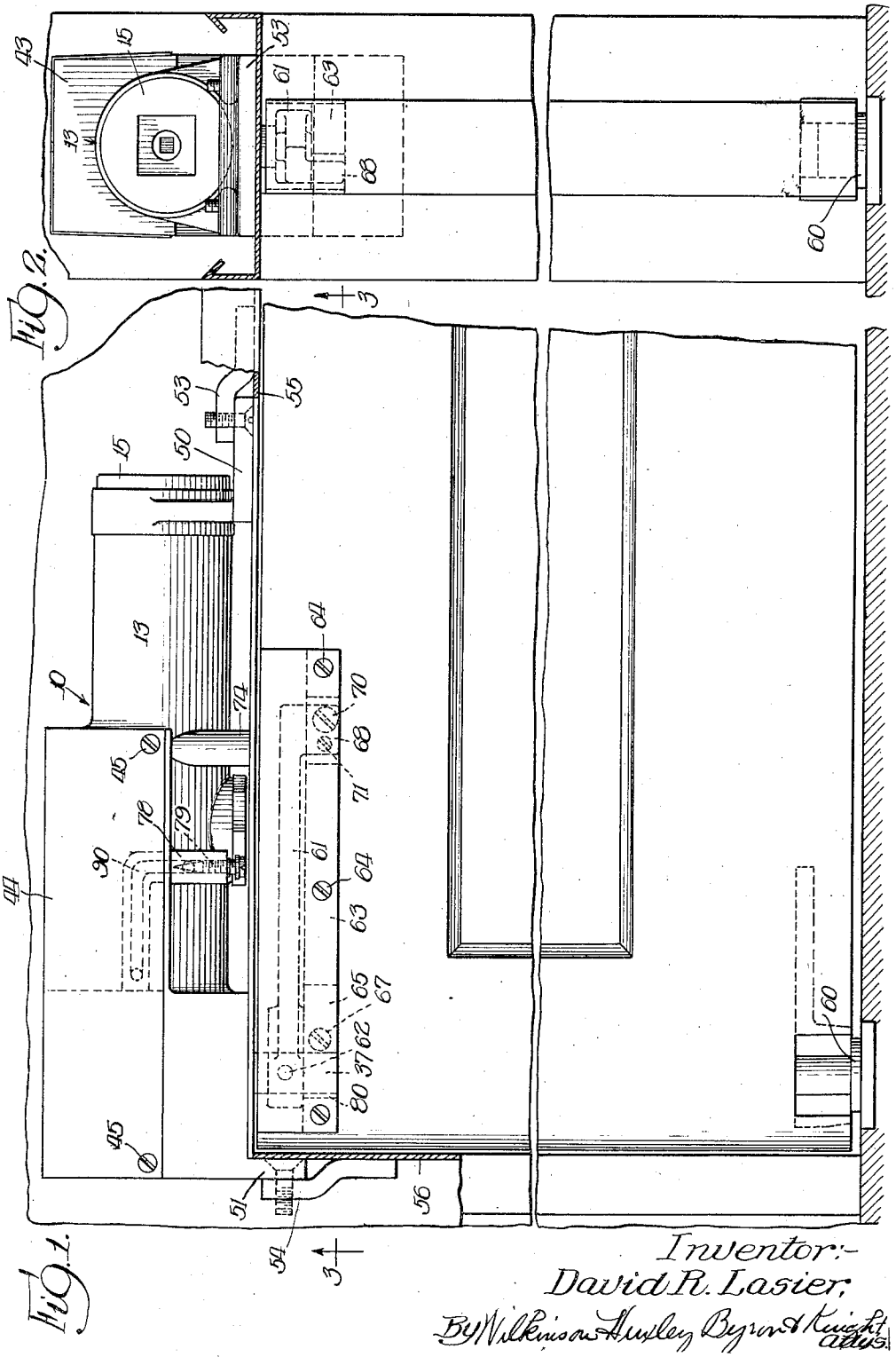
Oct. 18, 1938. D. R. LASIER 2,133,709

DOOR CLOSING AND CHECKING DEVICE

Filed June 5, 1937 3 Sheets-Sheet 1



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DOOR CLOSING AND CHECKING DEVICE

