

Oct. 10, 1944.

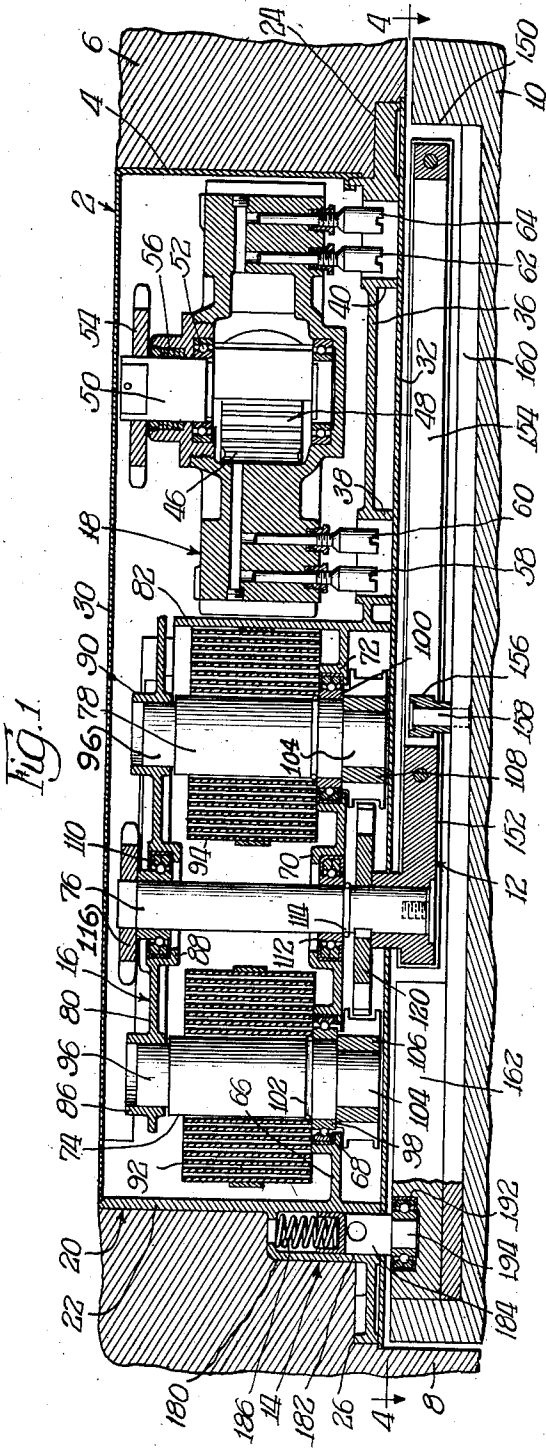
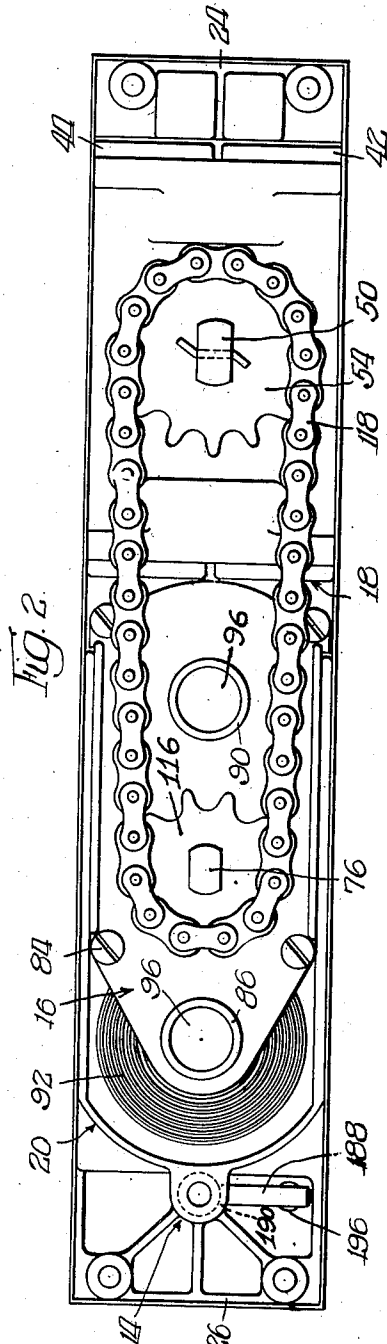
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2,360,095

