To all whom it may concern:

Be it known that I, ARTHUR W. WALKER, a citizen of the United States, residing at Malden, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Counterpoise For Doors, of which the following is a specification.

This invention relates to an improved counterpoise for doors. It is particularly adapted for drop doors of ranges and other stoves, that swing down about a horizontal axis at the bottom edge of the door, for if such a door slips from the grasp of a person, its fall is annoying, and dangerous, and may result in breakage of the door or rupture of the stove frame. It is adaptable to other doors, however, including those swinging on vertical axes; and may be used as a spring to close a door.

Various expedients have been proposed to provide a sort of drag upon a drop door but the frictional clamps proposed cause such excessive wear that the journals become loose; and in the case of springs coiled on the hinges, the heat either destroys their resiliency or renders them brittle, and in either case, for renewal, there is considerable delay in getting the special shapes necessary.

It is among the objects of the present invention to provide a counterpoise in the form of a simple and inexpensive, stout flat spring. This is arranged both to impose a frictional drag upon the journals if such be desired, and to offer resilient resistance to their turning; and to do this without the stated objections. Another feature of the invention is the provision of means for changing the effective force of the spring so that the resistance offered may be varied as desired. Another feature resides in the shaping of that portion of the journal against which the spring presses, so that as long as the door is closed no tension or strain is imposed upon the spring, but upon the door being opened substantially the full force of the spring is immediately rendered effective.

It is intended that the patent shall cover, by suitable expression in the appended claims, whatever features of patentable novelty exist in the invention disclosed.

In the accompanying drawings:

Figure 1 is a front elevation of an oven door construction embodying the present invention;

Figure 2 is a similar elevation of a portion of the same, with the bearing plate removed;

Figure 3 is a plan in section on line 3—3 of Figure 1, but with the door open;

Figure 4 is a view like Figure 3, with the door closed, and

Figures 5 and 6 are side elevations in section on line 5—5 of Figure 1, with the door closed and opened respectively.

Referring to the drawings, 10 is the front portion of the casing enclosing the space to be rendered accessible through a door 12. The latter is preferably hinged at the bottom of the opening as shown, because for structural reasons it is easier to make the cross part 10' of the frame strong, with reduced danger of breakage of the frame; and because by placing the journals below, the straight vertical lines at the sides are left unbroken, thus attaining a desired appearance of the front. To the cross member 10' of the door frame is fastened a bearing plate 14 extending horizontally along it and having hollow protuberances 16 at its ends, whose hollows open toward the frame 10 and, in conjunction with the latter, form journal-bearings for the pivots or journals 18 of the door. Such journals are ordinarily made entirely round, but a feature of this invention is to make a portion 20 of each approximately semi-cylindrical and with its flat face 23 toward the door frame when the door is closed. As illustrated the chord 22 cuts off about a third of the cylinder, and the remainder 20 has a little peripheral protuberance 21 beyond the circular unit, at the end of the chord. This portion will hereinafter be termed the cam portion of the journal. The remaining full round part of the journal is ample as a pivot to insure the proper swinging of the door. The smaller the section cut off by the chord, the more will the effect of the spring be merely to produce frictional pressure of the bearing surfaces, while the greater the angular length of the chord, or the more the toe 21 projects, the more will the resilient resistance characteristic predominate with spring returning tendency.

The type of journal illustrated is perhaps the most simple form in which the invention is applied, but variations, such as providing a roller eccentrically mounted on the journal, could be readily devised which would still be within the scope of the invention.
In fact a plain cylindrical journal could be used, but as will hereinafter appear, the provision of a cam portion is preferable.

The strip of the bearing plate 14 that extends between these end bearings is made to stand out a little from the door frame so that a long stout, flat bar spring 24 can be housed in the space thus provided. The ends of this spring overlap the cam portions of the door journals so that when the latter is closed, as shown in Figures 4 and 5, each spring end rests against the flat surface of the cam and so that when the door is open, as in Figures 3 and 6, the spring rides on the curved surface. It will be observed that the spring has a plane face against which presses a part on the door which has a cylindrical path, when the door moves, through which path the said plane cuts as a chord of the cylinder.

