Oct. 25, 1955 E. S. POLLOCK 2,721,547

CLOSURE MECHANISM FOR A COOKING RANGE OVEN

Filed May 5, 1952 5 Sheets-Sheet 1

Fig. 1

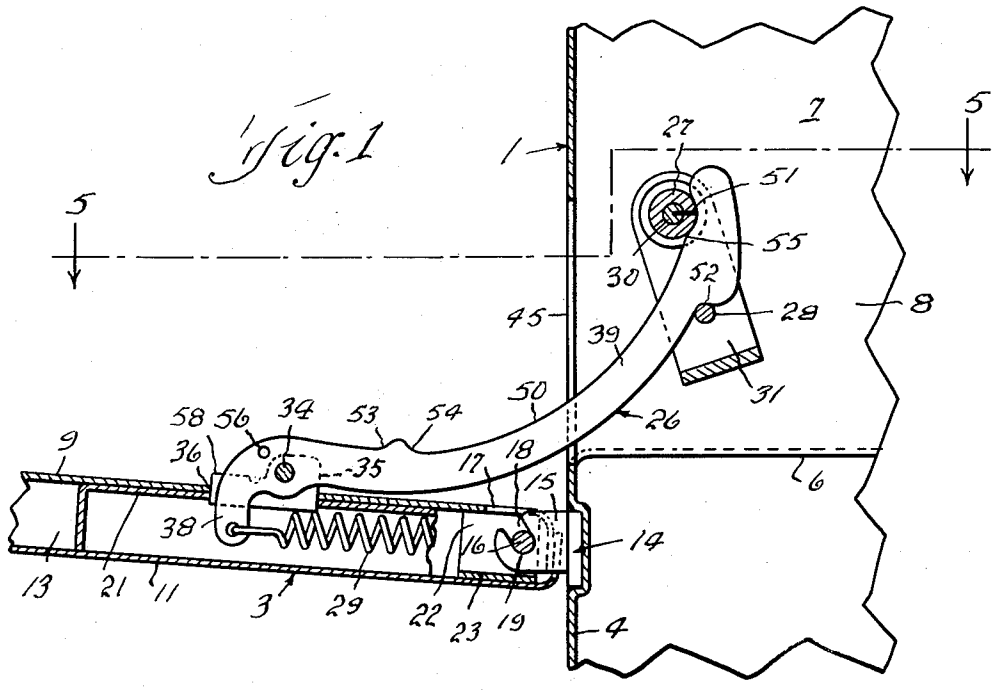
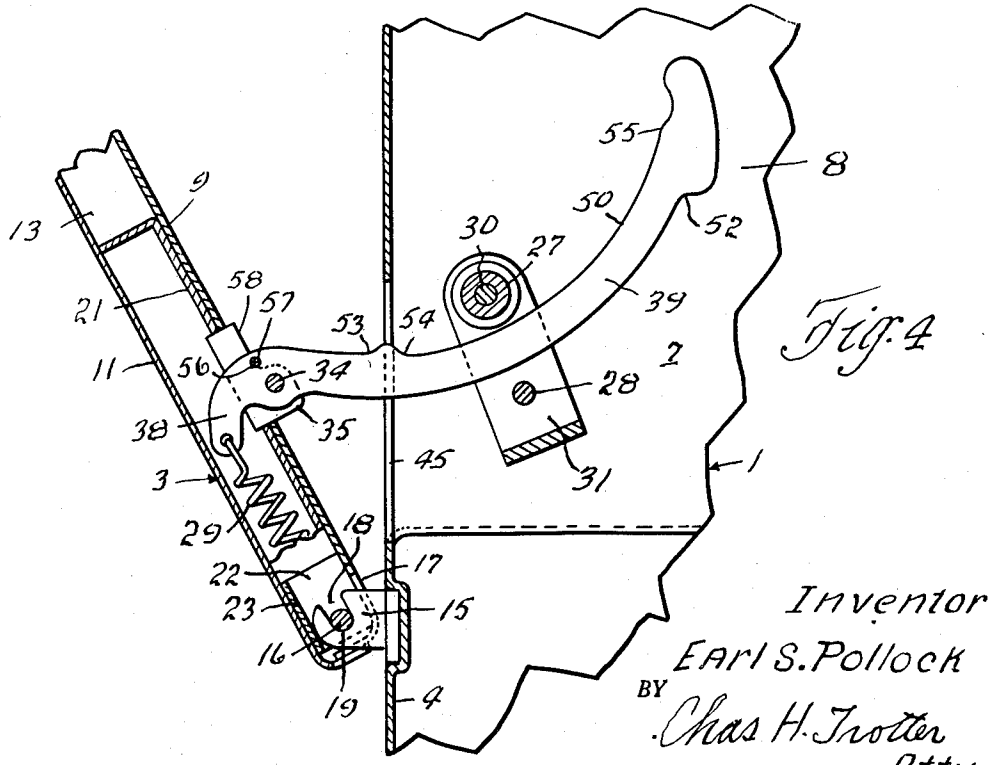



