No. 641,499. Patented Jan. 16, 1900.

W. K. CROFFORD.

DOOR CHECK.

(Application filed June 1, 1898. Renewed May 24, 1899.)

(No Model.) 3 Sheets—Sheet 1.

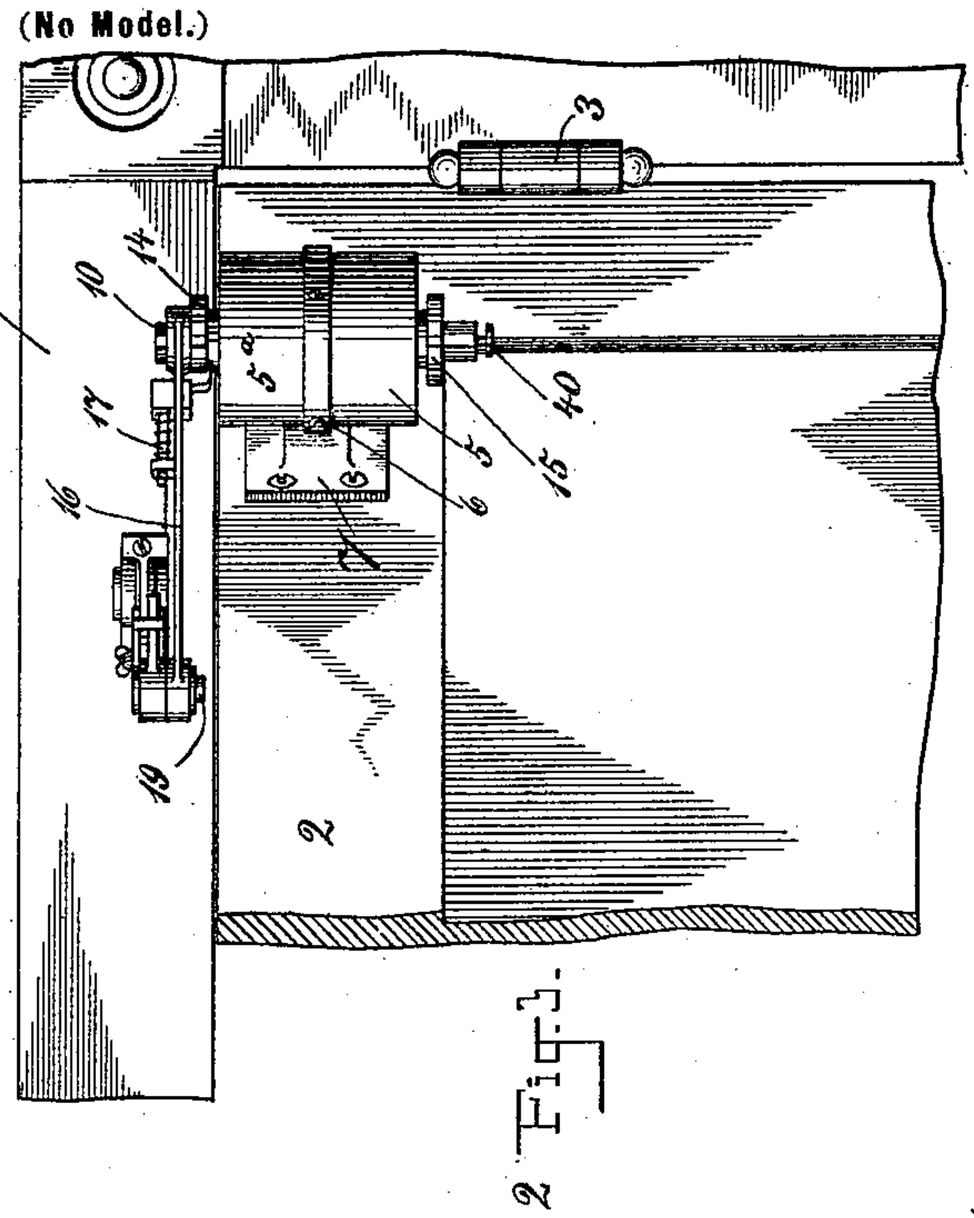

Fig. 1.

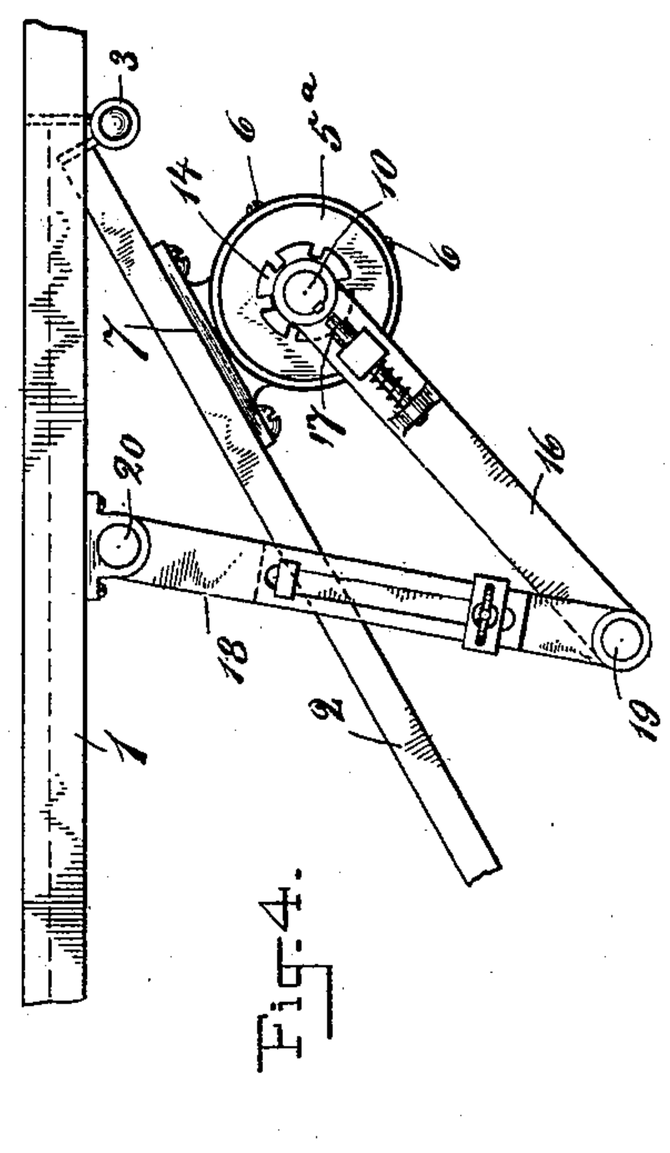

Fig. 4.