DOOR CLOSING AND CHECKING DEVICE

Filed Sept. 8, 1941

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

Fig. 3

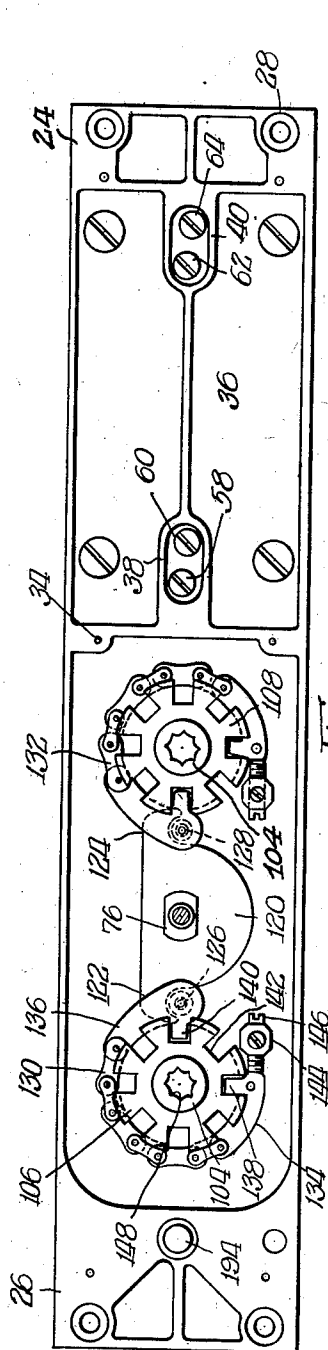


Fig. 4

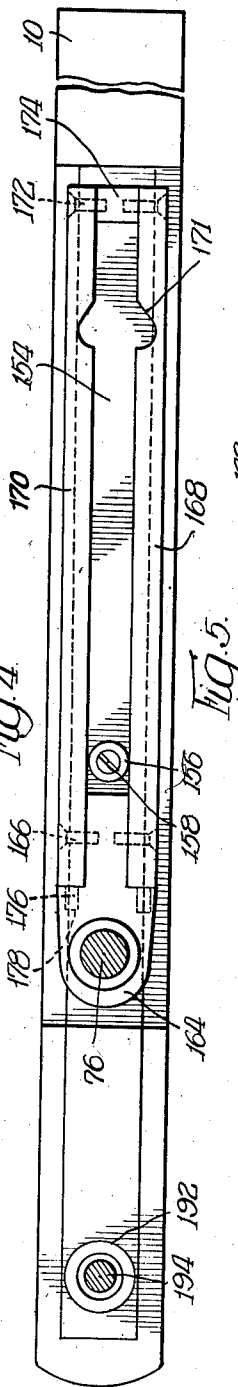
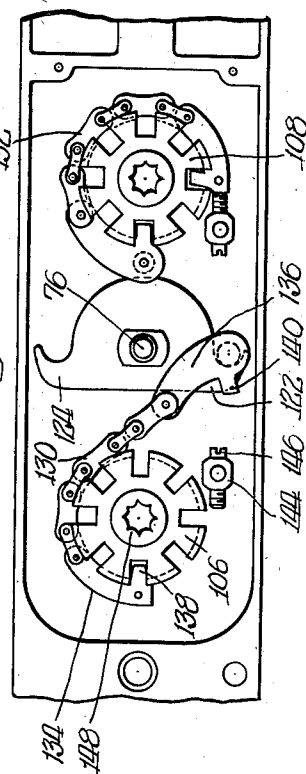


Fig. 5



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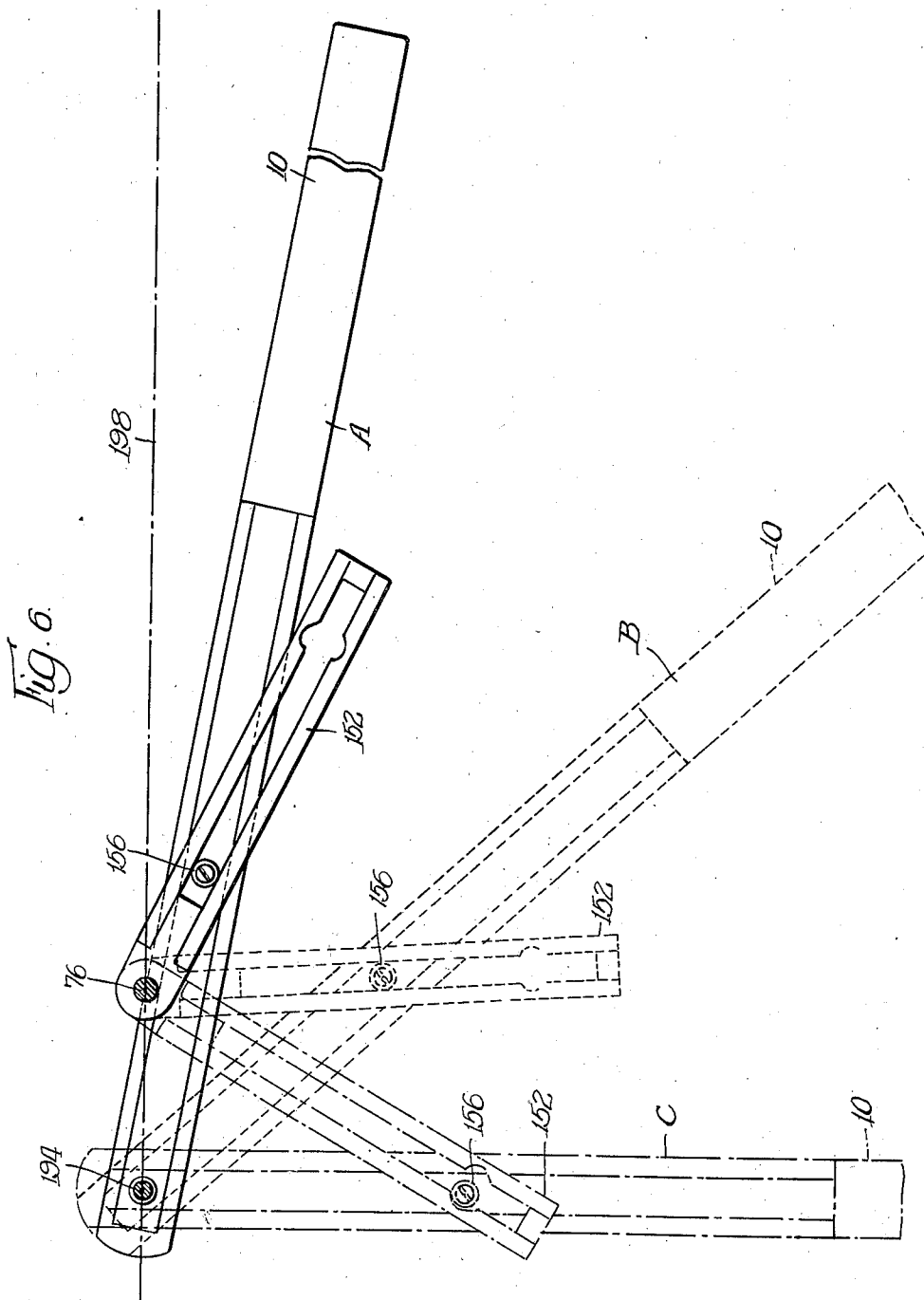
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DOOR CLOSING AND CHECKING DEVICE

