W. B. SMITH.

HINGE CHECK.

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1,178,460.

Patented Apr. 4, 1916.

Fig. 1

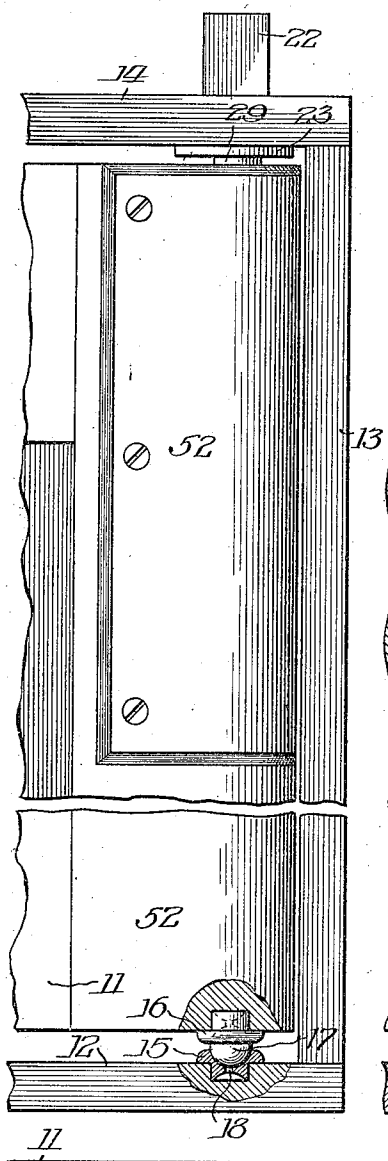


Fig. 2

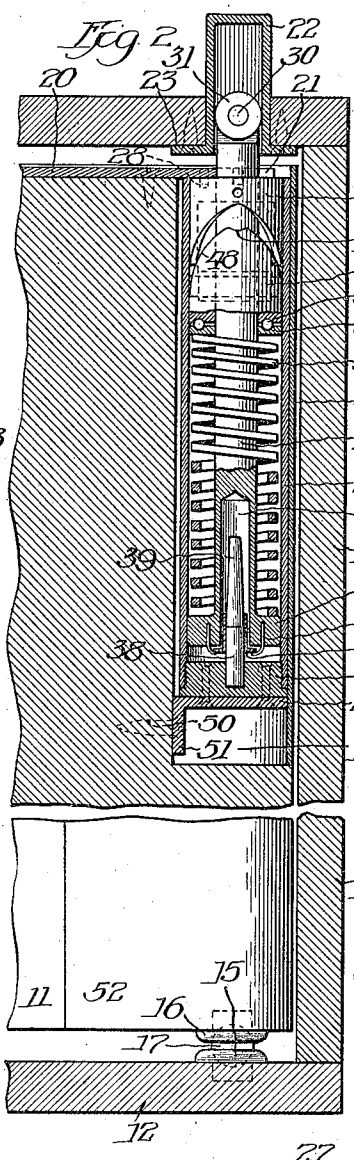
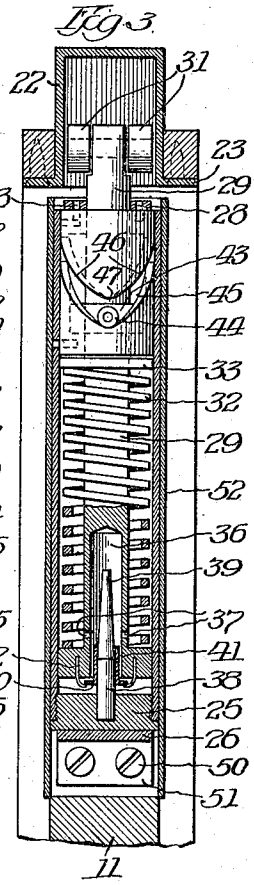


