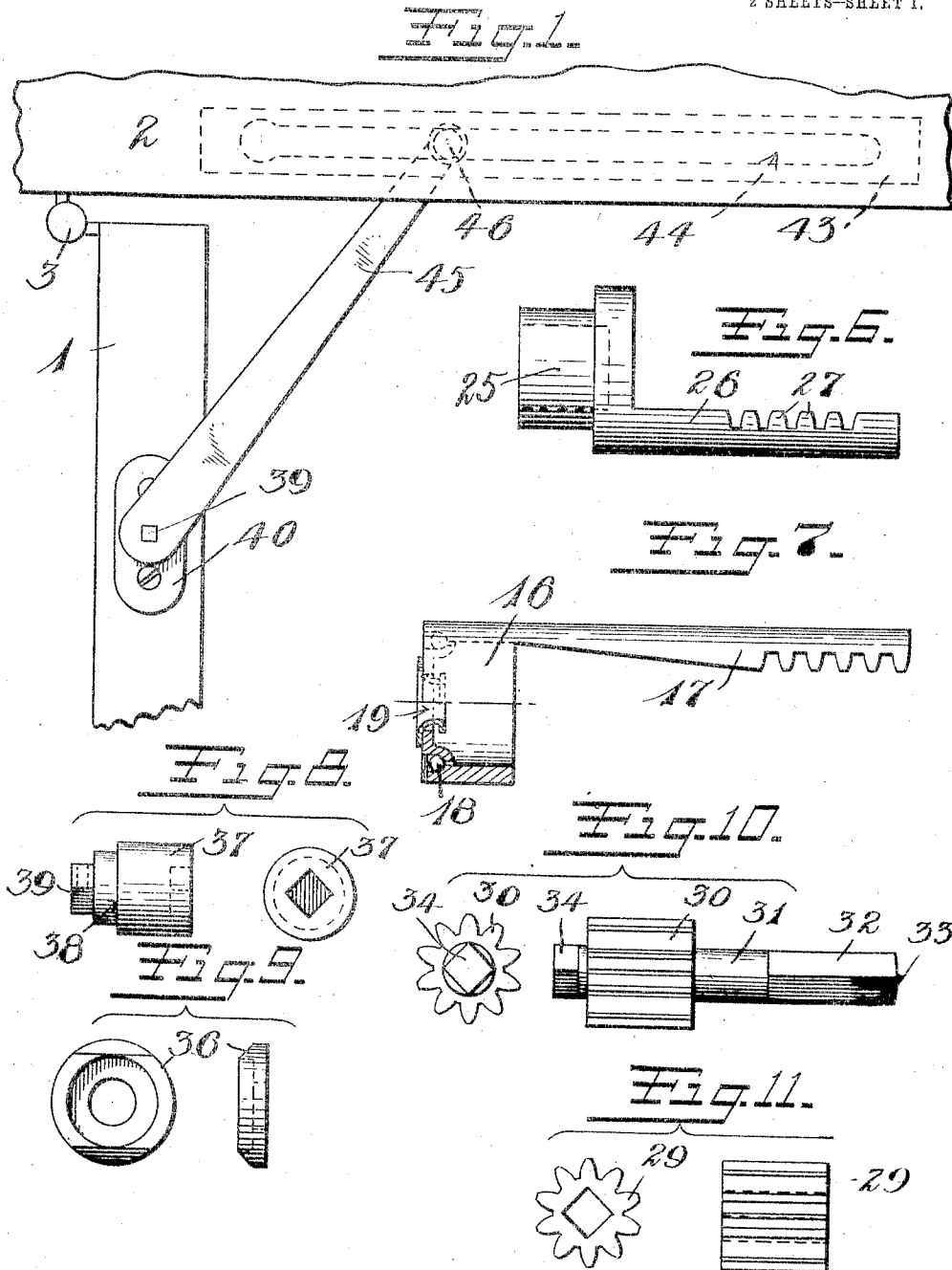


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DOOR CLOSER AND CHECK.
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DOOR CLOSER AND CHECK.