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3 Sheets-Sheet 3



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2,360,095

DOOR CLOSING AND CHECKING DEVICE

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Application September 8, 1941, Serial No. 409,935

33 Claims. (Cl. 16—51)

The present invention relates to door closing and checking devices and to novel mechanisms for operatively connecting the same to doors.

Among the objects of the present invention is to provide a door closing and checking device which is highly efficient in operation, is simple and compact in construction, and which readily adapts itself for installation in concealed position with respect to the door.

Another object of the present invention is to provide a novel door closing and checking device and means for connecting the same to a door, which may be applied to doors opening in a single direction or doors of the double acting type which swing open in both directions from closed position.

Another object within the purview of the present invention is to provide a novel door closing and checking device and means for connecting the same to a door, so constructed and arranged with respect to said door that the force required to overcome the spring resistance of the said door closing device is greatest during movement of said door through a limited angular displacement with respect to its normal closed position.

Still another object of the present invention is to provide a novel door closing and checking device and means for operatively connecting the same to the door whereby the movement of the door during limited angular travel thereof into full open position is controlled by the said checking device to provide an effective backstop or cushioning arrangement for said door into said full open position.

Still a further object of the present invention is to provide a novel door closing and checking device and novel means for attaching the same to a door as described in the two immediately above paragraphs, in which the said checking device in conjunction with the closing device and means for connecting said devices to the door, operate to provide for substantially uniform movement of the door from any of its open positions to its normal closed position.

A still further object of the present invention is to provide a novel door closing and checking device for a door of the double acting type, and novel means for connecting the same thereto, and which are so constructed and arranged with respect to said door that the same moves at a substantially uniform rate into its normal closed position and comes to rest without oscillation as now experienced with such doors at the present time.

As a further desideratum, the present invention contemplates a novel closing and checking device for a door and novel means for connecting the same thereto which is positive in action, extremely durable and serviceable, and which is particularly characterized as being positive in its closing action and as having the desirable functional qualities hereinabove set forth.

As another aspect, the present invention involves a novel spring device which may be readily constructed for either type of door as herein suggested, and so constructed and arranged with respect to the door through the medium of novel connecting means that movements of the door into open position as characterized above, are effected.

More particularly, the present invention contemplates a novel door closing device as immediately above described, in combination with a door checking device directly connected to one another and to the door whereby movements of the door into and out of its open positions as above indicated may be readily effected.

The present invention has as a further object the provision of a novel connection between the spring means for the door closing device and the door which renders the resistance of the spring means more difficult to overcome during the initial movement of the door through limited angular displacement with respect to its normal closed position, thereby providing a door which is positive in its closing movement and which comes to rest without oscillation at its normal closed position.

The invention also contemplates as an object thereof the provision of a novel connection between the door closing and checking device which embodies in its construction a pivot mounted on the door in fixed relation to the door pivot, and an operating arm having sliding cooperative relation with said pivot to provide, in conjunction with the said door closing and checking device, a novel means for producing the desired results as hereinabove enumerated. More particularly, the invention embraces within its scope the provision of a novel operating arm constituted in part by a longitudinal slot defined by opposed guide elements, at least one of which is provided with a recess adapted to cooperate with the fixed pivot for holding the door in open position and which may further, if desired, embody at least one guide element which is readily detachably secured to the arm for ease and facility in assembling the arm with respect to the pivot.

A still further object of the present invention

is to provide a novel pivot mechanism for a door which may be advantageously used in association with the novel door closing and checking device as set forth herein.

Other objects, features, capabilities and advantages are comprehended by this invention, as will later appear and as are inherently possessed thereby.

Referring to the drawings:

Figure 1 is a side elevational view in cross-section of a door closing and checking device and means for connecting the same to a door, both constructed in accordance with the present invention;

Figure 2 is a top plan view of the device shown in Figure 1 of the drawings;

Figure 3 is a bottom plan view of the device shown in Figure 1 of the drawings;

Figure 4 is a view partly in plane and partly in section of the connecting means of the device shown in Figure 1 and taken in the plane represented by the line 4-4 of that figure;

Figure 5 is a fragmentary bottom plan view of the device of Figure 1 of the drawings, showing the position of certain mechanism thereof when the door is in full open position; and

Figure 6 is a diagrammatic view of the door and connecting means and the relation of one to the other in several positions of the door.

Referring now more in detail to the drawings, a door closing and checking device made in accordance with the present invention and generally referred to as 2 is shown mounted in a recess 4 in the lintel 6 of a door frame which includes opposed jambs such as 8 and a conventional sill (not disclosed) in opposed relation to the lintel 6. The door closing and checking device 2 selected to illustrate the present invention is shown as being connected to a door 10 of the double acting type through the medium of connecting means generally represented as 12. The door 10 is mounted in the door frame by opposed pivots, one of which, as represented at 14, is of novel construction, which will be hereinafter described more in detail.