Fig. 4




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CLOSURE MECHANISM FOR A COOKING RANGE OVEN

Filed May 5, 1952 5 Sheets-Sheet 2

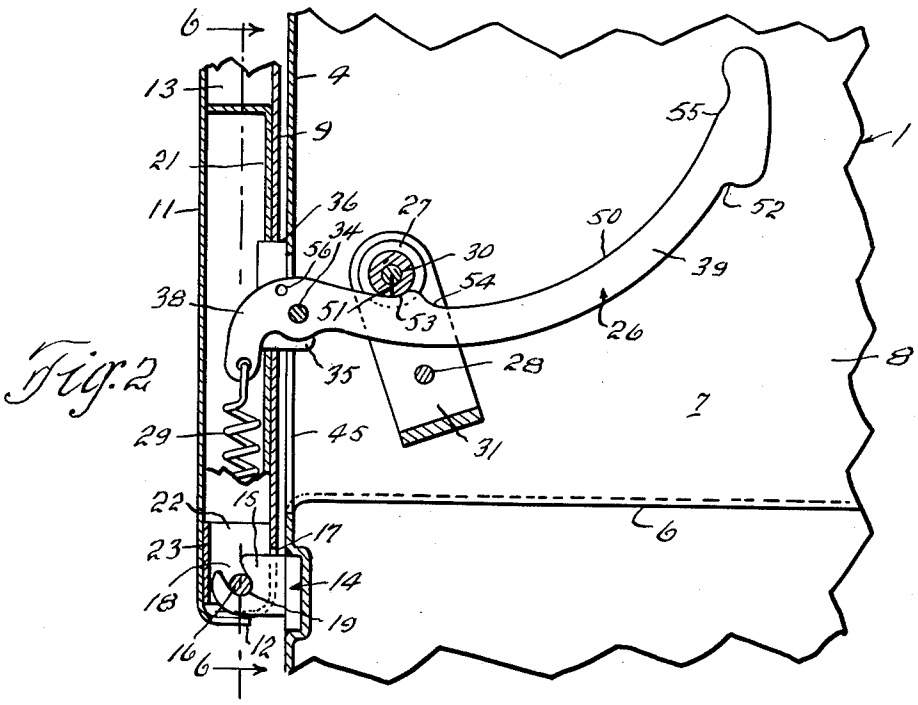



Fig. 2

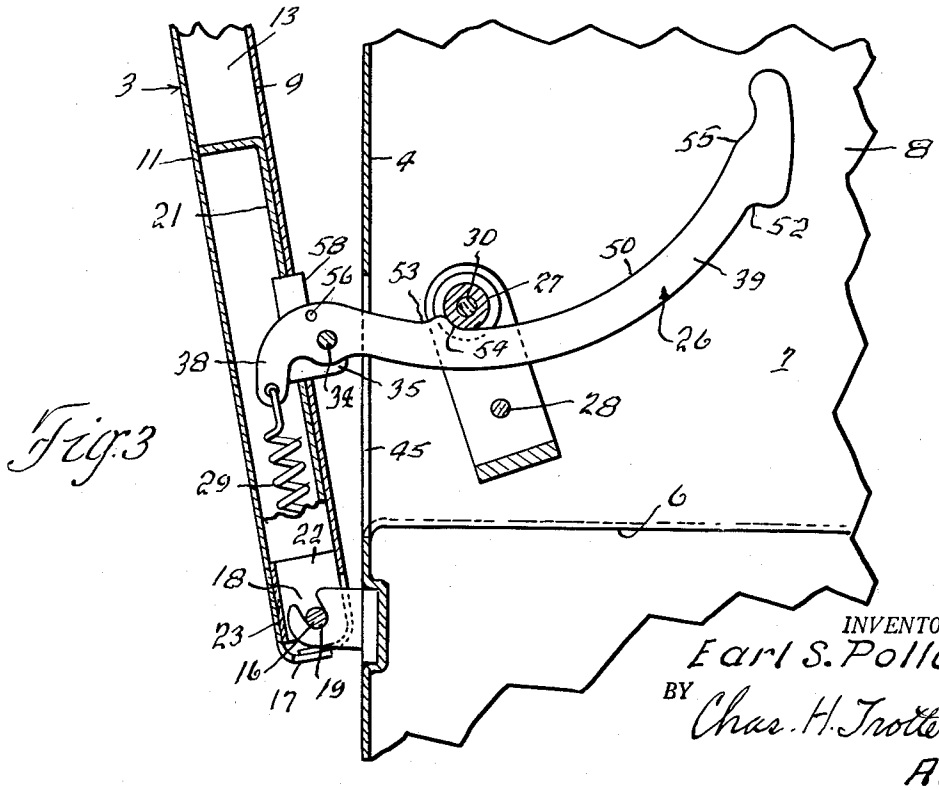



Fig. 3

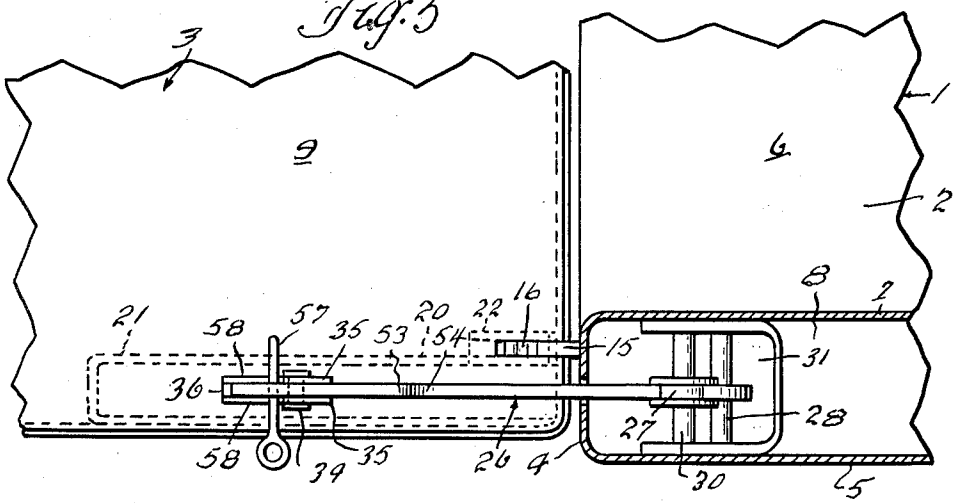
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CLOSURE MECHANISM FOR A COOKING RANGE OVEN

