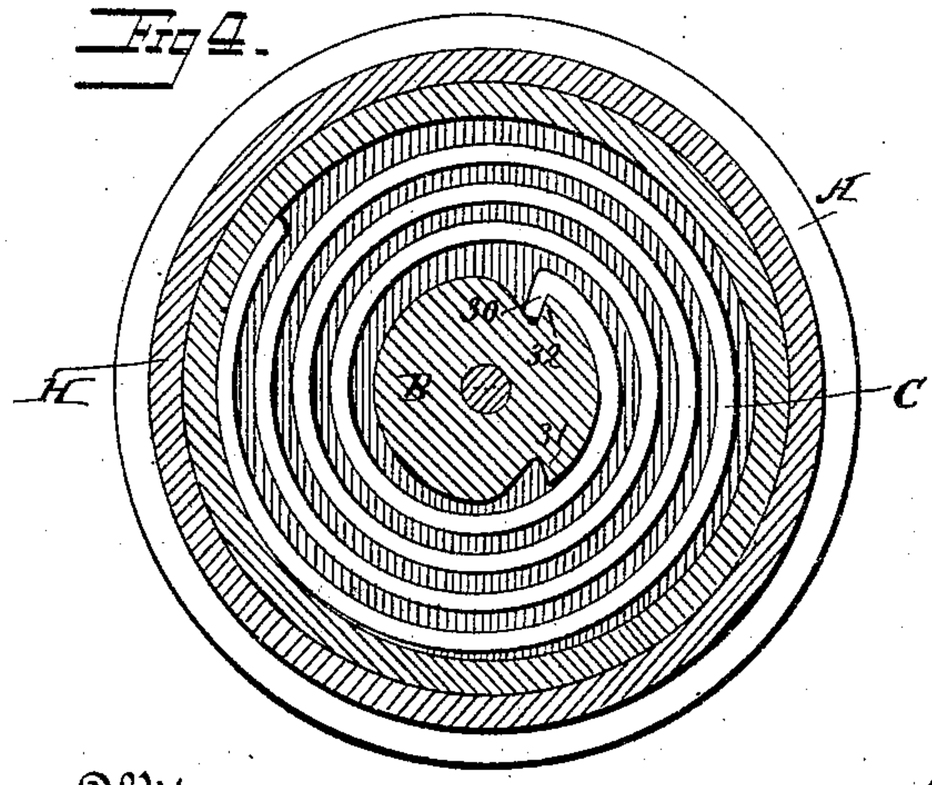
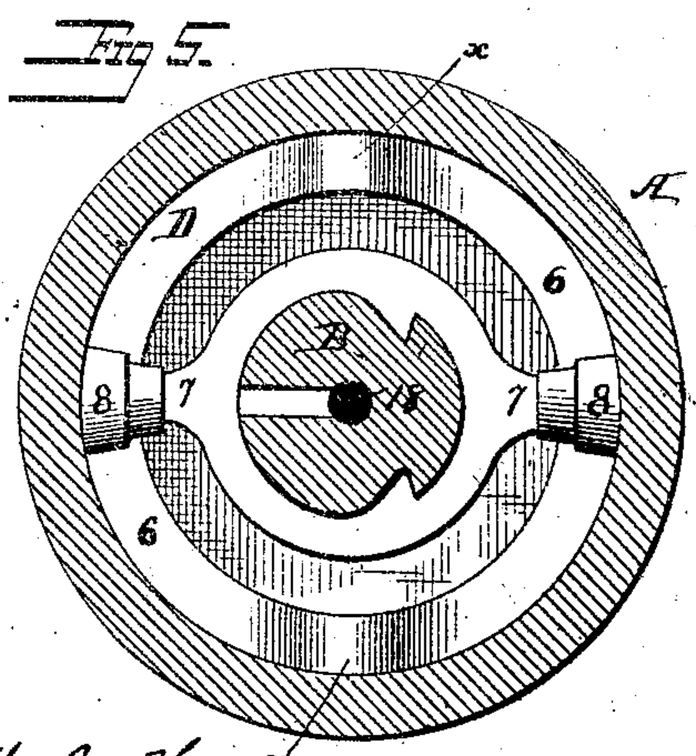


Fig 5.



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UNITED STATES PATENT OFFICE.