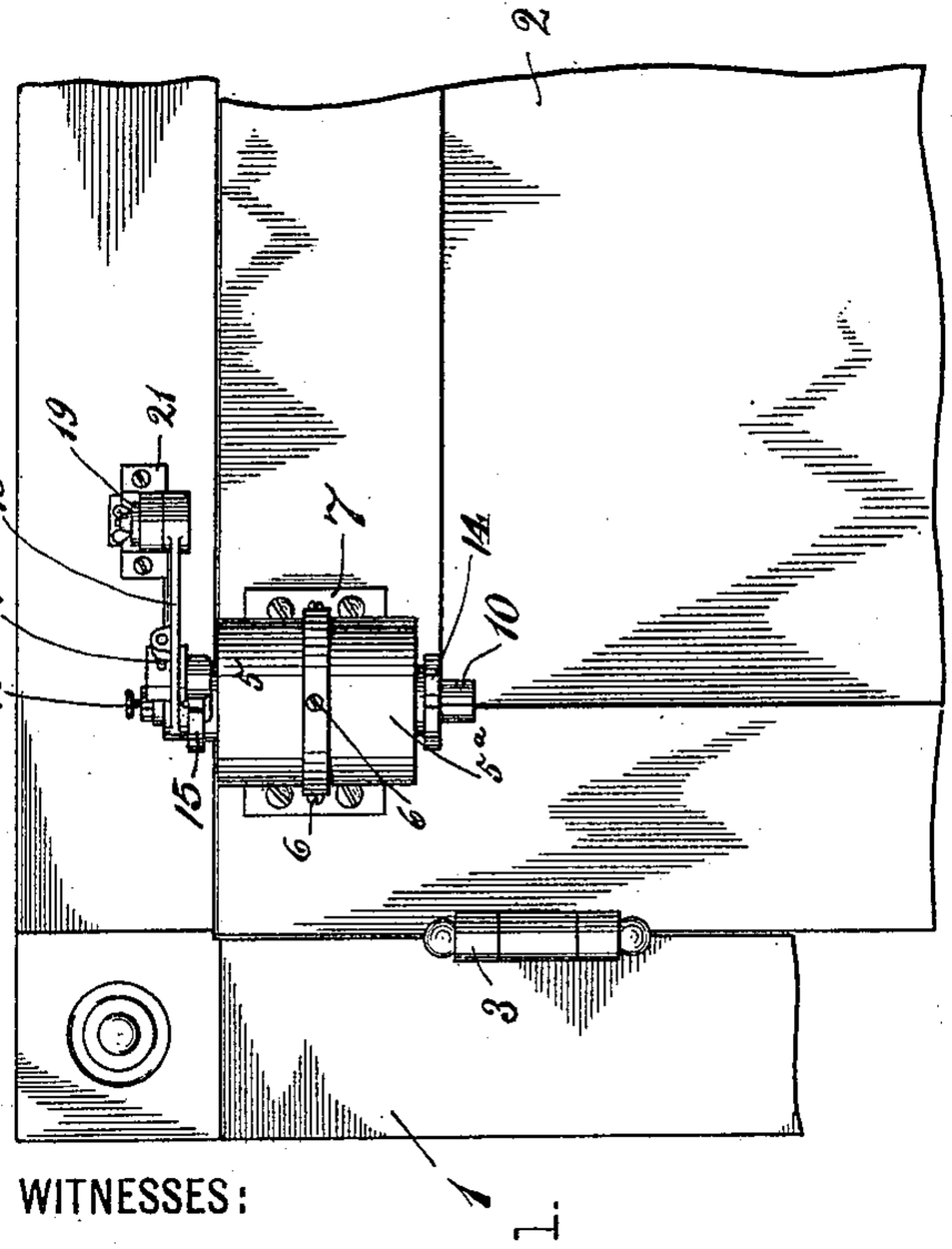

Fig. 5.

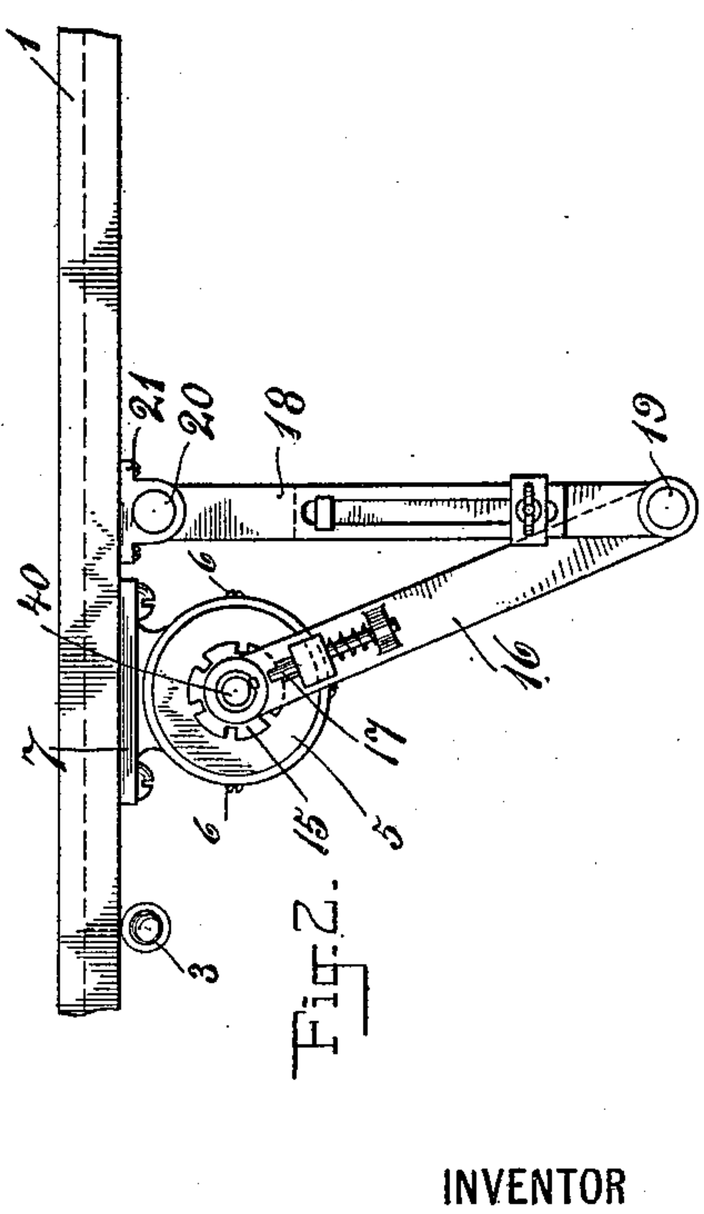

Fig. 2.

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W. K. CROFFORD.

DOOR CHECK.

(Application filed June 1, 1898. Renewed May 24, 1899.)

(No Model.) 3 Sheets—Sheet 2.