About midway between each spring end and its middle there is provided on the door frame a projection 26 which constitutes a fulcrum about which the spring may be bent. An ordinary bolt 28 passes through the middle of the bearing plate, threads into a nut 30 inside held non-rotatable in a socket 32 on the plate, and presses against the spring. This bolt enables the effective force of the spring to be varied, for if the bolt is turned inward the portion of the spring between the fulcrum is bowed more toward the door frame thereby causing the end portions of the spring beyond the fulcrums to press harder against the cam portion of the door journals.

Upon opening the door, each journal turns about its true axis because its full round portion fits between the bearings of the plate and frame. Immediately the turning begins, the part 22' of the cam portion that has been left full and especially its toe 21, if that be present as illustrated, begins to press the spring end inward toward the frame. The spring yields, resisting with increasing force as its deflection becomes greater. The effect of this is twofold. The force of the spring opposes the movement of the journal, and the pressure exerted by the journal to do this causes the latter to rub harder against its bearing, thus imposing a frictional drag on the journal. There is also the frictional drag to the spring on the cam portion as the former slides along the latter. All these coact to brake the door's movement, and may be so regulated by the setting of the bolt 28 against the spring, that a perfect counterpoise is effected.

Obviously journals of the door might extend outward away from each other instead of inward toward the other and the spring might be otherwise arranged with respect to the journals, and might be of more than one piece, but the construction shown is convenient and simple. Although breakage of the spring is not to be expected, if it should give way it could be readily replaced by any household or ordinary mechanic, since it consists merely of a piece of flat-bar stock.

When compared to the spiral springs heretofore used, which must be carefully made to size and strength, the spring of the invention is far cheaper both as to first cost and as to maintenance. Moreover the whole construction of spring, journals and bearing plate is more easily made and assembled, and withal is much stronger than any other type of counterpoise known to me.

When the invention is applied to range doors of either the coal, electric or gas type, it is well to perforate the face strip of the bearing plate at 34 for such holes permit ventilation through the space in which the spring is placed, as an aid in keeping down its temperature. However, the spring is not of that type which is easily affected by heat; in fact it is well adapted for use on so called flush front ranges or stoves, when it is set in beyond the surface to secure a smooth flush front.

I claim as my invention:

1. A counterpoise for a door, having partly circular pivots at an edge of the door and turning with it, arranged parallel to said edge and toward each other comprising a spring extending between the said journals yieldingly engaging them to impede their turning, and means to hold said spring in journal engaging position.

2. A counterpoise for a door comprising the combination, with the pin and socket elements of a pair of pivoted bearings therefor at opposite ends of the door, of a spring extending between the bearings, and yieldingly pressing the elements of each bearing together; two fulcrums for the spring between the bearings; and means positively to deflect the spring between the fulcrums thereby to cause pressure by it at said bearings.

3. A counterpoise for a door comprising the combination, with the pin and socket elements of a bearing therefor, of a bar spring yieldingly pressing the elements of the bearing together; a fulcrum for the spring; and means positively to deflect the spring about the fulcrum thereby to cause pressure by it at said bearing.

4. A door and frame therefor, a bearing plate mounted on said frame along an edge of the door, with a space between it and the frame, having bearings at its ends for the door journals; a spring arranged in said space, yieldingly engaging the door at the journals to oppose its turning; there being a projection from said frame into said space.
constituting a fulcrum upon which the spring may be bent to vary its effective pressure at the journals.

5. A door and frame therefor, a bearing plate mounted on said frame along an edge of the door with a space between it and the frame, having bearings at its ends for the door journals; a spring arranged in said space, yieldingly engaging the door at the journals to oppose its turning; a projection from said frame into said space constituting a fulcrum for the spring; comprising a screw extending through the plate and threading into a nut non-rotatably held by lugs on the plate, for bending the spring upon the fulcrum to vary its effective pressure at the journal.

Signed at Boston, Massachusetts, this third day of September, 1924.

ARTHUR W. WALKER.