HENRY A. HOUSE AND HENRY A. HOUSE, JR., OF BRIDGEPORT, CONNECTICUT.

COMBINED DOOR SPRING AND BUFFER.

SPECIFICATION forming part of Letters Patent No. 367,634, dated August 2, 1887.

Application filed February 14, 1887. Serial No. 227,665. (No model.)

To all whom it may concern:

Be it known that we, HENRY A. HOUSE and HENRY A. HOUSE, Jr., citizens of the United States, residing at Bridgeport, in the county of Fairfield and State of Connecticut, have invented certain new and useful Improvements in a Combined Door Spring and Buffer, of which the following is a specification.

Our invention relates to devices for controlling the movements of doors or swinging screens, shutters, &c.; and it consists in constructing the same as fully set forth hereinafter, and as illustrated in the accompanying drawings, in which—

Figure 1 is an external elevation of our improved device as constructed and applied to a door to constitute a combined door spring and buffer. Figs. 2 and 3 are sectional elevations, enlarged, showing the parts in different positions. Fig. 4 is a section on the line 1 2, Fig. 2. Fig. 5 is a section on the line 3 4, Fig. 2. Fig. 6 is a section on the line 5 6, Fig. 2. Fig. 7 is a distorted perspective view illustrating the construction of part of the device. Figs. 8 and 9 are views illustrating modifications, and Figs. 10 and 11 are views of the action of the device when applied to a door.

The case A of the device is constructed in any suitable manner, and contains a central spindle, B, and a coiled spring, C, so connected with the spindle and with the case that the turning of the spindle compresses the spring, and the case and spindle are connected, respectively, with the door and frame of the door in such manner that the opening or closing of the door, as the case may be, is the means of winding up or compressing the spring, the reaction of which imparts a reverse movement to the door when the latter is released.

Inasmuch as the unimpeded action of the spring will cause the sudden closing or opening or banging of the door, we provide means whereby a temporary yielding resistance is made to the action of the spring, but without in any way impairing the effective force of the latter in finally closing the door or opening it, as the case may be, while no resistance whatever is offered to the movement of the door in the reverse direction. Such a resistance is afforded by a body of water, oil, or other non-compressible fluid acted upon by a piston put in motion by the turning of the spindle and caused to pass through a contracted opening by the movement of the piston in such manner as to resist the said movement and retard it without preventing it, so that the closing of the door, while somewhat retarded, is effectually secured by the action of the spring.

Different modes of connecting the piston so as to slide under the rotation of the spindle may be employed—as, for instance, by providing the spindle with a quick thread, as shown in Fig. 8, and placing the piston D upon it as a nut, the piston sliding in the case, but being prevented from turning by means of ribs or projections 2 2, entering notches 3 3 in the piston. In Fig. 9 the piston is shown as connected by links 4 to arms 5 of the spindle, by which the same result is secured. We prefer, however, to provide the piston with inclines acted upon by bearings or arms provided with rollers projecting from the spindle, as best shown in Figs. 2, 3, 5, and 7. In this construction the spindle has two laterally-projecting arms, 7 7, each carrying a conical anti-friction roller, 8, and the piston D has upon its upper face two oppositely-arranged projections, 6 6, each inclined downward upon opposite sides of its highest point or apex *x*, so as to form an annular bearing having two opposite high points or projections and two intermediate low points or recesses, and the piston is prevented from turning by having downwardly-projecting arms 9 9, each of which enters a recessed lug, 10, within the casing. As the spindle B revolves in either direction, the rollers 8 traverse the bearing-face of the piston and force the latter downward until they pass over the highest points *x*.

The piston may be raised upon the reverse movement by means of a spring, 12, Figs. 8 and 9. We prefer, however, to lift it positively by providing the arms 9 with shoulders *y*, which bear upon an annular double-inclined cam, E, corresponding in form to the bearing-face upon the piston, and this cam is connected with the spindle B to rotate therewith, and the bearings *y* are intermediate of the bearing-rollers 8, so that as the bearings *y* move toward the upper portions of the cam E the rollers 8 will descend toward the lower portions of the bearing upon the piston, which is therefore moved positively downward by the bearing-rollers 8 and positively upward by the annular cam E.