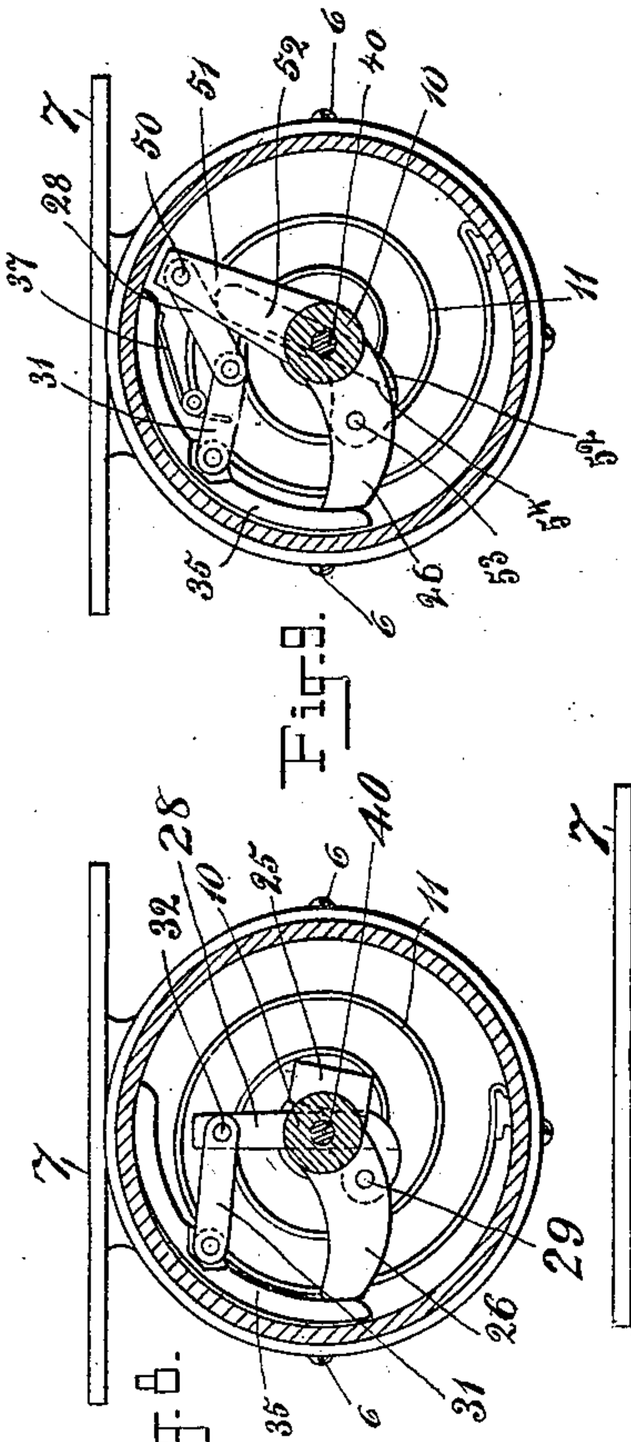

Fig. 9.

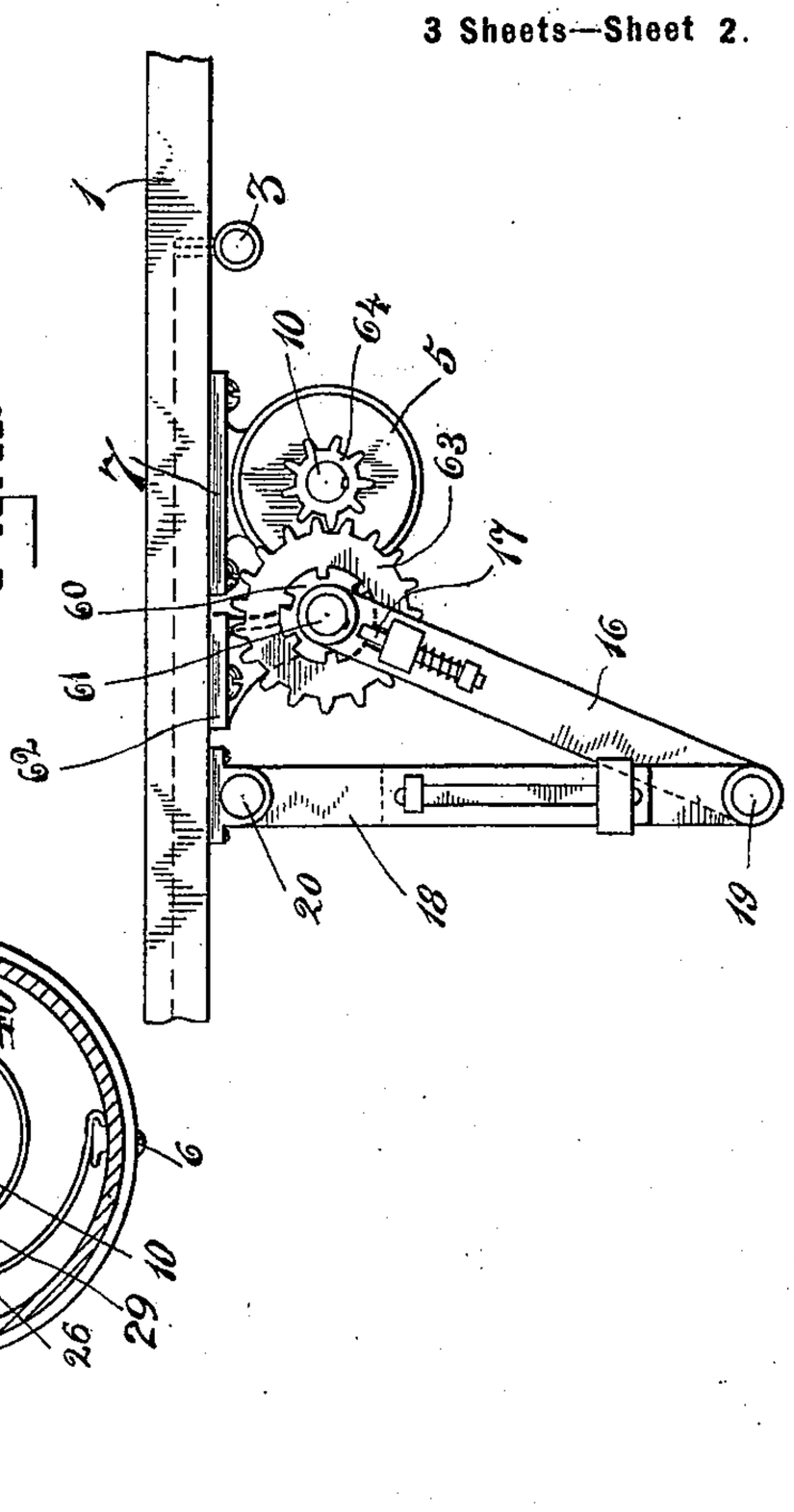

Fig. 10.

Fig. 8.