Filed June 5, 1937 3 Sheets-Sheet 2

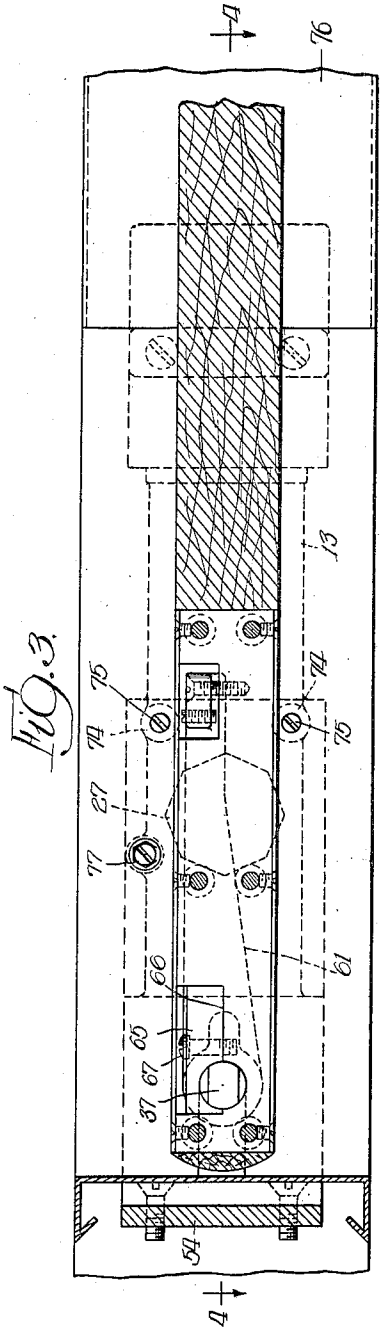


Fig. 3.

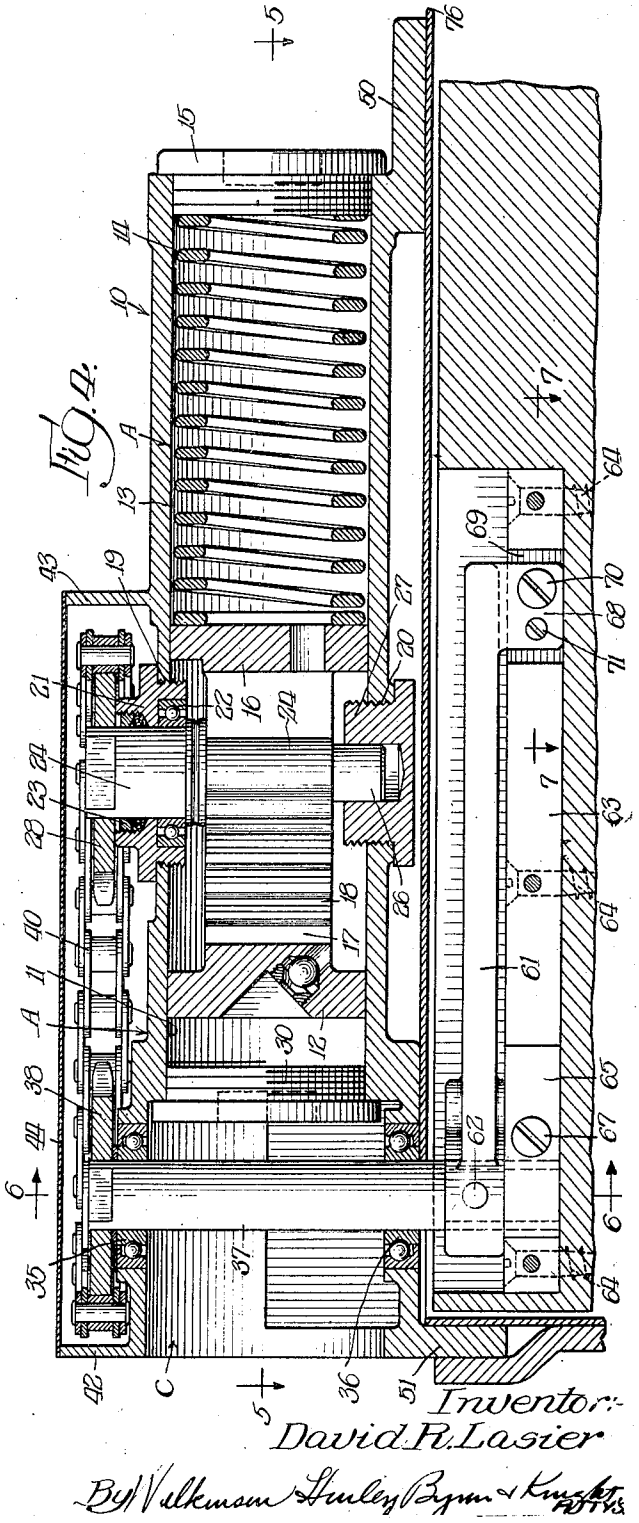


Fig. 4.