Water, glycerine, or other fluid is placed in the casing A, so as to fill the space below and cover the piston D, and the piston is either loosely fitted in the case or is provided with contracted openings, so that as it is forced downward the fluid can escape but slowly from the bottom to the top of the piston, thereby retarding the movement of the latter. The openings may be made directly in the piston, as shown in Figs. 8 and 9, where each opening, 13, is shown as closed at the lower side by a spring-supported valve, 14, so that the piston may rise without resistance when the door is open, but the valves will partially close when the piston begins to descend, so as to obstruct the upward flow of the fluid. A preferable construction is shown in the remaining views of the drawings, where the spindle B is provided with an opening or channel, 18, having an outlet near the lower end of the spindle and another above the highest point reached by the piston, and the piston has a central opening, 13, to which is fitted a valve, 14, supported by a light spring, 15, which insures the valve closing at once as the piston begins to descend; but the upward movement of the piston is effected without resistance, as the valve then opens downward, permitting the fluid to flow through the opening 13 to the space below.

The resistance to the descent of the piston results from obstructing the channel 18, and in order to permit this to be effected without dismembering the article, we use an adjustable stop-valve, 19, which may be adjusted by any suitable device from the outside of the case. For instance, the valve may be the conical lower end of a screw-rod, F, extending centrally through the spindle B, and provided with a cross-handle at the upper end. By merely closing the opening 18 the passage is obstructed to such an extent that the fluid can flow but slowly, and the door will close with a correspondingly slow movement; but while the movement is thus retarded the force of the spring is not weakened, and it will insure the final and absolute closing of the door, but without the abrupt movements incident to the use of springs unobstructed in their action.

To simplify and facilitate the construction of the device, we form the case A in two parts, 19 20, one with a flange overlapping the other, to which it is secured by suitable screws, and the upper part, 19, is provided with the attachments for connecting it to the door, so that the lower part may be withdrawn without disconnecting the said attachments. The spring C is supported in the case by a plate, G, resting upon a shoulder and provided with an annular track-bearing for the rollers 8, and the outer end of the spring is connected to an annular shell or sleeve, H, fitting within the case to turn freely and capable of being turned within the case, so as to apply any desired tension to the spring. One means of thus turning the shell H consists in providing it with openings *w*, arranged to be exposed through a slot or opening, *v*, in the case A, and the shell H will then be turned by inserting pins Y in the opening *w* until the desired tension is imparted to the spring, after which one of the pins is inserted in position to bear against the edge of the opening *v*, and thereby prevent the shell from turning back. A worm-shaft or other suitable device may be used for turning the shell H, instead of the device described.

An important feature of our above-described device consists in the construction of parts whereby the resistance to the rapid movement of the door exists only during a partial movement of the spindle—that is, during the time that the bearing-rollers are traveling from the lower to the highest points of the bearing-surfaces. This permits the said points to be so placed that the bearing-rollers will begin to move from said points downward just before the door is fully closed, so that the force of the spring is exerted to close the door to such an extent as to overcome the resistance of the spring of the door-latch. The bearing-rollers 8 pass from the highest points, *x*. The piston then begins to descend, thus instantly removing all resistance to the closing of the door, thereby insuring its perfect closing, which might not result if the resistance were continued till the end of the movement of the door.

The case A may either be carried by the door or the frame, with any suitable connections between them. In Fig. 10 the spindle B is shown as provided with an arm, I, and the spring is arranged within the casing and connected to the latter and the spindle, so as to exert a force in the direction of the arrow, Fig. 10, to turn the spindle in said direction and carry with it the arm I. The arm I is connected by means of an extensible rod, *j*, to a stud, *k*, upon the door-frame, so that when the door is open the spindle is turned in a direction the reverse of that indicated by the arrow, and when the door is released the force of the spring, turning the spindle in the direction of the arrow, causes the door to be closed.

It is desirable in many cases to prevent the spring which returns the door to its position from being overstrained, as would result if an equal tension were applied to wind or compress it, increasing regularly in proportion as the door is opened. To prevent this result, we make the connecting-rod *j* longer than the arm I, and arrange the stud *k* between the spindle and the door-hinges, so that as the door is opened the spindle will be turned to almost its entire extent during the first half of the movement of the door until the spring has acquired sufficient tension, but will thereafter be rotated with a very slight degree. This arrangement has the further advantage of permitting the pivot or joint *i* between the arm I and connecting-rod *j* to be carried beyond a line, *t*, passing through the pivot or joint *u*, connecting the rod *j* to the stud *k*, as shown in Fig. 10, so that when the door, hinged at 15,

is in its fully-opened position (shown in Fig. 11) the tendency of the spring to move the arm I in the direction of the arrow will be exerted to hold the door in its open position instead of to close it.