1,097,604.

Specification of Letters Patent.

Patented May 19, 1914.

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To all whom it may concern:

Be it known that I, HENRY G. VOIGT, a citizen of the United States, residing at New Britain, county of Hartford, State of Connecticut, have invented certain new and useful Improvements in Door Closers and Checks, of which the following is a full, clear, and exact description.

The present invention relates to door closers and checks and is designed to provide a device of this character which is practically concealed from view; may be readily applied; and which possesses not only the advantage of substantial invisibility but numerous structural advantages as well.

The invention in its preferable and most convenient form, provides a check and closer arranged to be inserted into a mortise formed in the rear edge of the door near its upper end, and a connecting arm between this closer and the door casing. This preferable embodiment is described in detail in the following specification taken in connection with the accompanying drawings forming part thereof.

In these drawings Figure 1 is a fragmentary and diagrammatic view showing an assembled device applied to a door and its casing. Fig. 2 is a vertical section taken through the rear edge of the door showing the construction of the check and closer on an enlarged scale. Fig. 3 is a view in elevation of the inner end of the door showing the check and closer inserted therein and with the cover plate removed. Fig. 4 is a fragmentary longitudinal section through the spring closer cylinder. Fig. 5 is a similar view of the checking cylinder. Figs. 6 to 11 inclusive, show details of construction of the check and closer.

Referring to the drawings by numerals, 1 designates a swinging door connected to the casing 2 by means of hinges 3. The rear or hinge edge of the door is mortised out to receive the casing of the door check and closer, the top edge of the door being counter-bored to receive the operating connections and other parts.

The check and closer casing comprises, preferably, two pieces 4 and 5 of wrought tubing secured together in parallel relation in any suitable manner, as for instance, by spot welding, riveting, or by the use of joining strips 6 extending longitudinally of the tubing and welded thereto. The ends of the tubing members are interiorly threaded, the

forward ends being closed by threaded plugs 7. The tubular member 4 provides the spring closing mechanism and the tubular member 5 a fluid checking mechanism, these two mechanisms being controlled by a common actuator and operatively connected as will be seen later. The adjacent connected faces of the two tubular members, at their forward ends, are provided with aligned threaded bores, into which is screwed a threaded bushing 8 serving to additionally connect the two members together. In the checking cylinder the inner end is closed by an inner threaded plug 9 and an outer cupped nut 10, a suitable washer 11 being interposed between the plug and nut. All three of these members are centrally apertured to receive and hold a hollow sleeve 12 threading into the plug 9. This sleeve 12 is itself interiorly threaded to receive a tubular valve member 13 whose outer end 14 is tapered and is provided with an outlet opening 14^a in its side communicating with the hollow interior of the valve member. A needle valve 15 screws into the end of this tubular valve member and has its end shaped to cooperate with the opening 14^a to vary the size thereof. Within the member 5 and forward of the valve member 14 is a cupped piston 16 having a longitudinally extending rack arm 17 provided at its forward end with teeth 17^a thereon. The piston 16 is provided with one or more check valves 18 of usual construction and is centrally apertured in line with the valve member 14, a bushing 19 being provided for this aperture and being of a diameter equal to the greatest diameter of the tubular valve member 14, but greater than the diameter of said member at its forward tapered end. The interior of the tubular member 5 contains some fluid such as oil, and it will be evident that if the piston 16 is moved toward the outer end of the member 5, the liquid will freely escape from this end of the cylinder toward its rear end through the central opening in the piston and through its check valve which opens on such outward movement. On the reverse direction of movement of the piston the check valve will close and the liquid will escape from the rear end of the member 5 into the front end through the central aperture of the piston, the check valve closing. The area of escape through this piston aperture is progressively decreased by the tapering tube 14 which extends through this aper-

ture, so that movement of the piston in this direction is gradually checked by reason of the decreased area of escape opening for the liquid in front of the piston. This valve and checking means does not *per se*, specifically form part of the present invention, but is merely illustrative of one desirable embodiment and of a standard construction.