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DOOR CLOSING AND CHECKING DEVICE

Filed June 5, 1937 3 Sheets-Sheet 3

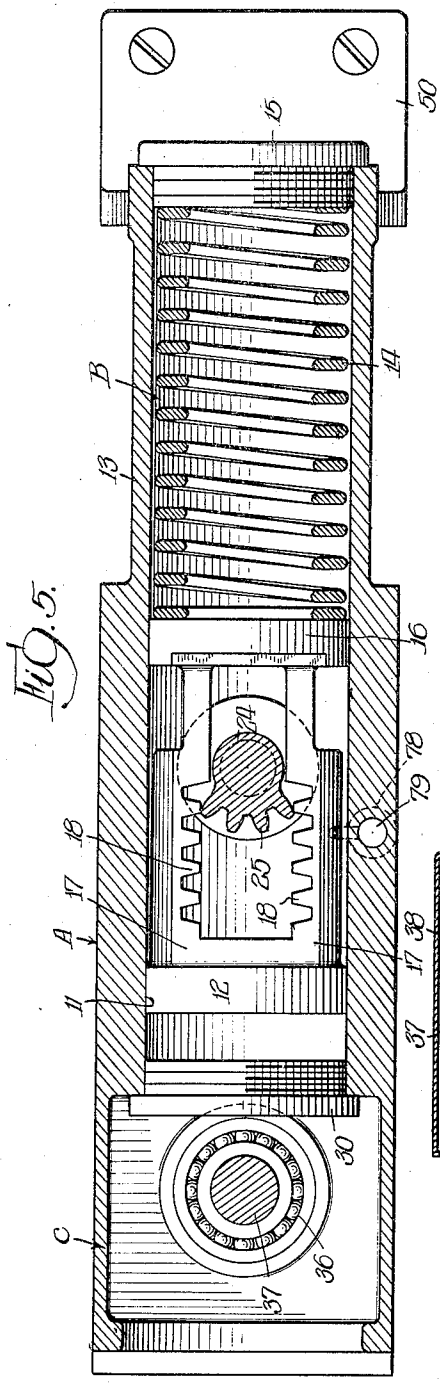


Fig. 5.

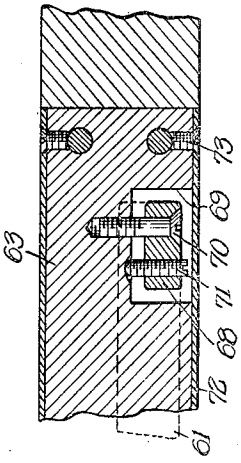


Fig. 7.

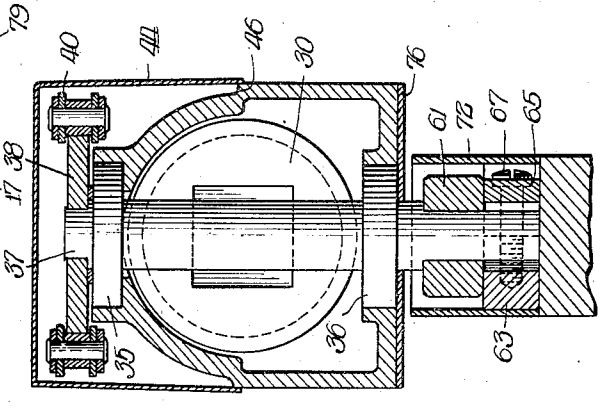


Fig. 6.

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Patented Oct. 18, 1938 2,133,709

UNITED STATES PATENT OFFICE

2,133,709

DOOR CLOSING AND CHECKING DEVICE

David R. Lasier, Chicago, Ill., assignor to Norton Lasier Company, Chicago, Ill., a corporation of Illinois

Application June 5, 1937, Serial No. 146,634

18 Claims. (Cl. 16—61)

This invention relates to an improved door closing and checking device of a type particularly adapted for use on double acting doors which may be mounted so as to be completely concealed in the door frame above the door.

It is an object of this invention to provide a door closing and checking device which will operate to close a double swinging door and control the closing movement thereof from any open position on either side of the closed position of the door and bring the door quickly and surely to the position of rest accurately aligned in the central position over the door sill.