The door closing and checking device comprises a closing mechanism or device, generally referred to as 16, and a door checking mechanism or device, generally referred to as 18, mounted as will be more fully disclosed hereinafter, within the frame 20 constituting a housing for various mechanisms and for securing the same in flush relation to the lintel 6. The frame structure 20 may be formed in part as a casting 22 flanged as at 24 and 26 having suitable openings, such as 28, to receive securing means for attaching the said frame to the lintel 6. To facilitate assembly and replacement of parts, the said casting 22 is closed by a removable cover, such as 30, to seal the device at the top and at one end. Furthermore, the finishing plate 32 may be provided and secured by attaching means engaging in the openings, such as 34, for providing a finished flush surface along the lower edge of the lintel 6 and to likewise completely conceal the various mechanisms on the under side of said structure 20.

The frame structure 20 adjacent the right-hand side thereof, as viewed in Figure 1 of the drawings, includes a horizontal wall 36 having the flanged openings 38 and 40 and above which is mounted the door checking device 18. This door checking device includes the parallelly arranged cylinders 42 and 44 having intercommunicating chambers in which are disposed double-

headed pistons formed with operating racks, such as 46, as shown in Figure 1 of the drawings, intermediate and in meshing relation with which is a pinion 48 mounted on an operating spindle 50 which is suitably journaled in the anti-friction bearings, such as 52, in the cylinders and which has a sprocket 54 mounted on the upper end thereof. The spindle 50 is sealed by a packing gland as at 56 to prevent loss of fluid which is provided within the fluid cylinders 42 and 44.

Control of the door 10 during certain of its movements is effected through and by virtue of adjustable valve elements 58, 60, 62 and 64 which are provided with slotted heads, the first two of which project into the opening formed by the flanged structure 38 and the latter two of which project into the opening formed by the flanged structure 40, for accessibility when the plate 32 is removed. These valve elements regulate the fluid orifices of the ducts communicating with the fluid chambers of the cylinders to regulate the movements of the door, which will be hereinafter more fully described.

To the left of the door checking device 18, as viewed in Figure 1 of the drawings, the frame structure 20 is provided with a horizontally disposed shelf or wall 66 having the flanged openings 68, 70 and 72 through which project the spindles 74, 76, and 78, respectively. In opposed relation to the wall or shelf 66 is a wall 80 removably secured to the wall structure 82 of the frame 20 by means of screws, such as 84, and which is formed with flanged openings 86, 88 and 90 into which project the spindles 74, 76 and 78, respectively.

The spindles 74 and 78 constitute operating shafts for spring devices 92 and 94, respectively, and have their upper ends of reduced diameter as at 96 journaled in the flanged structure defining the openings 86 and 90, respectively, of the plate 80.

The lower ends of the spindles 74 and 78 are journaled in the flanged structure defining the openings 68 and 72 through the anti-friction thrust bearings 98 and 100, respectively, which are retained against upward displacement by the spring rings, such as 102, fitting peripheral grooves formed in the spindles adjacent said anti-friction thrust bearings. The spindles 74 and 78 likewise have their opposite ends of reduced diameter, as at 104, upon which are mounted the ratchets 106 and 108, respectively.

The spring devices 92 and 94 are adapted to resist movement of the door in opposite directions inasmuch as the door is of the double acting type, and said spring devices have one end connected to the spindles and the other end connected to the wall frame structure 82, all as is conventional in the art.

The spindle 76 disposed between the spring devices 92 and 94 has its upper end journaled in the flanged structure forming the opening 88 by means of the anti-friction bearing 110, the said spindle extending downwardly through the opening 70 and being journaled in the flanged structure forming the opening 70 by the anti-friction bearing 112. The said spindle 76 is positioned at its lower end in respect to its journal mountings by means of the spring ring 114 abutting the anti-friction bearing 112, which is mounted within a suitable groove provided in the spindle 76 at that point. The spindle 76 is positioned at its upper end by a sprocket 116 which is mounted thereon and which abuts the inner race-ring of the anti-friction bearing 110,

the said sprocket 116 being connected to the sprocket 54 by a flexible chain 118.

The spindle 76 further has mounted upon its lower end a cross bar 120 provided with the opposed hooks 122 and 124 adapted to interengage the end rings 126 and 128 of flexible chains 130 and 132, respectively. The flexible chains 130 and 132 embrace the ratchets 106 and 108, respectively, and have their end links, such as 134 and 136, formed with lugs, such as 138 and 140, engaged within recesses or notches, such as 142, extending radially inwardly from the periphery of the ratchets and being spaced angularly about said periphery whereby a connection is effected between the cross bar 120 and either of the spring devices 92 and 94. The lugs 140 of the flexible chains 130 and 132 are operative to provide the connection above described, whereas the lugs 138 of these flexible chains are provided to maintain the flexible chains in operative position with respect to the ratchets 106 and 108 when either one of the hooks 122 or 124 is angularly displaced with respect to its ring 126 or 128, such as shown in Figure 5 of the drawings. Spring tension of the devices 92 and 94 is maintained by the stops, such as 144, adjustable through the medium of the screws 146 and which engage the end links 134 of flexible chains 130 and 132 when the cross arm or bar 120 is in normal position, as shown in Figure 3, which position corresponds to the normal closed position for the door 10.

In order to adjust the spring tension of the devices 92 and 94, the spindles 74 and 78 are formed with non-circular openings, such as 148, adapted to receive a tool whereby the said ratchets may be turned angularly to any adjusted position and to permit placement of the flexible chains 130 and 132 in any adjusted position with respect thereto, thus providing means for the ready adjustment of the spring devices 92 and 94. Such adjustment can take place upon removal of the finishing plate 32.