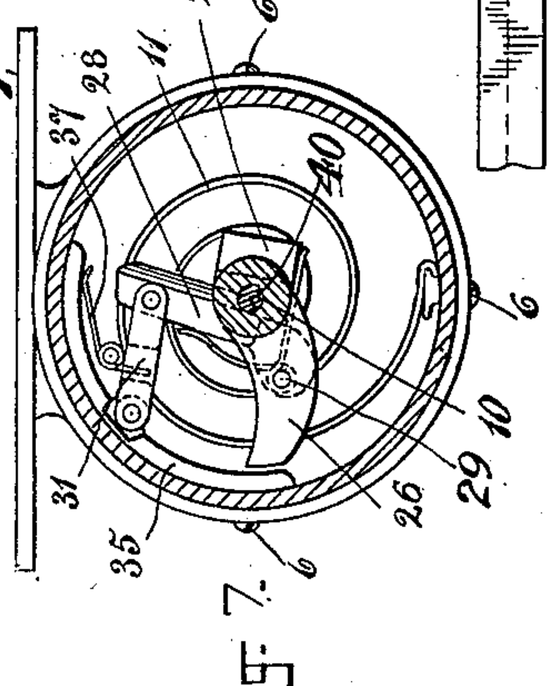

Fig. 7.

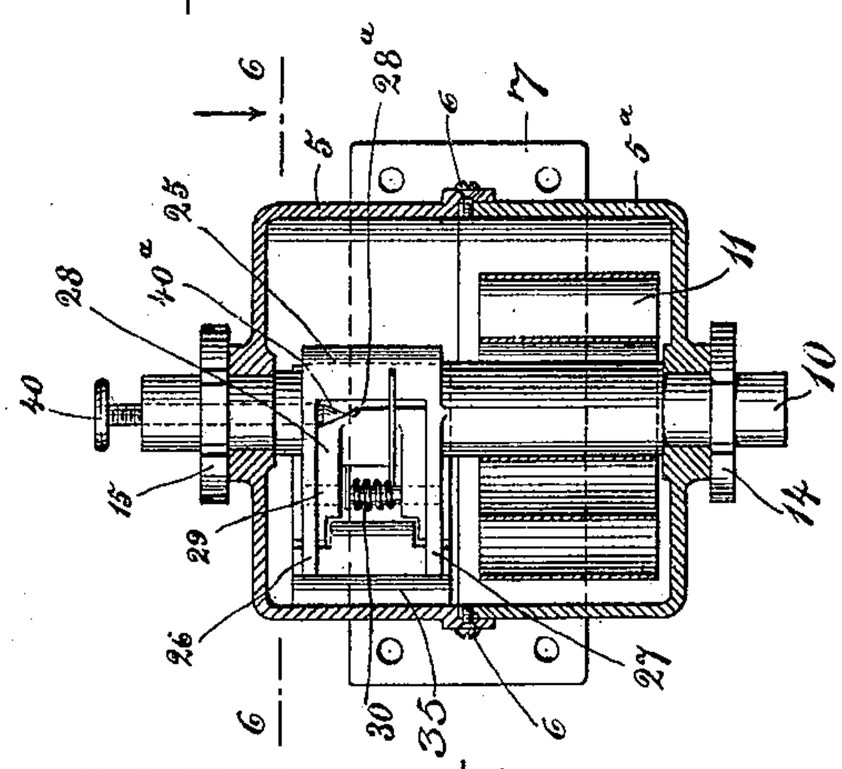

Fig. 5.

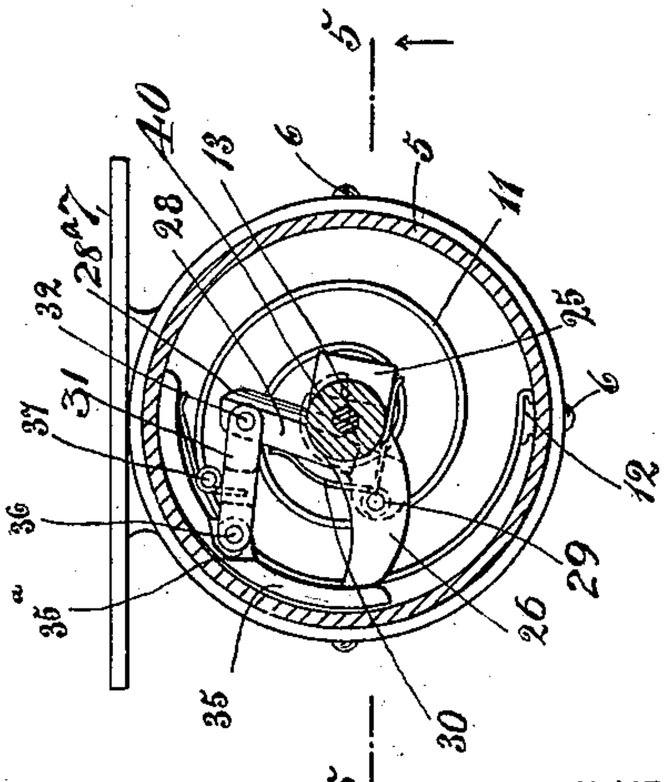

Fig. 6.

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No. 641,499. Patented Jan. 16, 1900.

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DOOR CHECK.

(Application filed June 1, 1898. Renewed May 24, 1899.)

(No Model.) 3 Sheets—Sheet 3.

Fig. 11.