Another object of this invention is to provide a door closing and checking device which is highly efficient in operation, is simple and compact in construction and is one which readily adapts itself to installation above the door.

It is a further object of this invention to provide a door closing and checking device of the type above referred to which has a minimum of parts and which is of simple construction, all of which can be manufactured at a minimum cost and assembled and installed by the simplest operations requiring the least possible time and expense.

A further object of the present invention is to provide means which are readily accessible for adjusting the fluid port of the door checking mechanism whereby the checking action of the door may be varied according to the desires of the particular installation.

A further object of the present invention is to provide a novel means for connecting the door checking and closing device to the door whereby the door may be closed and the closing thereof properly controlled while at the same time allowance is provided for relative vertical movement of the door with respect to the door frame and door closer. This feature is important in cases where there is accidental displacement or sagging of the door with respect to the door frame and door closing and checking device.

A further object of the present invention is to provide means for pivotally mounting a double acting door which serves to support the weight of the door at the bottom of the door and which also serves to connect the top of the door to the door closing and checking device, in such manner as to provide limited movement between the door and the door frame whereby the door may be vertically displaced with respect to the door closing and checking device, without disturbing the pivotability of the door or the operating connection between the door and door closing and checking device.

A still further object is to provide an adjustable connection between the door and the door closing and checking device by which the neutral position of the door over the center sill may be adjusted to coincide with the neutral position of the door closing and checking device, so that the door may be brought to rest in the center of the sill when the door closing and checking device comes to rest in neutral position.

Another object is to provide various means for accomplishing the closing and controlling operations referred to together with connection mechanism therefor, all of such construction that an improved controlling and closing action is produced making for higher efficiency in operation and a door closing device which is durable and not likely to get out of order.

The present disclosure is given merely by way of example and is not to be considered as limiting the invention but as illustrating one embodiment thereof. The nature of the invention may be determined from an understanding of the disclosed embodiment, which is illustrated in the accompanying drawings, in which;

Figure 1 is a side elevational view illustrating the upper and lower portions of a door and the associated portions of a door frame including a door closing and checking device constructed in accordance with this invention;

Figure 2 is an end view in elevation of the door and door closing device illustrated in Figure 1;

Figure 3 is a cross sectional view of the construction shown in Figure 1, taken on the line 3—3 and looking in the direction of the arrows;

Figure 4 is an elevational view in cross section taken on the line 4—4 of Figure 3 and looking in the direction of the arrows;

Figure 5 is a plan cross sectional view taken on the line 5—5 of Figure 4 and looking in the direction of the arrows;

Figure 6 is an elevational view in cross section taken on the line 6—6 of Figure 4 and looking in the direction of the arrows; and

Figure 7 is a cross sectional view taken on the line 7—7 of Figure 4 and looking in the direction of the arrows.

By referring to the drawings it will be noted that the embodiment of the invention here illustrated comprises a casing 10, which is of general cylindrical shape having formed therein a fluid piston compartment A, a spring compartment B, and a drive shaft compartment C. The fluid piston compartment A has its inner surface 11, suitably machined to form a fluid cylinder for cooperation with a fluid piston 12. The spring com-

partment B is preferably disposed in alignment with the fluid cylinder and is adapted to contain a compression spring 14 which bears at its outer end against a closing disk 15 screw threaded, or otherwise secured to the end of the spring casing 13 and at its other end against the head 16, formed integrally with the fluid piston 12.

The head 16 and piston 12 are connected by integral parallel members 17 which are provided on their interior surfaces with gear teeth forming oppositely disposed racks 18. Adjacent the central portion of the casing 10, openings 19 and 20 are provided. The upper opening 19 is preferably screw threaded so as to receive the member 21 serving as a mounting for the antifriction bearing 22 and which includes a packing and sealing means 23, both of which cooperate with the central operating shaft 24. This shaft is provided throughout its middle portion with an integrally formed mutilated gear, 25, which is provided with a suitable number of teeth for driving cooperation with the oppositely disposed racks 18 carried by the members 17 connecting the fluid piston 12 and the spring head 16.

The lower end of the spindle 24 is provided with a suitable journal bearing 26 which is rotatably supported in the bearing member 27, screwed into the lower opening 20 in the casing member 10. An antifriction bearing could be employed at the lower end of the shaft if desired although the construction as illustrated, is found to operate satisfactorily in practice and avoids the necessity for cutting away additional metal such as would be necessary if an antifriction bearing were used.