The connecting means 12 is mounted in substantially flush relation to the top edge of door 10 in a recess 150 and comprises a part of an operating arm 152 provided with a slot 154 in embracing and cooperative relation to a roll 156 mounted upon the stud pin 158, which in turn is connected to the supporting bar 160 having one end formed with the bearing block 162.

As more clearly shown in Figure 4 of the drawings, the operating bar of the present assembly is of multi-part construction comprising the hinge element 164 connected to the lower end of the spindle 76 and to which are removably connected, by the screws 166, opposed guide elements 168 and 170 forming the slot 154 and which cooperate with the roll 156. The guide elements 168 and 170 are removably connected adjacent their opposite ends by means of the screws 172 to a spacer block 174. Furthermore, in order to assure safety in operation of the operating arm 152, the said guide elements 168 and 170 are each provided at their inner end with a securing lug 176 received within recess 178 formed in the pivot block 164.

In order to hold the door in its full open position, as will be more clearly described hereinafter, the guide elements 168 and 170 are formed with opposed recesses, such as 171, communicating with the slot 154 and which cooperate with the roller 156 when the same is moved into the

recesses as the door is moved into its full open position.

The pivot 14 for the door 10 comprises a housing 180 which, in the present instance, is cast integral with the housing structure 20 and which has a longitudinal bore 182 open from the lower housing in alignment with a similar opening formed in the plate 32. Mounted within the bore 182 is a plunger 184 spring-pressed downwardly through the medium of the coil spring 186 disposed in abutting engagement at one end of the plunger 184 and at its other end with the housing 180.

This plunger has mounted therein a laterally extending pin 188 extending through a slot 190 provided in the side of the housing 180 and which slot limits the downward movement of the plunger 184 to maintain the same in assembled relation within said housing. The pivot for the door 10 is completed by an anti-friction bearing assembly 192 mounted in the bearing block 162 and which is adapted to receive the reduced end 194 of the said plunger 184 to hold the door in assembled relation to the door frame. Assembly and disassembly of the plunger 184 with respect to the door are effected by a tool insertable through the opening 196 formed in the flange 26 in alignment with the pin 188 which permits the plunger to be moved in the housing 180, thus facilitating the erection and removal of the door with respect to its frame.

As previously alluded to, the door closing and checking device and the connection between the same and the door as above described, operates in a particular manner to bring about the desired movement of the door during its opening and closing, and in order to better understand the novel characteristics of the said door closing and checking device and its connecting mechanism to the door, reference may be had to Figure 6 of the drawings showing the door and the operating arm for the door closing and checking device in various positions. As is evident from Figures 1 to 5, inclusive, the mechanism hereinabove described is designed for a door of the double acting type which, in Figure 6, is diagrammatically shown as being pivoted as at 194 and which door is in its normal closed position as represented by line 198 and accordingly is adapted for movement angularly to either side of its center line position 198.

As hereinbefore indicated, novel results are accomplished in accordance with the present invention because of the particular lever system through which the door is connected to the door closing device 16 and to the door checking device 18. Such results are accomplished in part by the lever system as shown in Figure 6 of the drawings and in part by the lever system as shown in Figure 5 constituted by the cross-arm 120 and the flexible chains 130 and 132 connecting the same to the spring devices.

By reference to Figure 6, it will be clearly apparent that, considering the door 10 as part of this system, force applied to or delivered from the roller 156 through the medium of the door acts through a fixed lever arm defined by the distance between the roller 156 and the pivot 14. On the other hand, however, since the roller slides within the slot 154 of the arm 152, any force applied to or delivered from the roller through the medium of the operating arm 152 acts through a variable lever arm defined by the distance between the roller 156 and spindle 76 which

in turn is dependent upon the position of the door. This lever arm varies from a minimum when the door is at its normal closed position, as represented at 198, to its full open position, as represented at C.

Accordingly, due to the lever system above described, force applied to the door necessary to overcome the resistance of the spring devices is a maximum when the door is in its normal closed position 198 and is a minimum when the door is in its full open position (except for the back-check arrangement to be later described). In the present illustrative example of the invention, the roller 156 is fixed in position with respect to pivot 14 and spindle 76 so that the force required to overcome the resistance of the spring units is greatest during movement of the door through substantially 10 to 15 degrees from normal closed position. This is quite evident when it is observed that the arm 152, as shown in the door position as represented at A of Figure 6, has traveled ahead of the door a considerable angular distance during movement of this door from its normal closed position. From the door position as represented at A to the door position represented at B, less force is required to overcome the spring resistance due to the increase in the lever arm between the roller 156 and the spindle 76, as represented by the diagram of door position B. This is apparent from the drawings, which show that for angular movement of the door between positions A and B, the operating arm has moved angularly through substantially the same distance. It is also apparent from the drawings that the force necessary to overcome the spring resistance decreases between positions A and B between which angular displacement of the door and the operating arm 152 is substantially equal. However, in the present device, after the door has swung to within 5-10 degrees of its full open position, the fluid control device 18 becomes effective to check the door swing during its movement into full open position at C.

Operating in conjunction with the connecting arm 152 and roller 156 to effect the results hereinabove described is the cross-arm 120 and the particular disposition thereof with respect to the ratchets 106 and 108 and the flexible chains 130 and 132 associated therewith. Maximum force required to overcome the resistance of the spring device when the door is in its normal closed position is not only due to the minimum lever arm provided at that time between spindle 76 and roller 156, but is also due to the fact that the effective lever arm for the connection of the cross-arm 120 to either of the flexible chains 130 and 132 is a maximum. Due to the disposition of the cross-arm 120 with respect to the chains 130 and 132, the effective lever arm between the cross-arm 120 and the spring devices 92 and 94 decreases as the cross-arm 120 is angularly moved from a position corresponding to the normal closed position of the door to its normal full open position, as will be quite apparent from Figures 3 and 5. As shown in Figure 5, for example, the cross-arm 120 is displaced 90 degrees from its position in Figure 3, corresponding to the positioning of the door, as represented at C. It is also apparent that for the first 10-15 degrees displacement of the cross-arm 120 corresponding to the movement of the door 10 to position A, the effective lever arm connection between cross-arm 120 and either of the flexible chains 130 and 132 remains substantially constant.