A spring closer mechanism carried by the tubular member 4 preferably takes the following form. The rear end of the cylinder is closed by a threaded plug 20 and an outer cupped nut 21, a washer 22 preferably being interposed therebetween. These parts are provided with aligned threaded bores centrally thereof through which extends an adjusting screw 23 for a purpose hereinafter to be seen. Within the member 4 and at its rear end is seated a tubular flanged abutment member 24 its rear face resting against the plug 20 and adjusting screw 23. Between this abutment member and the outer end of the casing is located a plunger in the form of a second tubular flanged abutment member 25, having a longitudinal outer extension 26 formed with a series of rack teeth 27 thereon. Interposed between these two abutment members 24 and 25 and guiding on the tubular portions thereof, is a coil closer spring 28, the ends of this spring resting against the flanges of the abutments. It will be obvious that if the plunger abutment 25, which is movable relative to the abutment 24 is moved toward said abutment, the spring 28 will be compressed and will normally tend to return the abutment 25 to its first position.

The rack bars 26 and 17 of the tubular casings 4 and 5 respectively, are arranged at opposite sides of their respective casings to equalize strain and must be moved in opposite direction simultaneously, to effect a simultaneous closing and checking movement, these two bars being operated through a common controlling member. The tubular casing 4 at a point in axial alignment with the bushing 8 is formed with a bore therethrough. Previous to the closing of the end 7 of the lower tubular casing 5, a gear 29 is inserted within said casing with its teeth in mesh with the teeth 17^a of rack bar 17, said gear being provided with a squared bore therethrough in axial alignment with the bushing 8. A second gear element 30 is provided, this gear element having rigidly formed therewith and extending longitudinally and axially thereof at one side, a spindle embodying the rounded portion 31 and a squared portion 32 having at its extremity a bearing point 33. At the opposite end of the gear 30 an axial stud 34 is provided, this stud forming a common controlling means for the two mechanisms and being preferably squared in cross section to receive the hub of an operating crank

or lever. The gear element 30 is inserted through the bore in the upper face of the tubular casing 4 so that its squared shank 32 will extend through the squared aperture in the gear element 29, the rounded portion 31 of its shank journaling in the bushing 8 and the pointed bearing end 33 resting against the interior face of the tubular casing 5 at its bottom. The under face of the gear 30 may rest upon and be supported by a washer 35 engaging the upper edge of the bushing 8. The gear member 30 will be constructed and arranged to engage with the rack teeth 27 of the rack bar 26.

The upper edge of the door in axial alignment with the gears 29 and 30 is counter-bored, and a flanged washer 36 is threaded into the threaded bore formed in the upper face of the tubular casing 4. The squared stud 34 of the gear element 30 extends through said washer. A hub member 37 is inserted through the bore in the door and rests upon the flange of the washer 36, the under face of said hub member being provided with a squared socket engaging with the squared stud 34 of the gear element 30. The upper end of the hub member is reduced in diameter to provide an annular shoulder 38 and a squared end 39. In order to hold the check and closer case in position and also to provide a proper bearing for the upper end of this hub member, a plate 40 is preferably provided, this plate being set into the upper edge of the door and resting on the shoulder 38 of the hub member, the squared end 39 of this member projecting through a bore formed in the plate, the edge of the door being preferably counter-bored to receive spacing collars 41 resting against the upper face of the tubular casing 4 and the under face of the bearing plate 40 so that screws may be inserted through these collars to attach the plate to the casing.

It will be obvious that the two tubular casings assembled together and with the mechanism described inserted therein, may be inserted as a unit in a mortise formed in the rear edge of the door, the upper edge being counter-bored as described and the hub member, holding plate, collars and screws being subsequently applied. The rear end of the check and closer mechanism is hidden from view preferably by means of a cover plate 42 set into the rear edge of the door and suitably secured thereto, as by screws. This plate may be readily removed to permit regulation of a valve 15 of the checking mechanism or of the screw 23 of the spring closer, which may be screwed in against the abutment 24 to increase the tension of the coil spring 28, or vice versa.