Fig. 3



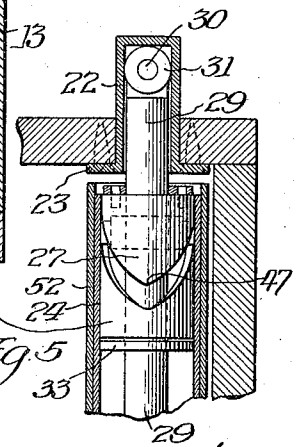


Fig. 5

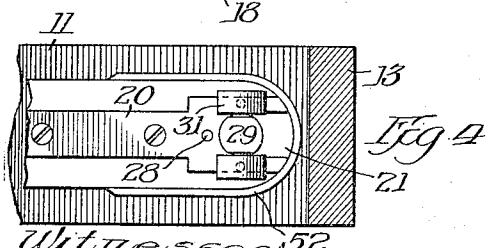


Fig. 4

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HINGE-CHECK.

1,178,460. Specification of Letters Patent. Patented Apr. 4, 1916.

Application filed July 6, 1914. Serial No. 849,142.

To all whom it may concern:

Be it known that I, WILLIAM B. SMITH, a citizen of the United States, residing at Danville, in the county of Vermilion and State of Illinois, have invented certain new and useful Improvements in Hinge-Checks, of which the following is a specification.

The invention has for its objects the provision, in a device of this character, of an improved form of mounting of the hinge check on the door whereby to secure a uniform minimum amount of clearance between the door and the sill, lintel, and jamb under all conditions; means to facilitate the hanging of the door; mechanism whereby the retarding action is normally effective until the door comes to rest in its closed position and which yet permits a double swinging door to be manually swung quickly past the normal closed position to an opening movement in the opposite direction when occasion may arise; an arrangement guarding against leakage of the lubricant due to splashing of the same within the check; and an improved guiding of the reciprocating parts so as to reduce friction and strain.

Other advantageous features of construction and operation will be made manifest from the subjoined description of a preferred embodiment of the invention taken in connection with the accompanying drawing upon which such description is predicated, it being understood, however, that as the invention is susceptible of embodiment in other and varied constructional forms the description and drawing are to be taken in an illustrative and not in an unnecessarily limiting sense.

In the drawing—Figure 1 is a fragmentary side elevation of the hinge check mounted in a door; Fig. 2 is a vertical section through the check in the median plane of the door; Fig. 3 is a similar section in a plane at right angles to that of Fig. 2; Fig. 4 is a top plan view of the check; and Fig. 5 is a fragmentary sectional view similar to Fig. 3, but with the moving parts of the check in the position assumed when the door is open.

Having particular reference to the drawing, the numeral 11 designates a double swinging door mounted within the opening formed by the sill 12, the jamb 13, and the sash bar or lintel 14. Below the door is supported upon a footstep bearing hinge comprising a pair of oppositely disposed double concave members 15 and 16 within the opposed concavities of which is mounted a ball 17, the two concavities of each member intersecting or being connected by a small orifice 18. The rear edge of the door is cut out to form a recess 19 extending from the upper end of the door for a considerable distance downwardly along the side and upon the upper end of the door is mounted a plate 20, the end of which overhangs the upper portion of the recess 19, the said plate being bifurcated or notched at 21.

The sash bar or lintel of the door is bored out to receive a cap 22 of considerable depth, of elongated cross section, being shown herein rectangular, the said cap being secured in position by means of screws passing through a flange 23 which bears against the lower face of the lintel. This cap serves as a guide for the reciprocating member of the hinge check as will be hereafter more fully explained.

The body of the check comprises the barrel 24 closed below by screw plug 25 carried by a plate 26. The check barrel is provided with an interlining 27 which may be formed integral with or rigidly secured to the said barrel. This interlining is provided in its upper face with a plurality of recesses adapted to be engaged by a corresponding number of pins 28 projecting downwardly from the overhanging portion of the plate 20.