Filed May 5, 1952 5 Sheets-Sheet 3

Fig. 5



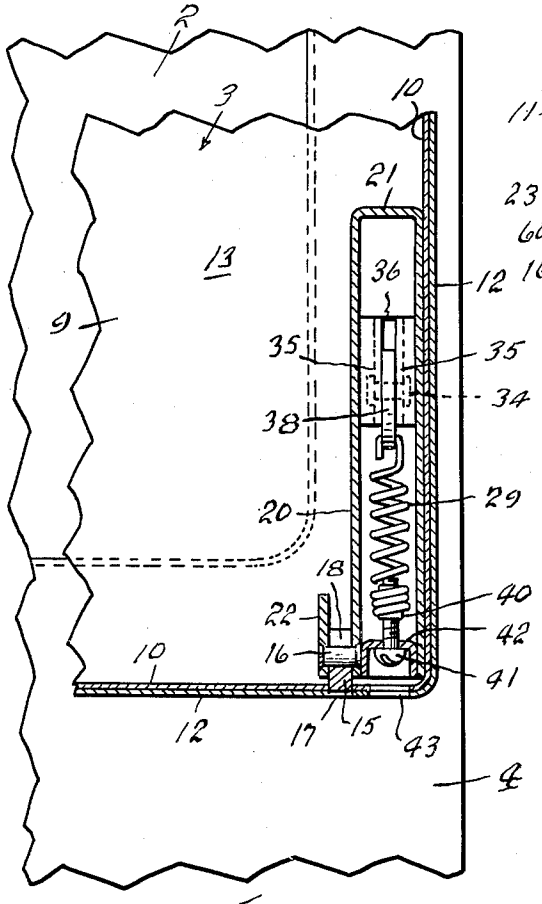




Fig. 6

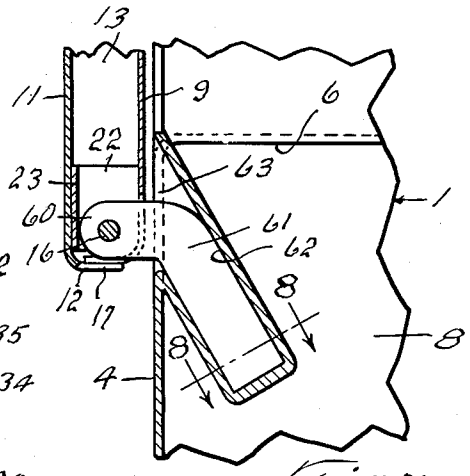



Fig. 7

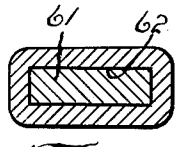



Fig. 8

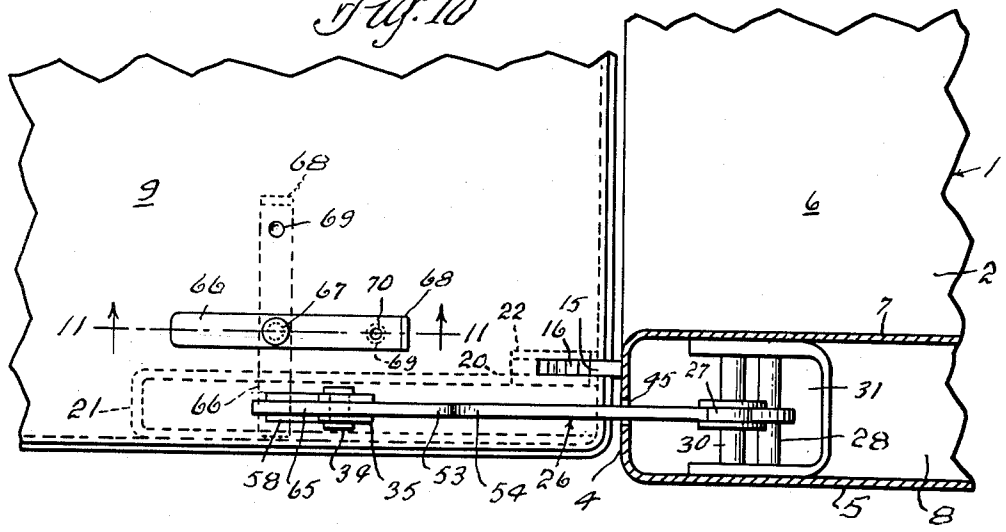
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Oct. 25, 1955 E. S. POLLOCK 2,721,547