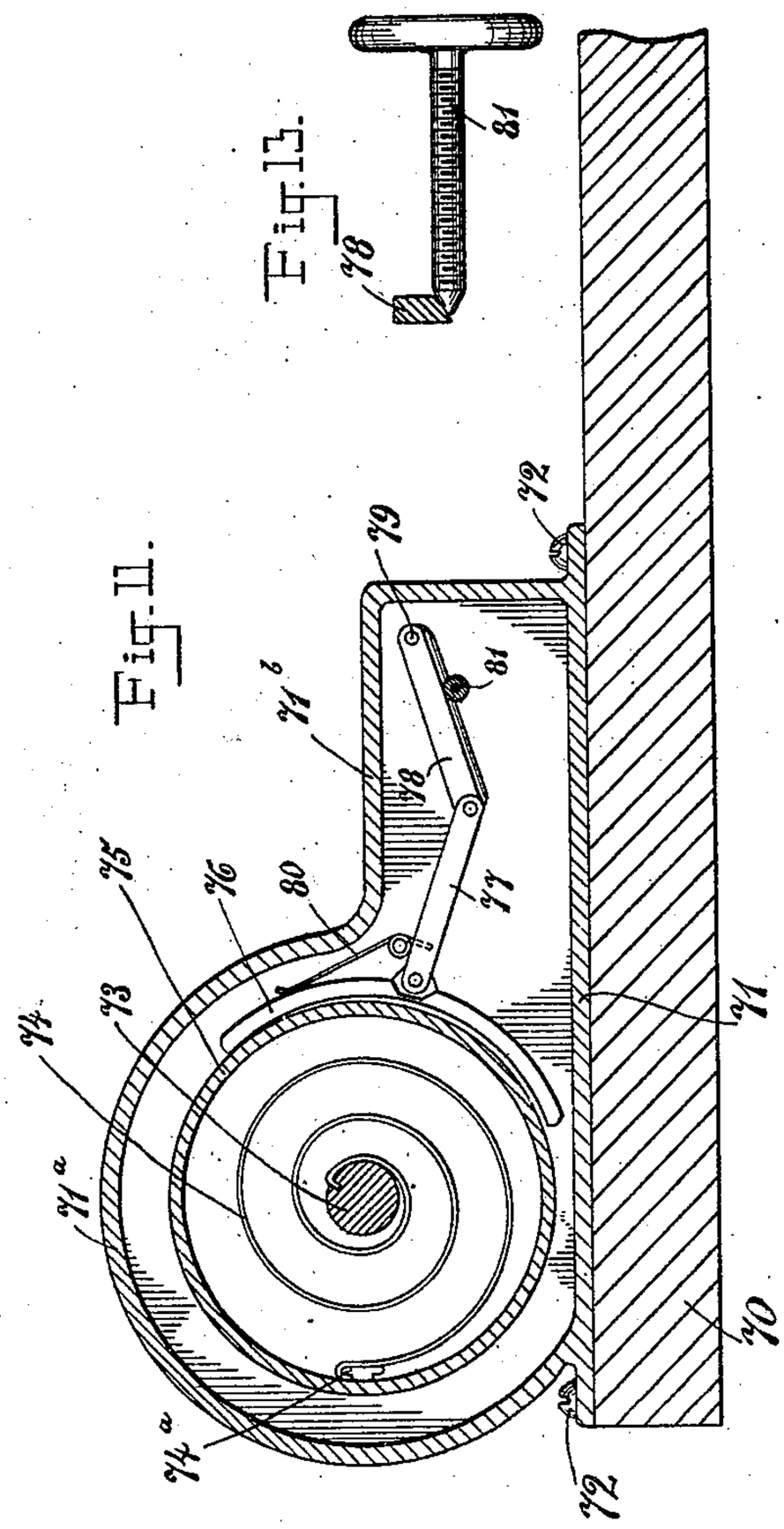
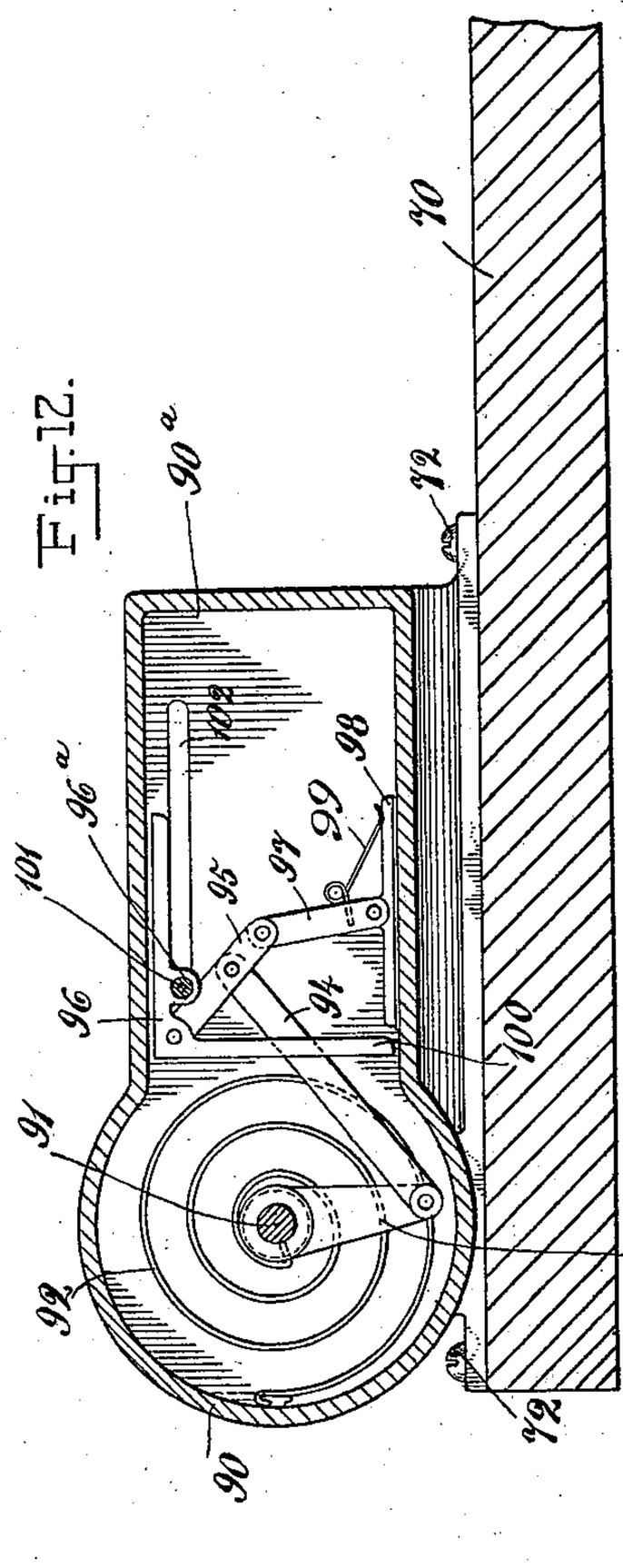


Fig. 13.

Fig. 12.



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UNITED STATES PATENT OFFICE.

WARREN K. CROFFORD, OF NEW YORK, N. Y.

DOOR-CHECK.

SPECIFICATION forming part of Letters Patent No. 641,499, dated January 16, 1900.

Application filed June 1, 1898. Renewed May 24, 1899. Serial No. 718,106. (No model.)

To all whom it may concern:

Be it known that I, WARREN K. CROFFORD, a citizen of the United States, residing at New York, in the county and State of New York, have invented certain new and useful Improvements in Door-Checks, of which the following is a specification.

The object of my present invention is to provide a simple and effective mechanical device capable of ready adjustment for frictionally retarding or braking the relative movement between the two parts of frictional door checks and closers, thereby improving the construction, cheapening the cost, and lessening their liability of getting out of order.

A further object of the invention is to provide for the ready reversal of the door check and closer, so that it may readily be applied to doors swinging in either direction.

My invention consists, broadly, of two frictional members having means for connecting them respectively to the door and door-frame, one of said frictional members being movable toward and away from the frictional surface of the other member, a pivoted link or arm arranged to control the action of said movable member, and means for adjusting the angular relation of the link or arm to said member for regulating the frictional action.