The upper end of the shaft 24 has fixed thereto a driving sprocket 28 which rotates with the shaft. The upper end of the shaft is provided with straight sides which cooperate with similarly formed portions in the sprocket. The end of the fluid cylinder is closed by a suitable closing disk 30 which is threaded into the end of the fluid cylinder 11 and serves to separate the fluid cylinder from the drive shaft compartment C.

From an understanding of the above described mechanism it will be seen that when the shaft 24 oscillates under the influence of an oscillating drive being imparted to the sprocket 28, that rotation in one direction from the central position will cause the mutilated gear to mesh with the rack 18 on one of the members 17 so as to retract the fluid piston and move it to the right, as shown in Figure 4, and further, so as to compress the spring 14, and that rotation in the other direction from the central position will cause the mutilated gear to mesh with the opposite rack 18 but to retract the piston and compress the spring in exactly the same manner as that effected by rotation in the first described direction.

Projecting downwardly from the casing 10 adjacent the fluid cylinder A is a drilled and threaded projection 78, (Fig. 1) intercepting at its inner end, the fluid bypass 90. The threaded needle valve 79 is adjustably mounted in the projection 78. This valve mechanism is of the conventional type used in regulating the flow of fluid in the cylinder which in turn, hastens or retards the closing action of the checking and closing device. As can be readily seen, the valve is so positioned that it can be conveniently adjusted without disturbing the mounting of the closing and checking device or removing the cover plate 76.

Referring now to the drive shaft compartment C it will be noted that there is an antifriction bearing 35 in the upper portion thereof and an antifriction bearing 36 in the lower portion thereof and that said bearings are in vertical alignment so as to rotatably receive and support the drive shaft 37. Drive shaft compartment C provides a rigid mounting which may be formed integrally with the fluid cylinder, for rotatably supporting shaft 37. In addition, it may be formed as a closed compartment so as to completely house the drive shaft 37 as well as provide strength for the casing as a whole. The outer end of compartment C as shown at the left hand side of Figure 4, is preferably left open so as to give access to the closing disk 30 which disk closes the end of the fluid cylinder. Thus the compartment C should be of sufficient size to permit the ready installation of the closing disk 30.

Shaft 37 extends upwardly above the upper bearing 35 and is provided with a straight sided end which receives a sprocket 38 keyed thereto by having straight sides corresponding to the straight sides of the shaft. This sprocket is disposed in substantially the same horizontal plane as the sprocket 28 mounted on the upper end of the drive spindle 24. Trained around these sprockets 28 and 38 respectively, is a drive chain 40, which may be of any suitable construction but is here illustrated as an endless roller chain.

Shaft 37 also extends downwardly below the antifriction bearing 36 and is provided with a suitably formed lower end adapting it for connection to a door in a manner hereinafter described. It will thus be apparent that when rotary movement in either direction is imparted to the shaft 37 that the sprocket 38 will impart similar movement to the drive spindle 24 through the chain 40 and sprocket 28. In this way, the operative movement is imparted to the fluid piston 12 and to the door closing spring 14.

The casing 10 is provided further with upstanding flanges or wall members 42 and 43 respectively, which are constructed to form end walls defining a space above the fluid cylinder compartment A and the driving shaft compartment C which when enclosed, by a metal top and side cover member 44, provides an enclosed housing for the sprocket and chain mechanism constituting the above described drive. The top and side cover member 44 may be formed of sheet metal bent into the form of an inverted U in cross section so as to engage at its ends the wall members 42 and 43 and provide with the casing, a complete enclosure for the gearing mechanism. The sheet metal cover 44 may be held in place by any suitable means such as screws 45 extending through the lower portions of the side walls thereof as shown in Figure 1. These screws may be threaded into corresponding openings formed in the casting itself.

It may be further noted from Figure 6, that the casting is also formed with a horizontal ledge 46 which cooperates with the lower edges of the cover member 44 so that the housing for the gearing mechanism may likewise be tightly closed at the bottom edge thereof.