The face of the door casing above the inner rear edge of the door is cut away and a plate 43 (shown in dotted lines in Fig. 1) is applied thereto, this plate having an elon-

gated slot 44 therein enlarged at one end, the upper face of the plate adjacent said slot being spaced from the adjacent face of the door casing. A controlling lever 45 is provided, one end of this lever having a roller 46 mounted thereon having an edge flange of less diameter than the enlarged end of the slot 44 but of greater diameter than the average width of the slot. This roller flange is of such size as to rest upon the upper face of the plate 43 and between said plate and the door casing being retained in such position by reason of the greater diameter of the roller, and by the fact that in practice, the roller is not permitted to move to the enlarged end of the slot in the casing. The opposite end of the controlling lever 45 is provided with a squared aperture therethrough of such size as to fit snugly over the squared stud 39 at the upper end of the hub member 37. A set screw is preferably employed to rigidly connect these parts. It will be evident, therefore, that as the lever 45 turns, the hub member together with the gears 30 and 29 will likewise turn. As the rack bars of the closer cylinder and checking cylinders are at opposite sides, the movement of the gears in the same direction will cause movements of the parts operated thereby in diametrically opposite directions. It will also be evident from Fig. 1 of the drawings, that when the door is in closed position the roller 46 will be positioned adjacent the outer end of the slot 44, that is as the door is opened said roller will move in said slot toward its opposite end, the lever 45 swinging and turning the gears 29 and 30.

In Fig. 2 of the drawings, the parts are shown in door closed position. When the door is swung open, the lever arm 45 will be turned to rotate the gear elements 30 and 29 toward the left in Fig. 2. This will cause the abutment 25 to move toward the abutment 24 thereby compressing the coil spring 28, and will cause the piston 16 to move in the opposite direction and away from the tapering valve tube 14, the oil that is in the casing flowing freely from the outer end thereof to the rear end. When the door is released the compressed spring 28 will move the abutment 25 and its rack bar 26 outwardly rotating the gear elements 30 and 29 in a reverse direction, this movement of the gear elements operating through lever 45 and its roller 46 to swing the door toward closed position. This reverse movement on the part of the gear 29 will move the piston 16 toward the rear end of its casing whereupon the closing movement of the door will be checked owing to the progressively decreasing area of escape opening which is provided for the fluid in the checking cylinder as heretofore described.

From the foregoing, it will be evident that the only parts of the mechanism which are exposed to the eye will be the controlling lever 45 and the slotted plate 43, and that these parts will not even be obviously apparent. Furthermore, the construction of closer and check provides means whereby all the parts of the closer and check may be inserted within a mortise formed in the edge of the door and provides a structure sufficiently powerful to accomplish the ends desired. The construction described is exceedingly compact forming a combined closing and checking unit of compact body which may be entirely inserted within the edge of any door of standard construction and size. The structural embodiment provides numerous specific advantages as well as economy of space, and while the structure is a preferable one, it will, of course, be understood that I do not desire to limit myself to the specific structure shown and described, but that the structure of the invention is susceptible of variation within the spirit of the invention and the scope of the appended claims.

What I claim, therefore, and desire to secure by Letters Patent is:

1. In combination with a door and its casing, a combined door closer and check inserted wholly within the door adjacent the inner edge thereof as an assembled unit, an arm operatively connected with the door casing, and operative connections between said arm and said check and closer, said connections extending through a horizontal door edge.

2. In combination with a door and its casing, the door having a mortise formed in its rear edge adjacent one horizontal edge, said mortised portion being counter-bored from the adjacent edge of said door, an assembled door closing and fluid checking apparatus arranged to be mounted within said mortised portion, and operating means between said apparatus and the adjacent casing, said means extending through the counter-bored portion of said door.