Within the barrel of the check is contained a piston the stem 29 of which extends axially through the interlining 27 upwardly beyond the said barrel and has its upper end transfixed by a pin 30 serving as an axle for a pair of laterally arranged rolling members 31, the length of the axle and the diameter of the rolling members being such as to fit snugly within the two dimensions of the cap 22 with the peripheries of the rollers bearing against the side walls of the cap. A coiled spring 32 bears upwardly against the wear plate 33 between which latter and the lower wall of the interlining 27 is arranged an anti-friction ball bearing 34. This spring 32 bears downwardly against the piston head 35 which in the closed condition of the door occupies a position in the lower end of the cylinder or barrel. The lower portion of the piston stem 29 is in-

teriorly bored to provide an interior chamber 36 which communicates by means of the ports 37 with the space within the cylinder exterior to the piston. The bore of the piston extends through the head 35 and is adapted to receive a pin 38 having a tapered portion 39 the said pin being rigidly fixed within the screw plug 25 forming the bottom of the barrel or cylinder. Within the entrance to the chamber 36 about the pin 38 is arranged an annular check valve 40 having a loose sliding fit upon the pin 38 and providing between its outer wall and the inner wall of the bore an annular space 41. The valve 40 in its lower portion is outwardly flanged so as to underlie the piston head and in its upper position to close off the interspace between the valve and the piston head. The reciprocating vertical movement of the valve is limited upwardly by the engagement of its flange with the lower face of the piston and downwardly by means of hooks 42 carried by the piston head and engaging beneath the flange of the valve.

Intermediate the two extremities of the piston stem the latter has fixed thereon a collar 43 and at diametrically opposed points the collar carries suitably journaled rollers 44 adapted to travel within helical grooves 45 arranged in quadruple in oppositely disposed intersecting pairs, as shown. Each grooved helix extends through a quadrant to a point of intersection with the adjacent helix, the two adjacent helices being at opposite inclinations. The upper walls 46 of adjacent grooves are cut away or shortened at their point of intersection as indicated at 47 so as to provide a clearance to enable the roller 43 when descending one groove to cross quickly and descend the next adjacent groove without first descending to the lowest point of intersection between the bottom walls of the grooves. The lower walls 48 of the grooves are at their upper point of intersection notched as indicated at 49 to provide a resting place for the rollers 44 in the open position of the door whereby the door may be retained in such open position against the influence of gravity tending to cause the rollers to descend the groove on either side of the notch.

It will be readily understood that as the hinge check is rigidly affixed to the door the helically groved interlineing 27 will be angularly turned with the door while the piston will be held against turning by the engagement of its rollers 31 within the elongated cap 22. Thus the pair of rollers 44 of the piston will be caused by the manual swinging of the door to ride upwardly within a pair of oppositely disposed grooved helices either to a position of rest within the notches 49, or if the door is released before such point is reached, the energy stored up within the spring 32 by the ascending of the piston will cause the rollers 44 to again descend and in doing so restore the door to its closed position.

In order to permit the piston to ascend readily and to retard its descent the barrel or cylinder is partially filled with a liquid lubricant such as oil. As the piston ascends the oil will flow from above the piston through the ports 37 to the chamber 36 and thence around the valve 40 to the space below the piston. As the piston reaches an elevated position with the valve about the reduced tapered portion 39 of the pin the oil can also flow through the valve between its inner walls and the surface of the pin. Being in its elevated position the beginning of the piston descent and the consequent initial closing movement of the door will be quite rapid by reason of the facility with which the oil can escape from below the piston through the valve, but during the latter portion of such movement as the cylindrical portion of the pin enters the valve the passage of the oil is throttled, the space about the valve being closed off by the flange bearing against the lower face of the piston so that the oil can only pass through the constricted space about the cylindrical pin. Thus the final closing movement of the piston and of the door is normally quite gradual. However, by cutting away the upper wall of the helical grooves at 47, as stated, the door can be swung quickly past a closed position and opened in the opposite direction without waiting for the piston to reach its lowermost position.

The provision of the chamber 36 within the piston provides a baffle by which the oil rushing through the valve in the earlier closing movement of the door is prevented from squirting or spraying to the upper portion of the barrel and thus causing leakage, the upper extremity of the bore receiving the oil jet and forcing it to pursue a circuitous route through the ports 37.