The casing 10 is further provided as at the right hand end shown in Figure 4, with a projecting flange 50 and as shown in the left hand end with a depending flange 51 both of which serve as mounting brackets for attaching the door closing and checking mechanism to the door frame above the door. These brackets 50 and 51 may be provided with suitable openings of any desired number for mounting screws which may be screwed directly into other brackets 53 and 54 respectively, welded, or otherwise

secured to the door frame proper. Obviously, other means of mounting the door closing and checking device may be employed as these brackets could be screwed directly into supports or other means provided within the door frame. The construction here illustrated however, shows a suitable means for mounting the door closing and checking device in conjunction with a conventional sheet metal door frame, of the type now in common use in many fire proof constructions. Such frames provide adequate space above the door for the mounting of a door check of the construction of this invention and when so provided may have suitable brackets such as brackets **53** and **54** provided therewith to serve as supports for the door closing and checking device.

It will be apparent that the door frame may be cut away from a point **55**, adjacent the bracket **53** down to the corner where the upright portion **56** of the door frame joins the upper portion of the frame. This space will be occupied by the door closing and checking device.

From the underside of the ledge **46** and on either side of the fluid chamber A, are two projections, **74**, which terminate in the same plane as the bottom of the drive shaft compartment C and the projecting flange **50**. These projections are threaded and adapted to receive the screws **75**, (Figure 3) to support the metal cover plate **76**. There are also screw holes in the bottom of the drive shaft compartment C and in the bottom of flange **50**. A sheet metal cover plate **76** having corresponding screw holes and a cutout U-shaped section to surround the drive spindle **37** and a circular opening opposite the valve adjustment screw **77** of sufficient size for the insertion of a screw driver, is secured by the screws **75** for completely covering and concealing the bottom of the checking and closing device and giving a finished and trim appearance to the top of the door frame.

When installed the door closing and checking device is connected to the door at the location of the axis of the drive shaft **37**. When so installed a pivot hinge **60** is provided located on the floor below the door and serving to entirely support the weight of the door. The upper pivot is on the lower extended end of the drive spindle **37**. Means are provided adjacent the top of the door which constitute an adjustable connection, which will now be described in greater detail.

The lower extended end of the drive spindle **37** is straight sided and receives an arm **61** having a straight sided opening in one end which keys it to the spindle **37**. This opening is of such size that the straight sides thereof coincide precisely with the straight sides of the spindle preventing any horizontal movement of the arm in relation to the spindle. The length of this opening however, is slightly greater than the greatest diameter of the spindle and thus permits the arm to pivot vertically to a corresponding degree on the pin **62** which passes horizontally through the arm and the shaft. This pin also serves to confine the arm to the upper part of the shaft immediately below the drive shaft compartment C, leaving the lower remaining part of the shaft to be inserted in the journal block **63**.

The journal block is slightly longer than the arm **61** and is adapted to hold the spindle **37** at its inner end and the outer end of the arm **61**, at its outer end. The block is adapted to be secured by screws **64**, to the inner portion of the upper edge of the door which is cut away to a depth approximating the combined thickness of the arm and the block. The inner end of the block has a round opening **80** adapted to receive the lower end of the drive spindle **37**. In order to facilitate this connection, a portion of the block is made as a separate removable piece **65**, which abuts the block at **66**, as shown in Figure 3, and is held in place by the screw **67**. By removing this segment of the block the bearing surface is half exposed enabling it to be placed into contact with the spindle **37** by moving it horizontally. Segment **65**, containing the other half of the bearing surface may then be put into place completing the bearing contact. As can be readily seen, this enables the installation and removal of the door after the block has been secured to the door and the door checking and closing device has been secured to the door frame. It will be noted that this journalling means permits vertical movement of the journal block and door with respect to the spindle without interfering with the efficiency and operation of the spindle.

The outer end of the arm **61** has a depending portion or lugs **68** formed integrally with it and of a length approximating the thickness of the block **63** and of a width sufficient to accommodate two horizontally aligned holes, the function of which will be described later. The lug **68** is adapted to fit into a cutout portion **69**, of the outer end of the block **63**. This cutout portion should be of greater depth than the thickness of the lug **68** to allow for horizontal adjustment of the lug in relation to the block without the face of the lug extending beyond the edge of the block when adjusted to its most extended position. This adjustment is accomplished by means of a flat headed screw **70** loosely passing through one of the openings in the lug and threaded into a corresponding opening on the rear face of the cutout portion. Into the other opening in the lug a threaded headless stud **71** is screwed. This stud protrudes from the back side thereof and pushes in engagement with the rear surface of the cutout portion. This screw serves to draw the lug inwardly toward the rear face of the cutout portion.