CLOSURE MECHANISM FOR A COOKING RANGE OVEN

Filed May 5, 1952 5 Sheets-Sheet 4

Fig. 10



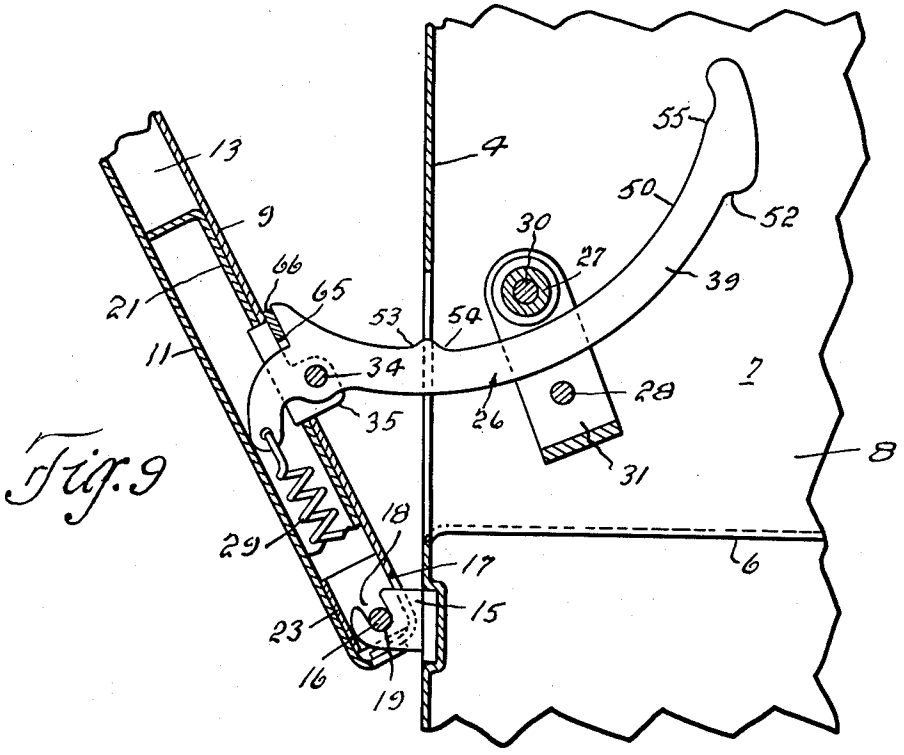
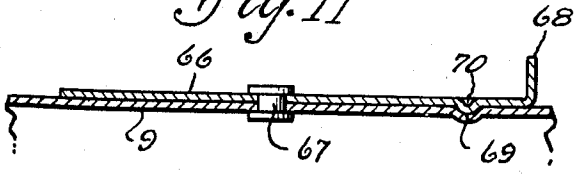