In mounting the door and check the ball 17 is placed within the base member 15 and the door with the upper member 16 is placed upon the ball at an inclination. It can then be moved to a vertical position, the member 16 rolling upon the ball and the base 15 without the necessity of lifting the same and thus permitting the door to be mounted without providing undue vertical clearance between the sill and lintel and the ends of the door. The rollers 31 of the piston can then be inserted within the cap 22 and by the slight upward movement the holes in the upper face of the door are brought into engagement with the pins 21 depending from the plate 20. Thereupon the lower end of the check will be laterally secured to the inner wall of the recess by means of screws 50 engaging the flange 51 of the plate 26.

A curved finish plate 52 may then be used to inclose the check and impart an exterior finish thereto as shown in Fig. 1.

I claim:

1. In a hinge check, the combination with a barrel adapted to be fixed to the door and provided interiorly with a grooved helix, of a downwardly spring pressed piston mounted within the barrel and having a central valved bore, the piston stem extending through the upper end of the barrel and provided with laterally arranged anti-friction members, a guiding cap telescopically receiving the projecting upper end of the piston, and rollers mounted on the stem intermediate its ends and traveling within the grooves of the helix, substantially as described.

2. In a hinge check, the combination with a barrel adapted to be fixed with the door and having an upstanding tapered pin axially mounted in its lower portion and provided interiorly with a grooved helix, of a downwardly spring-pressed piston mounted within the barrel and having a central bore adapted to receive the tapered pin, the piston stem extending through the upper end of the barrel and provided with laterally arranged anti-friction rollers, the guiding cap telescopically receiving the upper projecting end of the piston stem, and rollers mounted on the stem intermediate its ends and traveling within the grooves of the helix, substantially as described.

3. The combination with a door, and a hinge check mounted thereon and including a vertically reciprocating member, of a guide therefor comprising a cap mounted on the door frame and adapted to receive the reciprocating member for axial movement only, substantially as described.

4. The combination with a door, and a hinge check mounted thereon and including a vertically reciprocating member, said member carrying laterally arranged anti-friction rollers, of a guide therefor comprising a horizontally elongated cap mounted in the door frame and adapted to slidably receive the rollers of the reciprocating member, substantially as described.

5. The combination with a door having in its edge a recess extending along one side near the end, of a plate attached to the door and having a portion overlying the recess, a hinge member disposed in the recess and having a vertically slidable interlocking engagement with said overlying portion of the plate, and a horizontal connection between the other end of the hinge member and the door, substantially as described.

6. The combination with a door having in its edge a recess extending from the top end down one side, of a plate attached to the door and having a portion overhanging the recess, said plate having a downwardly depending portion, a hinge member disposed within the recess and having in its upper end a socket adapted to receive the depending portion of the plate, and a removable horizontal connection between the lower end of the hinge member and the edge of the door, substantially as described.

7. The combination with a door having in its edge a recess extending from the end along one side, of a plate attached to the end of the door and overlying the recess, a hinge member disposed in the recess, a vertically slidable pin and socket engagement between one end of the hinge and plate, and a horizontal connection between the other end of the hinge and the door, substantially as described.

8. In a hinge check, the combination with a barrel adapted to be fixed to the door, of a spring-pressed piston mounted within the barrel, said piston having a central longitudinal bore with a lateral passage from the bore through the walls of the stem to the interior of the barrel above the piston head, the upper wall of the passage being a substantial distance below the top of the bore, and a valve controlling the entrance to the bore from the space below the piston head, substantially as described.

9. In a hinge check, the combination with a barrel adapted to be fixed to the door and provided interiorly with a grooved helix, of a downwardly spring-pressed piston mounted within the barrel and having a central bore in lateral communication through the walls of the stem with the interior of the barrel above the piston head, a valve controlling the entrance to the bore from the space below the piston head, the piston stem extending through the upper end of the barrel and provided with a laterally projecting member, a horizontally elongated guiding cap mounted in the door frame and adapted to slidably receive the laterally projecting member of the piston, and rollers mounted on the stem intermediate its ends and traveling within the grooves of the helix, substantially as described.