In order to permit the action of the spring to be reversed, we provide for the ready reversal of the spring by connecting it detachably at either of two points upon the spindle. For instance, the spring is provided at the inner end with a bearing-lip, 30, adapted to bear upon either of two shoulders, 31 32, of the spindle B, according to the position in which the spring may be inserted in the casing. By this means the action of the spring may be made either to open or close a door, or applied to swing the door to the right or left.

Some of the features above described may be used without being connected with the other, accordingly as it is desired to make a door-spring or a buffer device.

Without limiting ourselves to the precise construction and arrangement of parts shown, we claim—

1. The combination of a case containing a fluid, a rotatory spindle within the case, a piston within the case surrounding the spindle and movable longitudinally thereof by the turning of the spindle, and a contracted channel for the passage of the fluid from one side of the piston to the other, substantially as described.

2. The combination of a case containing a fluid, a rotatory spindle within the case, a piston within the case surrounding the spindle and movable longitudinally thereof by the rotation of the spindle, means for preventing the rotation of the piston with the spindle, and a contracted channel for the passage of the fluid from one side of the piston to the other, substantially as described.

3. The combination of the case, spindle, sliding piston, channel connecting the spaces above and below the piston, and valve for closing said channel in the spindle, connected with an operating device outside of the casing, substantially as set forth.

4. The combination of the case, a rotating spindle therein, a piston sliding on said spindle, and a channel connecting the spaces above and below the piston, the openings to the channel being arranged substantially as set forth, whereby the piston in its movements does not cover them, as described.

5. The combination of the casing, spindle, sliding piston connected to be moved by the rotation of the spindle, circulating-passage in said spindle opening above and below the piston, and adjustable valve for regulating the opening in said passage, substantially as set forth.

6. The combination, with the casing, rotating spindle, sliding piston, circulating-passage, and spring, of a shell arranged within the casing and connected to the spring and provided with adjusting means, for the purpose specified.

7. The combination of the casing, revolving spindle provided with arms extending laterally therefrom, a sliding piston having projections with inclined edges affording bearings for said arms, a passage connecting the spaces above and below the piston, and a valve carried by the piston and arranged to close as the piston moves in one direction, substantially as set forth.

8. The combination, with the sliding piston, of the rotating spindle having arms bearing upon projections, a piston having inclined edges, and a cam carried by the spindle corresponding in form to the bearing-face of the piston and affording a bearing for the piston, substantially as and for the purpose set forth.

9. The combination, with the sliding piston and rotating spindle, of arms carried by the spindle and bearing on cam projections of the piston, a cam carried by the spindle, and arms upon the piston bearing upon the said cam, the parts constructed and arranged to positively move the piston in both directions by the rotation of the spindle, substantially as set forth.

10. The combination of the case, rotatory spindle, spring, a sliding piston in a body of liquid within the case, a contracted opening for the passage of the fluid from one side of the piston to the other, and bearings between the spindle and piston, whereby the latter is forced against the liquid during part of the revolution of the spindle only, substantially as described.

11. The combination, with the sliding piston, rotating spindle, and a case containing a body of liquid against which the piston bears, of an inclined bearing upon the piston and a bearing-arm upon the spindle, the piston-bearing arranged to be passed by the bearing-arm before the spindle completes its movement, whereby the resistance of the piston to the rotation of the spindle is removed, substantially as set forth.

12. The combination of the casing, spring, spindle, having a fluid-passage, 18, therein, and connected to a sliding piston, and a valve carried by the piston, substantially as set forth.

13. The combination, with the casing, a rotatory spindle, sliding piston connected to be moved by said spindle against a body of fluid in the casing, and contracted passage for the circulation of said fluid, of an arm extending from and turned by the spindle, and a longer arm or connecting-rod jointed to the end of the spindle-arm and hinged at the point upon a door or frame between the casing and the hinge of the door, substantially as and for the purpose set forth.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

HENRY A. HOUSE.
HENRY A. HOUSE, JR.

Witnesses:
WALTER W. FENTON,
WM. A. BARNES.