It can be readily seen that when the screw **70** has passed through the opening in the lug and penetrated the threaded opening in the rear face of the cutout portion until its head is flush with the outer face of the lug and when the headless stud **71** is unscrewed to any extent, whereby no part of it protrudes from the rear face of the lug, that then a firm connection is established between the lug and the block, with the rear face of the lug and the cutout portion of the block perfectly flush.

If, however, the checking and closing device has been installed in the door frame and the journal block mounted in the top of the door and the door has been hung, and it is then discovered that the neutral position of the arm and the closed position of the door do not coincide, an adjustment of the screw and the stud may be made to compensate for the difference. For example, if it is found that when the door is closed and the arm is in a neutral position, the lug **68** on the arm does not fit flush against the rear face of a cutout portion and that there is a small intervening space, the screw **70** may be threaded into the block to such an extent that the remaining part of its length exactly takes up the intervening space. To make this connection firm, the stud **71** is then screwed through the lug until its

end pushes against the rear face of the cutout portion of the block forcing the arm outwardly and causing it to push against the under face of the screw head thus taking out the slack in the connection. To make the distance shorter it is necessary merely to unscrew the stud and tighten the screw. It is obvious that the adjustment could be accomplished equally well with the stud and screw in vertical alignment or with any other arrangement but inasmuch as the arm moves horizontally, a stronger and more rigid connection is maintained when they are horizontally aligned. There being but one screw **70** at this point it is possible for the arm **61** to pivot vertically on it without in any way disturbing the firmness of the connection in regard to horizontal movement. Thus it can be readily seen that should the door sag or settle, the arm would be permitted to pivot on the pin **62** at its inner end and on the screw **70** at its outer end and yet maintain a firm connection at both ends with respect to horizontal movement.

Sheet metal plates **72**, (Figure 7) may be secured by screws **73**, to both sides of the journal block so as to completely conceal the block and arm.

The pivot hinge **60** preferably includes a combined radial and thrust antifriction bearing of conventional design but it is apparent that any type of pivot hinge may be used. It will thus be seen that a door may be set in place on the bottom hinge and while the segment bearing block **65** is removed, swing laterally into place over the door sill until the lower end of the spindle **37** engages the bearing opening **80**, and that then the segment bearing block **65** may be attached to complete the pivoting of the door. Next, the arm **61** may be properly connected to center the door directly over the door sill when the door closing and checking device is in neutral position.

Finally, the finishing plates **76** for the door closing and checking device and plates **72—72** for the bearing block may be attached as above described. Thereafter, the adjusting screw **79** which is readily accessible with the finishing plate **76** in position, may be adjusted to control the retarding action of the device on the closing movement of the door, as may be desired in the particular installation.

I claim:

1. A double acting door closing and checking device comprising a support adapted to be mounted in a frame above a door, a cylinder mounted on said support and having a fluid piston mounted therein, a compression spring located in one end of said cylinder and a drive shaft support mounted on the other end of said cylinder, a spindle extending upwardly from said piston, a drive shaft mounted in said drive shaft support and extending to locations above and below the same and means for journalling said drive shaft in a door and other means for connecting the same to said door remote from said journal, said last named means being adjustable for aligning said door with respect to the door sill.

2. In combination, a door and a door closing and checking device, means operatively connecting the same comprising a spindle extending from said door checking and closing device, and means pivotally connected to said spindle and pivotally connected to said door, the pivotal connection between said means and door having its axis substantially normal to the axis of the spindle.

3. In combination with a door and a door closing and checking device, means operatively connecting said door and door closing and checking device comprising a spindle extending from said door closing and checking device, means mounted on said door and spindle for mounting the adjacent end of said door, means connecting said door and spindle adapted to impart swinging motion of said door to said spindle, the connections of said last named means being capable of limited pivotal movement for accommodating variations between the location of said door and door closing and checking device.

4. In combination, a door, a door frame and a door closing and checking device mounted in said frame and having a spindle located at the axis of said door, said door being journalled on said spindle and having free axial movement with respect thereto, and means for establishing a drive connection between said door and said spindle said last named means being remote from the location of said spindle.

5. In combination, a door, a door frame and a door closing and checking device mounted in said frame and having a spindle located at the axis of said door, said door being journalled on said spindle and having free axial movement with respect thereto, and means for establishing a drive connection between said door and said spindle, said last named means being remote from the location of said spindle and having a pivotal connection with said door.

6. In combination. a door, a door frame and a door closing and checking device mounted in said frame and having a spindle located at the axis of said door, said door being journalled on said spindle and having free axial movement with respect thereto, and means for establishing a drive connection between said door and said spindle, said last named means being remote from the location of said spindle and having a pivotal and adjustable connection with said door.