My invention consists, more specifically, in its preferred form, of a spring-actuated shaft or rotary member adapted to be connected to the door-frame and journaled upon the door, a retarding frictional surface, and a friction-shoe yieldingly connected with the spring-actuated shaft or rotary member and supported thereby in operative relation with the friction-surface. The friction-shoe is preferably connected with the spring-actuated shaft by a pair of toggle-links, and in combination with these elements I employ a suitable adjusting device for regulating the working angle of the toggle-links with relation to each other or the working angle of one of the links with relation to the shoe, and consequently regulating the position of the friction-shoe with relation to the friction-surface and the degree of friction between the shoe and friction-surface, such regulating device consisting, preferably, of an adjusting-screw threaded in a suitable support and engaging an inclined or beveled face upon one of the links which connect the shoe with the shaft.

To provide for the reversibility of the door check and closer, I provide the rotary member with means for attaching it at either end to the arms which are connected with the door-frame.

In order that my invention may be fully understood, I will first describe the same with reference to the accompanying drawings, and afterward point out the novelty with more particularity in the annexed claims.

In said drawings, Figure 1 is a detail front elevation of the preferred form of my improved door check and closer, showing it applied to a door. Fig. 2 is a top plan view of the same. Fig. 3 is a view similar to Fig. 1, showing the same form of door check and closer applied in reversed position to a door which swings in the opposite direction from that illustrated in Fig. 1. Fig. 4 is a plan view of the arrangement shown in Fig. 3. Fig. 5 is a vertical sectional view of the door check and closer, taken on the line 5 5 of Fig. 6. Fig. 6 is a transverse sectional view of the same, taken on the line 6 6 of Fig. 5. Fig. 7 is a similar view showing the position of the parts when the check is operating. Figs. 8 and 9 are similar views of modified forms. Fig. 10 is a view similar to Fig. 2, showing a modified arrangement for connecting the spring-actuated shaft with the door-frame. Figs. 11 and 12 are detail sectional views of further modifications. Fig. 13 is a detail of the adjusting device shown in Fig. 11.

1 represents the door-frame, and 2 the door, hinged at 3.

5 5ª are respectively the upper and lower portions of the sectional cylindrical casing, secured together by any suitable means, such as set-screws 6, one of said sections being provided with an integral bracket 7, which is adapted to be secured to the door by screws.

10 is the vertical spring-actuated shaft, journaled in suitable bearings in the upper and lower sections of the cylindrical casing and extending longitudinally through said casing with its upper and lower ends projecting beyond the ends of the casing.

11 is a helical spring having its outer end attached to the casing at 12 and at its inner end attached to the vertical shaft 10 at 13.

14 and 15 are ratchet-wheels secured to the opposite projecting ends of the shaft 10 by a key or other suitable device.

16 is an arm formed with an opening adapted to fit over one of the projecting ends of shaft 10 and carrying a spring ratchet or pawl 17, which is adapted to engage the ratchet-wheel 14 or 15.

18 is an extensible arm journaled at 19 to the end of arm 16 and at 20 to a bracket 21, adapted to be attached to the door-frame above the door.

The shaft 10 within the casing 5 5ª above the helical spring 11 is formed with an eccentric portion 25, from which extends the rigid radial arms 26 and 27.

28 is an arm or link journaled upon a pin 29 between the rigid radial arms 26 and 27. 30 is a spiral spring surrounding the pin 29 within the bifurcated end of the arm or link 28 and having its opposite ends engaging the eccentric portion 25 and the link 28, respectively, for holding the link 28 pressed against the inner face of the eccentric portion 25 with a yielding pressure. 31 is a second arm or link, formed with bifurcated ends and journaled at its inner end to the outer end of the arm or link 28 by means of pin 32.

35 is a convex frictional shoe faced with a suitable friction material, such as leather, and formed with an integral lug 35ª, which is journaled in the bifurcation at the outer end of the arm or link 31 by means of the pin 36.

37 is a spring secured to the arm or link 31 and engaging the rear end of the convex frictional shoe 35 for yieldingly pressing it outwardly into engagement with the concave or inner friction-surface of the upper portion 5 of the casing.

40 is an adjusting-screw threaded axially into the upper end of shaft 10 and formed with an inner beveled or pointed end 40ª. The arm or link 28 is formed with an inclined or beveled face 28ª, with which the beveled or pointed end 40ª of the adjusting-screw engages, the spring 30 holding the inclined or beveled face of the link 28 in constant engagement with the end of the adjusting-screw 40. The screw 40 regulates the angular relation between arms 28 and 31 and also the relation between arm 31 and shoe 35.

The rigid radial arms 26 and 27 are extended beyond the journal 29 to points adjacent to the forward end of the convex frictional shoe 35, so as to resist any inward tendency of the shoe and confine the shoe in operative relation to the concave frictional surface.

The device as far as above described is illustrated in Figs. 1, 2, 5, 6, and 7. Fig. 5 shows the device when at rest, and Fig. 7 illustrates the position of the parts during the retarding or braking action of the door-check.

In Fig. 8 I have shown a slightly-modified form of the door-check, in which the spring 30 is omitted and the shape of the link 28 is slightly changed. In this form of the device the frictional shoe is thrown into engagement with the frictional surface by centrifugal force, and is preferably employed with an arrangement such as shown in Fig. 10 for multiplying the movement of the shaft 10, as hereinafter explained.

In Fig. 9 I have shown a further modification, in which the arm or link 28 is journaled at 50 in the outer end of the rigid arm 51, extending radially from the shaft 10. In this form I also provide an adjusting-lever 52, journaled at 53 and engaging the arm or link 28, and formed with the beveled or inclined face indicated by the dotted line 54, which is engaged by the adjusting-screw 40.

In Fig. 10 I have represented the door-check applied to the door in a different manner. In this figure the arm 16, carrying the ratchet or pawl 17, engages a ratchet-wheel 60, keyed to a short shaft 61, journaled in the bracket 62 and having keyed to its lower end a gear-wheel 63, which meshes with a small gear-wheel 64, keyed to the upper end of the shaft 10 of the door-check. The object of this modified arrangement is to multiply the effect of the movement of shaft 61 upon the door-check shaft 10 to increase the effectiveness of the operation of the check. As above stated, the arrangement of the frictional members shown in Fig. 8 is employed with the form of connecting devices shown in Fig. 10, the centrifugal force throwing the shoe into engagement with the frictional surface.

In Figs. 11 and 13 I have shown a modified form of my invention, in which a frictional cylindrical member rotates with relation to the frictional shoe. In this form 70 is a door, to which a casing 71 is attached by screws 72. The casing 71 has a cylindrical bulge 71ª and a reduced portion 71ᵇ. Secured centrally in the bulge portion 71ª of the casing is a shaft 73, upon which is journaled a cylindrical drum 75, having an exterior friction-surface. 74 is a helical spring having its inner end secured to the stationary shaft 73 and its outer end secured at 74ª to the inner surface of the frictional drum. 76 is a curved frictional shoe journaled in the forward end of arm or link 77, which is in turn journaled upon an arm 78, pivoted to the casing upon journal 79. A spring 80, mounted upon arm 77, engages the heel of shoe 76 for giving it a yielding pressure in the direction of the frictional drum. 81 is the adjusting-screw, with a pointed end engaging the beveled face of arm 78 for adjusting the angular relation of arm 78 and shoe 76 and the consequent frictional engagement between shoe 76 and drum 75. Arms 77 and 78 are located in the contracted portion of the casing. Screw 81 also adjusts the angular relation of arms 77 and 78. In this form of my invention the rotary frictional drum or cylinder is adapted to be connected to the door-frame by the usual arms above described, (the casing 71 being mounted upon the door,) so that the opening of the door will rotate the drum in the casing and wind the spring. When the door is released, the action of the spring 74 will close the door, the rapidity of closing being regulated by the fric-

tion of the retarding shoe, working against the rotating drum.