Therefore, operation of the lever system con-

necting the door to the door closing and checking device, as hereinabove described, is due in part to the particular connection between 76 and the door 10 and in part due to the particular arrangement of the cross-bar 120 and either of the chains 130 and 132.

When the door is moved into the position as represented at C in Figure 6 of the drawings, roller 156 engages one of the slots 171 to hold the door in that position.

The mechanism hereinabove described cooperates with the fluid control means 18 to cause substantially uniform movement of the door from its full open position to its normal closed position. As shown for example in Figure 6 of the drawings, valve 60 is adjusted to produce this uniform movement. When the door 10 is swung to open position in the opposite direction from that illustrated in Figure 6, the valve member 62 is properly adjusted whereby the fluid control means 18 cooperates with the other mechanisms previously described to produce a uniform movement of the door into closing position.

Furthermore, back checking of the door during its movement into full open position represented in Figure 6 of the drawings is controlled by adjustable valve member 64, while back checking of the door during its movement into open position in the opposite direction is controlled by adjustable valve member 58.

With the mechanisms hereinabove described in proper adjustment, a door of the double acting type as illustrated in the drawings will move uniformly from any open position to its normal closed position, as represented by line 198, and come to a positive stop without oscillation in the opposite direction. Furthermore, because of the particular arrangement of the spring mechanism and the means connecting the same to the door, there is a "building up of force" to a maximum when the door is in its normal closed position, at which time the operating arm 152 is on dead center with respect to the door. This is a highly desirable characteristic in a door of this type in that positive closing action is assured even though a strong draft may be blowing through the door opening at the time the same is moved into its closed position.

Although the invention has been described in connection with a door of the double acting type, it is to be understood, however, that the same is not limited thereto but may be embodied in a door assembly of the single acting type. Furthermore, the invention is of such a scope as to comprehend a door closing and checking device and means connecting the same to the door which embodies the novel features and characteristics thereof and which is adapted for installation in association with the door sill for connection to a door of either the single or double acting type.

While I have herein described and upon the drawings shown an illustrative embodiment of the invention, it is to be understood that the invention is not limited thereto but may comprehend other constructions, arrangements of parts, details and features without departing from the spirit of the invention.

I claim:

1. In a door closing and checking device adapted to be mounted in the lintel of a door frame, said device comprising a fluid control means, a spring mechanism, means connecting said fluid control means and said spring mechanism to a door hinged to said frame including an operating arm pivoted to said door, said connecting means

having means so connected to said spring mechanism and said door through said pivotal connection that the force required to overcome the resistance of said spring mechanism during movement of said door to open position is a maximum at its normal closed position.

2. In a door closing and checking device adapted to be mounted in the lintel of a door frame, said device comprising a fluid control means, a spring mechanism, means connecting said fluid control means and said spring mechanism to a door hinged to said frame including an operating arm pivoted to said door, said connecting means having means so connected to said spring mechanism and said door through said pivotal connection that the force required to overcome the resistance of said spring mechanism is greatest during limited angular movement of the door from its normal closed position to open position.

3. In a door closing and checking device adapted to be mounted in the lintel of a door frame, said device comprising a fluid control means, a spring mechanism, means connecting said fluid control means and said spring mechanism to a door hinged to said frame including an operating arm pivoted to said door, said connecting means having means so connected to said spring mechanism and said door through said pivotal connection that the force required to overcome the resistance of said spring mechanism during movement of said door to open position is a maximum at its normal closed position, and said fluid control means having means effective through said connecting means for back checking said door during limited angular movement thereof adjacent and into its open position.

4. In a door closing and checking device adapted to be mounted in the lintel of a door frame, said device comprising a fluid control means, a spring mechanism, means connecting said fluid control means and said spring mechanism to a door hinged to said frame including an operating arm pivoted to said door, said connecting means having means so connected to said spring mechanism and said door through said pivotal connection that the force required to overcome the resistance of said spring mechanism is greatest during limited angular movement of the door from its normal closed position to open position, and said fluid control means having means effective through said connecting means for back checking said door during limited angular movement thereof adjacent and into its open position.

5. In a door closing and checking device adapted to be mounted in the lintel of a door frame, said device comprising a fluid control means, a spring mechanism, means connecting said fluid control means and said spring mechanism to a door hinged to said frame including an operating arm pivoted to said door, said fluid control means having means for controlling said connection to provide for substantially uniform closing movement of said door, and said connecting means having means so connected to said spring mechanism and said door through said pivotal connection that the resistance of said spring mechanism to a force tending to open said door is greatest during limited angular movement of said door into closed position.

6. A door closing and checking device comprising a fluid control means having an operating spindle, spaced spring devices, an operating spindle between said devices adapted to be connected to a door, means connecting said spindles, and means operatively associated with said second-

named spindle and directly connected to said spring devices.

7. A door closing and checking device comprising a fluid control means having an upwardly extending operating spindle, spaced spring devices, an upwardly extending operating spindle disposed between said devices adapted to be connected to a door, flexible means connecting said spindles, and means operatively associated with said second-named spindle and directly connected to said spring devices.