7. In combination with a door, a door frame, a closing and checking device having a spindle mounted in said door frame said door being freely journalled on said spindle and a lever connected to said spindle and at its opposite end to said door at a location remote from said spindle, said last named connection permitting vertical displacement of said door and door closing and checking device.

8. In combination with a door, a door frame, a closing and checking device having a spindle mounted in said door frame, said door being freely journalled on said spindle and a lever connected to said spindle and at its opposite end to said door at a location remote from said spindle, said last named connection being adjustable to permit the alignment of said door and door frame.

9. In combination with a door, a door frame, a closing and checking device having a spindle mounted in said door frame, said door being freely journalled on said spindle and a lever connected to said spindle and at its opposite end to said door at a location remote from said spindle, said last named connection being pivotal to permit bodily displacement of said door and door closing and checking device, and adjustable to provide for alignment of said door and door frame.

10. A door closing and checking device comprising a casing, an operating spindle extending into said casing and spring and fluid checking means in said casing connected to said spindle, bearing supports formed integrally with said casing and bearings in said supports, a drive spindle mounted in said bearings and gearing mechanism

externally of said casing connecting said drive spindle and said operating spindle.

11. A door closing and checking device comprising a casing having integrally formed fluid compartment, a spring compartment and bearing supports adjacent said fluid compartment, a spring in said spring compartment, a fluid controlled piston in said fluid compartment and bearings in said supports, and an operating spindle extending from said fluid compartment, a drive shaft mounted in said bearing, and bearing mechanism connecting said drive shaft and operating spindle.

12. A door closing and checking device comprising an integrally formed casing having a centrally disposed fluid cylinder, a spring compartment in axial alignment with and to one side of said fluid cylinder, and a shaft supporting compartment in alignment with and on the other side of said cylinder, a spindle extending upwardly from said fluid cylinder and a spring in said spring compartment and a shaft in said shaft supporting compartment extending above and below said casing, gearing means connecting the upper ends of said shaft and said spindle and means for mounting said door closing and checking device for connection with a door and means for operatively connecting said shaft and said door.

13. In a door closing and checking device of the character described, the combination of a cylindrical casing, transverse vertical flanges extending upwardly from the outer surface of said cylindrical casing, horizontal flanges extending longitudinally of and outwardly from the side of said cylindrical casing between said vertical flanges, a cover, and means for holding said cover in contact with the edges of said vertical and horizontal flanges.

14. A casing for a door closing and checking device comprising an elongated cylindrical portion and an integrally formed compartment at the end of said cylindrical portion, said compartment being separated from said cylinder portion by a threaded plug and having an end opening of sufficient size to permit the introduction of said plug.

15. In combination with a door, a door frame and a door closing and checking device mounted in said frame above said door, a spindle extending downwardly from the upper portion of said door frame, and a journal block for receiving said spindle secured to the upper portion of said door, having a removable piece embodying a complementary portion of the journal of said block and means for pivotally supporting said door at its bottom for rotation on the axis of said spindle and means remote from said journal for connecting said door to said spindle.

16. In a door closing and checking device the combination of a shaft, an arm pivotally secured to the shaft, the other end of the arm being provided with pivotal and adjustable attaching means, a block mounted in a recess in a door having a journal adapted to surround and slide upon said shaft and means on said block adapted for connection with said pivotal and adjustable attaching means.

17. In a door closing and checking device the combination of an arm, adjustable and pivotal means for connecting said arm to a door, comprising a stud adapted to be screwed into an opening in said arm and a screw adapted to pass freely through another opening in said arm and threaded means in said door adapted to receive said screw.

18. A door closing and checking device having a spindle, a door, means for journalling said door to said spindle comprising a block carried by said door having a piece removably attached thereto, complementary portions of a journal bearing formed in said block and piece, respectively, and means for connecting said spindle to said block at a location remote from said spindle, said means being adjustable for relative horizontal displacement of said means and block, and being pivotal to provide for vertical displacement of said spindle and block.

DAVID R. LASIER.

CERTIFICATE OF CORRECTION.

Patent No. 2,133,709. October 18, 1938.

DAVID R. LASIER.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 5, first column, line 11, claim 11, for the word "bearing" second occurrence, read gearing; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 10th day of January, A. D. 1939.

Henry Van Arsdale

(Seal)

Acting Commissioner of Patents.