Fig. 9

Fig. 11



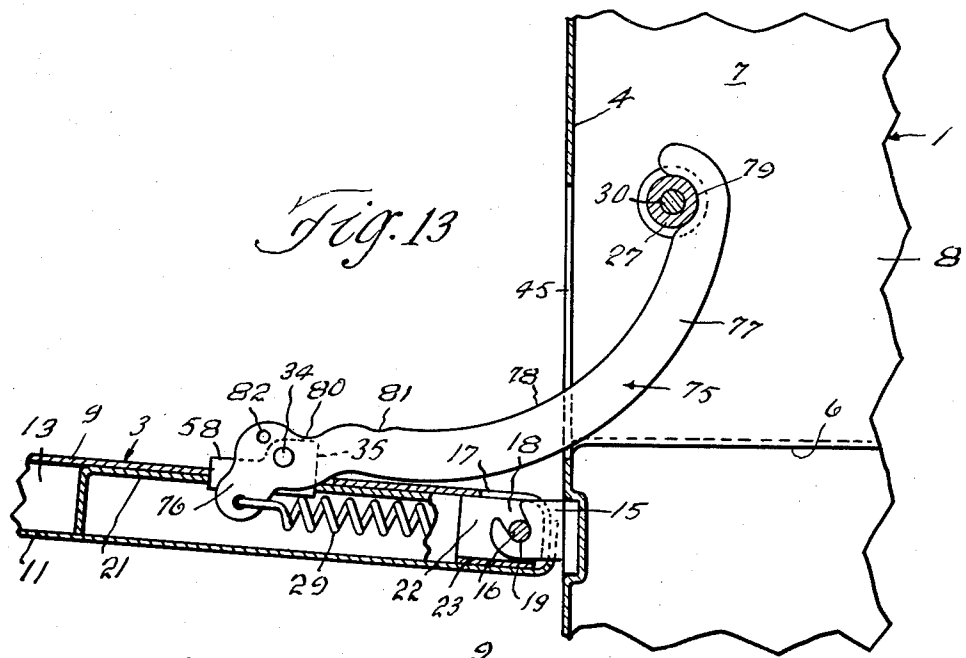

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CLOSURE MECHANISM FOR A COOKING RANGE OVEN

Filed May 5, 1952 5 Sheets-Sheet 5

Fig. 13



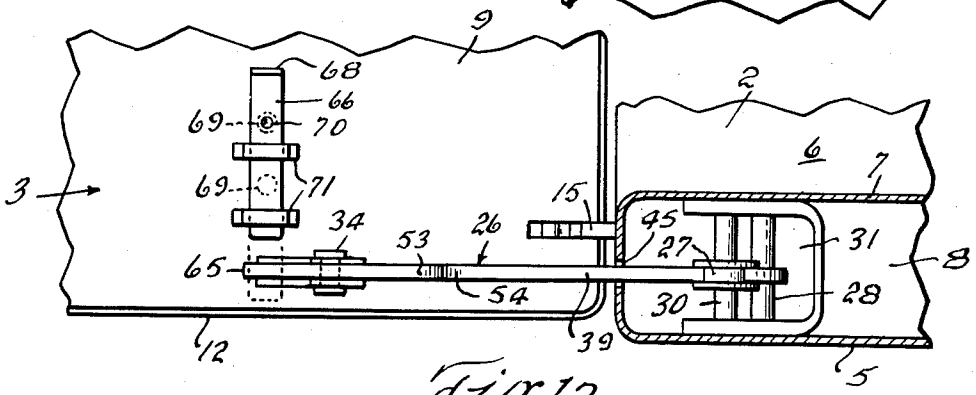
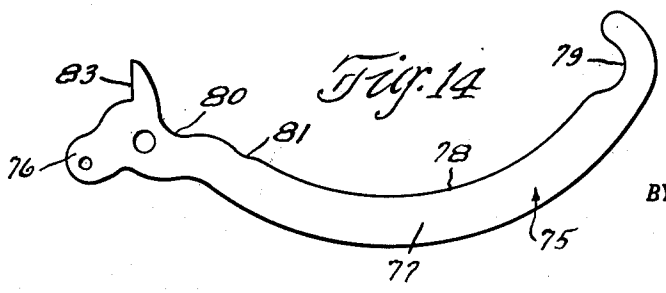




Fig. 12

Fig. 14




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2,721,547

# CLOSURE MECHANISM FOR A COOKING RANGE OVEN

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Application May 5, 1952, Serial No. 286,144

5 Claims. (Cl. 126—191)

This invention relates generally to a closure mechanism for a cooking range oven and is a modification and improvement of the closure mechanism disclosed in the copending application of Earl S. Pollock et al., Serial No. 286,143, filed May 5, 1952, now Patent No. 2,683,447, issued July 13, 1954. More specifically the invention relates to the hinge mechanism for removably mounting a door, of the "drop" type which swings outwardly and downwardly from a vertical closed position to a substantially horizontal open position, in front of an oven and to the means for locking the counterbalance mechanism therefor in inoperative condition so that the door can be quickly and easily removed and replaced when desired.

Cooking range oven doors are relatively heavy as they must be thoroughly insulated and constructed to stand hard usage. Means must be provided to limit the open position thereof to substantially horizontal and means must also be provided to hold the door tightly closed in order to prevent the escape of heat from the oven. Means should also be provided to substantially counterbalance the door in all positions between closed and fully open positions. In electric cooking ranges where the broiler element is located in the oven means should also be provided to hold the door slightly ajar in order to vent the oven and keep it from being unduly heated. In order to facilitate the cleaning of an oven, and the door therefor, after use the door should be so mounted that it can be quickly and easily removed and replaced.