8. A door closing and checking device comprising a fluid control means having an upwardly extending operating spindle, spaced spring devices, an upwardly extending operating spindle disposed between said devices adapted to be connected to a door, flexible means connecting said spindles, a cross-bar mounted on said second-named spindle, and flexible means for connecting said cross-bar and said spring devices.

9. A door closing device comprising spaced spring devices provided with notched operating ratchets, an operating spindle disposed between said devices adapted to be connected to a door, said spring devices being adapted to resist movement of said door in opposite directions, a cross-bar mounted on said spindle, flexible means for connecting said cross-bar and said spring devices, said flexible means being mounted on said ratchets and having lugs engaging in certain of said notches for operatively positioning said flexible means with respect to said ratchets, and stop means for said devices adapted to cooperate with said flexible means.

10. A door closing and checking device comprising a fluid control means having an operating spindle, a spring device, an operating spindle disposed laterally of said spring device adapted to be connected to a door, means connecting said spindles, and means directly connecting said last-named spindle to said spring device.

11. A door closing and checking device comprising a fluid control means having an operating spindle, a spring device, an operating spindle disposed laterally of said spring device adapted to be connected to a door, flexible means connecting said spindles, an operating bar connected to said last-named spindle, and flexible means connecting said bar and said spring device.

12. In a door closing device, the combination of a spring device having an operating ratchet, an operating spindle disposed laterally of said spring device adapted to be connected to a door, an operating bar connected to said spindle, and flexible means connecting said ratchet and bar.

13. In a door closing device adapted to be mounted on a door frame, said device having an operating spindle, a fixed pivot on a door hinged to said frame, and an operating arm for said door closing device connected adjacent one end to said spindle and having sliding cooperative relation with said pivot.

14. In a door closing device adapted to be mounted on a door frame, said device comprising a spring mechanism, said device having an operating spindle disposed laterally of said spring mechanism, means providing a varying power connection between said spindle and said spring mechanism, a fixed pivot on a door hinged to said frame, and an operating arm for said door closing device connected adjacent one end to said spindle and having sliding cooperative relation with said pivot.

15. In a door closing device adapted to be

mounted in the lintel of a door frame, said device comprising spaced spring mechanisms, said device having an operating spindle disposed between said mechanisms and depending from said lintel, means for connecting said spindle to said mechanisms, a fixed pivot on a double acting door hinged to said frame, and an operating arm for said door closing device connected adjacent one end to said spindle and having sliding cooperative relation with said pivot.

16. In a door closing and checking device adapted to be mounted in the lintel of a door frame, means connecting said device to a door hinged to said frame, said means comprising an operating spindle depending with respect to said lintel, a fixed pivot on said door, and an operating arm connected adjacent one end to said spindle and having sliding cooperative relation with said pivot.

17. In a door closing and checking device adapted to be mounted in the lintel of a door frame, means connecting said device to a double acting door hinged to said frame, said means comprising a fixed pivot on said door, an operating spindle for said device depending with respect to said lintel, and an operating arm connected adjacent one end to said spindle and having sliding cooperative relation with said pivot, said spindle, pivot and arm being in the plane of said door when the same is in closed position.

18. In a door closing and checking device adapted to be mounted in the lintel of a door frame, said device comprising a fluid control means having an operating spindle, a spring mechanism, an operating spindle for said spring mechanism disposed laterally thereof, means for connecting said spindles, means connecting said last-named spindle to said spring mechanism, and means connecting said last-named spindle to a door hinged to said frame, said means comprising a fixed pivot on said door, and an operating arm connected adjacent one end to said spindle and having sliding cooperative relation with said pivot.

19. In a door closing and checking device adapted to be mounted on a door frame, said device comprising a fluid control means having an operating spindle, spaced spring mechanisms, said spring mechanisms being adapted to resist movement of a door in opposite directions which is hinged to said frame, an operating spindle for said spring mechanisms disposed between the same, means for connecting said spindles, means connecting said last-named spindle to said spring mechanisms, and means connecting said last-named spindle to said door, said means comprising a fixed pivot on said door, and an operating arm connected adjacent one end to said spindle and having sliding cooperative relation with said pivot.

20. In a door closing and checking device adapted to be mounted on a door frame, said device comprising a fluid control means having an operating spindle, a spring mechanism, an operating spindle for said spring mechanism, means connecting said spindles, means connecting said last-named spindle to said spring mechanism, a fixed pivot on a door hinged to said frame, and means for connecting said last-named spindle to said door comprising an operating arm fixed to said last-named spindle having sliding cooperative relation with said pivot, said connection between said last-named spindle and spring mechanism having means cooperating with said arm and its connection to said door whereby the

force required to overcome the resistance of said spring mechanism is greatest during movement of said door through a limited angular displacement with respect to its normal closed position, and said fluid control means having means effective through its connection to said last-named spindle for back checking said door during limited angular movement thereof adjacent and into its open position.

21. In a door closing and checking device adapted to be mounted on a door frame, said device comprising a fluid control means having an operating spindle, a spring mechanism, an operating spindle for said spring mechanism, means connecting said spindles, means connecting said last-named spindle to said spring mechanism, a fixed pivot on a door hinged to said frame, and means for connecting said last-named spindle to said door comprising an operating arm fixed to said last-named spindle having sliding cooperative relation with said pivot, said connection between said last-named spindle and spring mechanism having means cooperating with said arm and its connection to said door whereby the force required to overcome the resistance of said spring mechanism is greatest during movement of said door through a limited angular displacement with respect to its normal closed position, and said fluid control means having means effective through its connection to said last-named spindle to provide for substantially uniform closing movement of said door.