In Fig. 12 I have shown a further modification. In this form the casing 90 has an extension 90ª. Journaled centrally in the cylindrical portion of the casing is the usual rotary shaft 91, adapted to be connected to the door-frame in the manner explained in connection with Figs. 1, 2, 5, and 6, the casing 90 being secured to the door 70 by screws 72. 92 is the helical spring, attached at its inner end to rotary shaft 91 and at its outer end to casing 90. 93 is a crank-arm on shaft 91, and 94 is a link or pitman connecting the crank-arm 93 with an arm or link 95, journaled at its upper end to a sliding frictional plate 96. The arm or link 95 is journaled at its lower end to the upper end of a similar arm or link 97, which in turn is journaled at its lower end to a lower frictional plate 98. A spring 99 on arm or link 97 holds friction-plate 98 pressed against the lower frictional surface of the extension 90ª of the casing. The frictional plate 96 is formed with a downward projection 100, which is adapted to engage the inner lower surface of extension 90ª of the casing and confine the plate 96 in close proximity to the upper frictional surface of the extension 90ª. 101 is the adjusting-screw, journaled in a lug 96ª, formed integral with the under face of the friction-plate 96 and engaging a beveled face on the link 95 for adjusting the angular relation between the arms or links 95 and 97 and link 95 and plate 96, and consequently the frictional effect of the plates 96 and 98 upon the inner surfaces of the extension 90ª of the casing. The adjusting-screw 101 slides with the plate 96 longitudinally in the extension 90ª of the casing, and to allow for this movement of the screw with the friction-plate I form a longitudinal slot 102 in the side of the extension 90ª, through which the screw 101 projects. In the operation of this form of the door-check the opening of the door rotates the shaft 91, winds spring 92, and moves the frictional plates 96 98 to the outer end of the extension 90ª. When the door is released, the spring 92 unwinding tends to close the door rapidly, but the crank-arm 93, operating through the pitman 94 and toggle arms or links 95 97, draws the friction-plates 96 98 inwardly in the extension 90ª (the arrangement of the pitman 94 and toggle-links 95 97 being such that the plates 96 98 will be forced into frictional contact with the inner surfaces of the extension 90ª) and retards the closing action, the friction depending upon the rapidity of the rotation of shaft 91 and the adjusted position of the plates 96 98 by reason of the adjustment of screw 101.

Referring to the form of device shown in Figs. 1, 2, 5, 6, and 7, it will be observed that when the door is opened the shaft 10 will be partially rotated through the arms 16 and 18 in a direction to wind the helical spring 11. When the door is released, the tendency of the spring 11 to unwind will draw the door closed through the arms 16 and 18 by rotating shaft 10 in an opposite direction. Should the closing action become too rapid, the frictional shoe 35, held yieldingly against the inner frictional surface of the casing, will retard the rotation of the shaft 10, and consequently the closing of the door. As the spring 37 engages the rear end of the shoe 35 it tends to free the forward end of the shoe from the frictional surface, and thereby prevents the wedging of the shoe against the surface. By the proper adjustment of the screw 40 the proximity of the shoe to the frictional surface and its frictional effect can be regulated to produce the best results. By adjusting the screw in or out the angle between links 28 and 31 and angle between link 31 and shoe 35 are changed, and the power of the toggle (formed by links 28 31) is also changed, for it will be observed that the more the two links 28 31 are brought into line or the more direct the thrust of link 31 becomes upon shoe 35 the stronger will be the frictional force exerted by the shoe upon the frictional surface of the other member.

In Figs. 1 and 2 I have shown the door-check applied to a door opening to the left, the arms 16 and 18 being connected to the upper end of shaft 10, through which the adjusting-screw passes. In Figs. 3 and 4 I have shown the door-check reversed, with the lower end of shaft 10, as represented in Fig. 1, presented upward. The connecting-arms 16 and 18 are applied in the same manner as in Figs. 1 and 2, and the check will operate in the same manner as just described, the shaft 10 rotating in the same directions for the opening and closing of the door.

In door-checks constructed upon the frictional principle heretofore employed the frictional parts are normally out of operative engagement, so that the retarding action upon the closing of the door becomes effective only after the door and closing-shaft have obtained sufficient momentum to throw the frictional parts into operation. In my improved door-check (when provided with the spring 37) the spring 37, operating upon the friction-shoe, holds it constantly in engagement with the friction-surface, so that it is always in proper position to operate and the door is closed with an even slow motion. When the spring 37 is omitted, as shown in Fig. 8, the centrifugal force may be relied upon to bring the frictional shoe into operative relation with the frictional surface of the casing, the check operating as just explained. During the closing action it will be observed that the pair of pivoted links operate as toggles, forcing the friction-shoe against the friction-surface with greater pressure when the shaft revolves rapidly than when it revolves slowly. As the door-check is operated at a slow speed it will be observed that the parts of the check may be made smaller and lighter than similar parts in checks heretofore employed, which have to be larger and stronger in or-

der to resist the inertia of the door and spring when suddenly thrown into operation by the momentum of the door as it starts to close rapidly. In those door-checks employing pistons and cylinders with air or oil for retarding the closing action the door is allowed to get up a momentum in closing and is then stopped suddenly. Such door-checks are also objectionable because of the noise created by the action of the piston in the cylinder and of the air or oil passing from the cylinder through the restricted passage. The checks employing oil as a retarding fluid are also objectionable because their action varies in different temperatures and because the oil is liable to leak out. My improved door-check is noiseless, is a cheap structure, is readily reversible, and the speed of operation does not alter its effectiveness. With the door-checks employing pistons working in cylinders, the friction of the piston in the cylinder has to be overcome in both opening and closing, making it hard to open the door and requiring an unusually strong spring to close the door and overcome the friction and retarding action of the confined fluid and also requiring great strength in the parts. My improvement obviates this objection, and as the checking action starts immediately when the door is released it will be observed that the door will not get up any considerable momentum in closing, as in checks heretofore employed.

With my improved check when the parts are applied to the door and door-frame, as above described, the tension of the spring can be regulated by holding the spring-pawl out of engagement with the ratchet-wheel upon the shaft 10, then rotating the shaft until the spring is at the required tension, and releasing the pawl into engagement with the ratchet-wheel. By a slight turn of the adjusting-screw 40 the relation of the friction-shoe to the friction-surface is adjusted. The parts are then in proper position to operate.