10. In a hinge check, the combination with a barrel adapted to be fixed to the door and having an upstanding tapered pin axially mounted in its lower portion and provided interiorly with a grooved helix, of a downwardly spring-pressed piston mounted within the barrel and having a central bore adapted to receive the tapered pin and in lateral communication through the walls of the stem with the interior of the barrel above the piston head, a check valve having a hollow stem slidable on the tapered pin and controlling the entrance to the bore from the space below the piston head, the piston stem extending through the upper end of the barrel and provided with laterally arranged rolling members, a horizontally

elongated guiding cap mounted in the door frame and adapted to slidably receive the rolling members of the projecting stem, and rollers mounted on the stem intermediate its ends and traveling within the grooves of the helix, substantially as described.

11. In a hinge check, the combination with a barrel adapted to be fixed to the door and provided interiorly with grooved helices arranged in quadruple in oppositely disposed intersecting pairs, each helix extending through a quadrant to a point of intersection with the adjacent helix, of a downwardly spring-pressed piston mounted within the barrel and having a central bore in lateral communication through the walls of the stem with the interior of the barrel above the piston head, a valve controlling the entrance to the bore from the space below the piston head, the piston stem extending through one end of the barrel and provided with laterally arranged rolling members, a horizontally elongated guiding cap mounted in the door frame and adapted to slidably receive the rolling members of the projecting piston, and a pair of rollers diametrically mounted on the stem intermediate its ends and traveling within the diametrically arranged grooves of the barrel, substantially as described.

12. In a hinge check, the combination with a barrel adapted to be fixed to the door and provided interiorly with grooved helices arranged in quadruple oppositely disposed intersecting pairs, each helix extending through a quadrant to a point of intersection with the adjacent helix, the upper walls of the grooves cut away at the lower points of intersection and the lower walls of the grooves notched at the upper points of intersection, of a downwardly spring-pressed piston mounted within the barrel and having a central bore in lateral communication through the walls of the stem with the interior of the barrel above the piston head, a valve controlling the entrance to the bore from the space below the piston head, the piston stem extending through one end of the barrel and provided with laterally arranged rolling members, a horizontally elongated guiding cap mounted in the door frame and adapted to slidably receive the rolling members of the projecting piston, and a pair of rollers diametrically mounted on the stem intermediate its ends and traveling within the diametrically arranged grooves of the barrel, substantially as described.

13. In a hinge check, the combination with a barrel adapted to be fixed to the door and provided interiorly with a grooved helix, of a downwardly spring pressed piston mounted within the barrel and having a central valved bore, the piston stem extending through the upper end of the barrel and provided with a guiding cap telescopically receiving the projecting upper end of the piston to confine the same against angular movement, and rollers mounted on the stem intermediate its ends and traveling within the grooves of the helix.

14. In a hinge check, the combination with a barrel provided interiorly with grooved helices arranged in oppositely disposed intersecting pairs, each helix extending to a point of intersection with the adjacent helix, of a downwardly spring pressed piston mounted within the barrel, means for preventing angular movement of the piston, and a pair of members diametrically mounted on the stem and traveling within the diametrically arranged grooves of the barrel.

15. In a hinge check, the combination with a barrel provided interiorly with oppositely disposed intersecting grooved helices, of a downwardly spring-pressed piston mounted within the barrel, the piston stem extending through one end of the barrel and provided with laterally projecting portions, a horizontally elongated guiding cap mounted on the door frame and adapted to slidably receive the projecting piston end, and anti-friction members mounted on the stem intermediate its ends and traveling within the oppositely disposed grooves of the barrel.

16. In a hinge check, the combination with a barrel provided interiorly with oppositely disposed intersecting grooved helices, the upper walls of the grooves cut away at the lower points of intersection, of a downwardly spring pressed piston mounted within the barrel, and an anti-friction member mounted on the stem intermediate its ends and traveling within the grooved helix.

17. In a hinge check, the combination with a barrel provided interiorly with oppositely disposed intersecting grooved helices, the walls of the grooves provided with a dwelling portion at the upper point of intersection, of a downwardly spring pressed piston mounted within the barrel, and an anti-friction member mounted on the piston stem intermediate its ends and traveling within the helix.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."