3. In combination with a door and its casing, the door having a mortise formed in its rear edge adjacent its upper horizontal edge, said mortised portion being counter-bored from the upper edge of said door, an assembled door closing and fluid checking apparatus arranged to be mounted within said mortised portion, said apparatus having a common controlling means positioned in the line of said counter-bored portion, and operating means between said controlling means and the adjacent casing, said means extending through the counter-bored portion of said door to engage said controlling means, and having a sliding connection with the door casing.

4. In combination with a door and its cas-

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ing, the door having a mortise formed in its rear edge adjacent its upper horizontal edge, said mortised portion being counter-bored from said upper edge of the door, an elongated casing; a closer mechanism mounted therein, a second elongated casing arranged in parallel to and rigidly connected with the first and having a checking mechanism mounted therein, said mechanisms being operatively connected to a common controlling member and said connected casings and mechanisms being inserted as an assembled unit within said door mortise with said controlling member alined with said counter-bored portion, and operating means between said controlling means and said door casing including an operating arm and means of operative connection between said arm and said controlling member and said arm and said door casing.

5. In combination with a door and its casing, the door having a mortise formed in its rear edge adjacent to one horizontal edge, said mortised portion being counter-bored from said horizontal edge, an assembled unitary closer and checking mechanism mounted within said mortised portion, said mechanism embodying two tubular casing members in parallel alinement and rigidly connected, a spring pressed plunger mounted on one of said casings for reciprocal movement and provided with a rack bar, a piston mounted in said second casing for longitudinal movement, said casing containing a fluid, and valve means being provided permitting a free flow of fluid past said piston in one direction of movement thereof, and a restricted flow past the piston in the opposite direction of movement, said piston having a rack bar in operative connection therewith, gearing in operative connection with said rack bars and provided with a common controlling member positioned in line with said counter-bored portion of the door, operating means between said controlling member and said door, said means embodying an operating arm having a hub member extending through said counter-bored portion to engage said controlling member, said arm having an operative connection with the door casing.

6. An assembled unitary closer and checking mechanism embodying two tubular members in parallel alinement and rigidly connected, a spring pressed reciprocating plunger within one of said casings provided with a rack bar, a reciprocating valved piston within the other of said casings, said piston having a rack bar connected thereto, and said casing having a fluid therein, said valved piston being arranged to permit a free flow of liquid therethrough in one direction of movement and a restricted flow

therethrough in the opposite direction of movement of said piston, said casings at their line of junction being provided with a bore therethrough, alined gears in operative connection with said rack bars, a common operating shaft for said gears extending through said bore, and an operating arm for said shaft.

7. A combined closer and checking case embodying two casing members of wrought tubing arranged in parallel relation and rigidly connected together, a spring closer mechanism mounted in one of said casing members a fluid checking mechanism mounted in the other of said casing members, said members having their adjacent faces provided with alined bores, one of said casing members having a separate bore therethrough in axial alinement with said other bores, and an operating shaft for said closer and checking mechanism extending transversely of said casings and in alinement with the bores therein.

8. A combined closer and checking mechanism for doors embodying an assembled unitary structure arranged to be inserted within a mortise formed in the rear edge of the door, said structure including a common operating member for said mechanism arranged to be positioned in line with a counter-bore extending into said mortised portion from a horizontal edge of the door.

9. A combined closer and checking mechanism for doors embodying two elongated casing members arranged in parallel relation and rigidly connected, one of said members having a plunger therein provided with a toothed rack bar, means engaging said plunger and normally tending to move the same in one direction, a piston having a rack member connected thereto mounted within the other of said casing members, said second member containing fluid and valve means cooperating with said fluid and piston to permit relatively free flow of said fluid past said piston in one direction of movement thereof, and a restricted flow past said piston in the opposite direction of movement thereof, said rack bars being disposed at relatively opposite portions of their respective casing members, said members having alined bores in their adjacent faces, a gear in one of said casings engaging the rack bar therein and in line with said bores, a second and alined gear in the other of said casings, and a common operating shaft for said gears extending through said bores and separable from one of said gears, and means whereby said shaft may be operated.

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