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

1. The combination, in a door-check, of two relatively movable members having coacting frictional surfaces, and means for connecting them respectively to a door and door-frame, a link or arm pivotally connected with one member and arranged to control the action of the members one upon the other, and means for adjusting the angular relation of the link or arm to the pivotally-connected member, substantially as set forth.

2. The combination, in a door-check, of two relatively movable members having coacting frictional surfaces, and means for connecting them respectively to a door and door-frame, a link or arm pivotally connected with one member and arranged to control the action of the members one upon the other, a spring interposed between the link or arm and controlled member, and means for adjusting the angular relation of the link or arm to the controlled member, substantially as set forth.

3. The combination, in a door-check, of two members having coacting frictional surfaces, and means for connecting them respectively to a door and door-frame, one of said members being movable to and from the frictional surface of the other member, and pivoted or toggle links or arms arranged to control the action of the movable member, substantially as set forth.

4. The combination, in a door-check, of two members having coacting frictional surfaces, and means for connecting them respectively to a door and door-frame, one of said members being movable to and from the frictional surface of the other member, pivoted or toggle links or arms arranged to control the action of the movable member, and means for adjusting the angular relation of the pivoted or toggle arms, substantially as set forth.

5. The combination, in a door-check, of a spring-actuated rotary member, a relatively stationary member, a friction-shoe, means connecting the friction-shoe with one of said members and supporting the shoe in operative relation to the other of said members with which it frictionally coacts, means for connecting the rotary member and stationary member with a door-frame and door, and an adjusting device for regulating the relation of the friction-shoe to said other coacting member, as set forth.

6. The combination, in a door-check, of a spring-actuated rotary member, a stationary member having a frictional surface, a friction-shoe, means connecting the shoe with the rotary member and supporting it in operative relation to the frictional surface of the stationary member, means for connecting the rotary member and stationary member with a door-frame and door, and an adjusting device adapted to regulate the relation of the friction-shoe to the friction-surface of the stationary member, substantially as set forth.

7. The combination, in a door-check, of a spring-actuated rotary member, a stationary frictional surface surrounding the rotary member, means for connecting the rotary member and friction-surface to a door-frame and door, a friction-shoe, means yieldingly connecting the friction-shoe with the rotary member and supporting it in operative relation to the stationary friction-surface, and an adjusting device mounted upon the rotary member and adapted to regulate the relation of the shoe to the friction-surface, as set forth.

8. The combination, in a door-check, of a spring-actuated rotary member, a friction-surface stationary with relation to the rotary member, means for connecting the rotary member and friction-surface to a door-frame and door, a friction-shoe, and a pair of pivoted or toggle links or arms yieldingly connecting the shoe with the rotary member, substantially as set forth.

9. The combination, in a door-check, of a spring-actuated rotary member, a friction-surface stationary with relation to the rotary member, means for connecting the rotary member and friction-surface to a door-frame and door, a friction-shoe, a pair of pivoted links connecting the friction-shoe with the rotary member, and a spring interposed between the friction-shoe and one of the links, substantially as set forth.

10. The combination, in a door-check, of a spring-actuated rotary member, a friction-surface stationary with relation to the rotary member, means for connecting the rotary member and friction-surface to a door-frame and door, a friction-shoe, a pair of pivoted links connecting the friction-shoe with the rotary member, a spring interposed between the shoe and one of the links, and an adjusting device mounted to move with and engaging one of the links, substantially as set forth.

11. The combination, in a door-check, of a spring-actuated rotary member, a friction-surface stationary with relation to the rotary member, means for connecting the rotary member and friction-surface to a door-frame and door, a friction-shoe, a pair of pivoted links connecting the friction-shoe with the rotary member, a spring interposed between the shoe and one of the links, and a second spring interposed between the rotary member and one of the links, substantially as set forth.

12. The combination, in a door-check, of a spring-actuated rotary member, a friction-surface stationary with relation to the rotary member, means for connecting the rotary member and friction-surface to a door-frame and door, a friction-shoe, a pair of pivoted links connecting the friction-shoe with the rotary member, a spring interposed between the shoe and one of the links, a second spring interposed between the rotary member and one of the links, and an adjusting device mounted to move with and engaging one of the links, substantially as set forth.

13. The combination, in a door-check, of a spring-actuated rotary member, a friction-surface stationary with relation to the rotary member, means for operatively connecting the rotary member and friction-surface to a door-frame and door, a friction-shoe, an arm rigidly secured to and projecting from the rotary member, and means yieldingly connecting the friction-shoe with the rigid arm of the rotary member, substantially as set forth.

14. The combination, in a door-check, of a spring-actuated rotary member, a friction-surface stationary with relation to the rotary member, means for operatively connecting the rotary member and friction-surface to a door-frame and door, a friction-shoe, an arm rigidly secured to and projecting from the rotary member, means yieldingly connecting the friction-shoe with the rigid arm of the rotary member, and an extension on said rigid arm projecting into close proximity to the friction-shoe for confining it in operative relation to the friction-surface, substantially as set forth.

15. The combination, in a door-check, of a spring-actuated rotary member, a friction-surface stationary with relation to the rotary member; means for operatively connecting the rotary member and friction-surface to a door-frame and door, a friction-shoe, a pair of pivoted links or arms connecting the friction-shoe with the rotary member, one of said links or arms being formed with an inclined or beveled face, and an adjusting-screw threaded into a suitable support and engaging the inclined or beveled face of the link for regulating the relation of the friction-shoe to the friction-surface, substantially as set forth.

16. The combination, in a door-check, of an approximately cylindrical casing having a frictional surface, a rotary member journaled in said casing, means for operatively connecting the casing and rotary member to a door-frame and door, a helical spring attached at its inner end to the rotary member and at its outer end to the casing, a friction-shoe, and a pivoted arm or link yieldingly connecting the friction-shoe with the rotary member and supporting the shoe in operative relation to the friction-surface, substantially as set forth.

17. The combination, in a door-check, of an approximately cylindrical casing, a rotary member journaled in said casing, means for operatively connecting the casing and rotary member to a door-frame and door, a helical spring attached at its inner end to the rotary member and at its outer end to the casing, a friction-shoe, means yieldingly connecting the friction-shoe with the rotary member and supporting it in operative relation to the friction-surface, and an adjusting device carried by the rotary member and regulating the position of the friction-shoe with relation to the friction-surface, substantially as set forth.

18. The combination, in a door-check, of a spring-actuated rotary member, a friction-shoe, toggle links or levers connecting the friction-shoe with the rotary member, a relatively stationary outer casing inclosing the friction-shoe and toggle links or levers and having an inner friction-surface against which the friction-shoe operates, and means for operatively connecting the rotary member and casing member to a door and door-frame, substantially as set forth.

WARREN K. CROFFORD.

Witnesses:
HARRY E. KNIGHT,
M. V. BIDGOOD.