22. In a door closing and checking device adapted to be mounted on a door frame, said device comprising a fluid control means having an operating spindle, a spring mechanism, an operating spindle for said spring mechanism, means connecting said spindles, means connecting said last-named spindle to said spring mechanism, a fixed pivot on a door hinged to said frame, and means for connecting said last-named spindle to said door comprising an operating arm fixed to said last-named spindle having sliding cooperative relation with said pivot, said connection between said last-named spindle and spring mechanism having means cooperating with said arm and its connection to said door whereby the force required to overcome the resistance of said spring mechanism is greatest during movement of said door through a limited angular displacement with respect to its normal closed position, and said fluid control means having means effective through its connection to said last-named spindle for back checking said door during limited angular movement thereof adjacent and into its open position and to provide for substantially uniform closing movement of said door.

23. In a door closing device adapted to be mounted on a door frame, said device comprising a spring mechanism, an operating spindle for said spring mechanism, means connecting said spindle to said spring mechanism, a fixed pivot on a door hinged to said frame, and means for connecting said last-named spindle to said door comprising an operating arm fixed to said spindle having sliding cooperative relation with said pivot, said connection between said spindle and spring mechanism having means cooperating with said arm and its connection to said door whereby the force required to overcome the resistance to said spring mechanism is greatest during movement of said door through a limited angular displacement with respect to its normal closed position.

24. In a door closing and checking device

adapted to be mounted on a door frame, said device comprising a fluid control means having an operating spindle, a spring mechanism, an operating spindle for said spring mechanism, means connecting said spindles, means connecting said last-named spindle to said spring mechanism, a fixed pivot on a door hinged to said frame, and means for connecting said last-named spindle to said door comprising an operating arm fixed to said last-named spindle having sliding cooperative relation with said pivot, said connection between said last-named spindle and spring mechanism having means cooperating with said arm and its connection to said door whereby the force required to overcome the resistance of said spring mechanism is greatest during movement of said door through a limited angular displacement with respect to its normal closed position, and said arm having means cooperating with said door pivot for holding said door in open position.

25. In a door closing and checking device adapted to be mounted on a door frame, said device comprising a fluid control means having an operating spindle, a spring mechanism, an operating spindle for said spring mechanism, means connecting said spindles, means connecting said last-named spindle to said spring mechanism, a fixed pivot on a door hinged to said frame, and means for connecting said last-named spindle to said door comprising an operating arm fixed to said last-named spindle having sliding cooperative relation with said pivot, said connection between said last-named spindle and spring mechanism having means cooperating with said arm and its connection to said door whereby the force required to overcome the resistance of said spring mechanism is greatest during movement of said door through a limited angular displacement with respect to its normal closed position, said fluid control means having means effective through its connection to said last-named spindle for back checking said door during limited angular movement thereof adjacent and into its open position, and said arm having means cooperating with said door pivot for holding said door in open position.

26. An operating arm for a door closing and checking device, comprising a member having means adapted for connection to said door closing and checking device and a longitudinal slot defined by oppositely disposed guide elements, at least one of said elements having a recess communicating with said slot for cooperation with a door pivot for holding said door with respect to said arm.

27. An operating arm for a door closing and checking device, comprising a member having means adapted for connection to said door closing and checking device and a longitudinal slot defined by oppositely disposed guide elements, at least one of said elements having a recess communicating with said slot for cooperation with a door pivot for holding said door with respect to said arm, and means for removably securing at least one of said elements in position.

28. An operating arm for a door closing and

checking device, comprising a member having means adapted for connection to said door closing and checking device and a longitudinal slot defined by oppositely disposed guide elements, and means for removably securing at least one of said elements in position.

29. In a door closing and checking device adapted to be mounted on a door frame and having an operating spindle, a fixed pivot on said door, and an operating arm connected adjacent one end to said spindle and having an elongated slot defined by oppositely disposed guide elements having guiding relation with said pivot, at least one of said elements having a recess communicating with said slot adapted to cooperate with said door pivot for holding said door in open position.

30. In a door closing and checking device adapted to be mounted in the lintel of a door frame, means connecting said device to a door hinged to said frame, said means comprising a fixed pivot on said door, an operating spindle for said device extending downwardly with respect to said lintel and being disposed intermediate said fixed pivot and the pivot for mounting said door, and an operating arm connected adjacent one end of said spindle and having sliding cooperative relation with said pivot.

31. In a door closing and checking device adapted to be mounted in the lintel of a door frame, means connecting said device to a double acting door hinged to said frame, said means comprising a fixed pivot on said door, an operating spindle for said device extending downwardly with respect to said lintel and being disposed intermediate said fixed pivot and the pivot for mounting said door, and an operating arm connected adjacent one end of said spindle and having sliding cooperative relation with said pivot.

32. In a door closing and checking device adapted to be mounted in the lintel of a door frame, means connecting said device to a door hinged to said frame, said means comprising a fixed pivot on said door, an operating spindle for said device extending downwardly with respect to said lintel and being disposed intermediate said fixed pivot and the pivot for mounting said door, and an operating arm connected adjacent one end of said spindle and having sliding cooperative relation with said pivot, said spindle, pivot and arm being in the plane of said door when the same is in closed position.

33. In a door closing and checking device adapted to be mounted in the lintel of a door frame, means connecting said device to a double acting door hinged to said frame, said means comprising a fixed pivot on said door, an operating spindle for said device extending downwardly with respect to said lintel and being disposed intermediate said fixed pivot and the pivot for mounting said door, and an operating arm connected adjacent one end of said spindle and having sliding cooperative relation with said pivot, said spindle, pivot and arm being in the plane of said door when the same is in closed position.

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