The mechanism disclosed herein comprises an oven door of the drop type which is removably mounted upon suitable hinge means in front of an oven and a counterbalance means therefor which will yieldingly hold the oven door tightly closed, yieldingly hold it slightly ajar, yieldingly hold it fully open, and will substantially counterbalance it in all positions between closed and fully open positions. The counterbalance means is designed for use with an oven door having inner and outer walls and a connecting annular flange to provide a chamber within the door. It comprises a lever which is mounted upon a fulcrum carried by a bracket which is suitably secured to the inner wall of the door, a roller which is mounted upon a fixed stud within a range, a fixed abutment within the range and a tension spring which is disposed within the door chamber. The end of the lever adjacent the pivot point is disposed at an angle to the rest of the lever and extends downwardly into the door chamber and has one end of the tension spring connected thereto. The other end of the spring is connected to a tension adjusting screw which is suitably mounted within the door chamber and is accessible through an aperture in the door flange. The upper edge of the other end of the lever is generally concave and extends into the range under the roller against which it is yieldingly held in all positions of the door by the tension spring. The under edge of the lever adjacent the free end thereof has a notch formed therein which engages the fixed abutment when the door is in fully open position. The fixed abutment and the roller cooperate with each other and the lever to limit the opening movement of the door to substantially horizontal position. The tension spring always tends to slightly bias the door toward closed position. The relative positions of the door hinge axis, the roller axis, and the fulcrum for the arm with respect to each other, and the contour of the upper edge of the lever are such as to progressively decrease the biasing force exerted by the spring as the door is moved from fully open to closed position and thus compensate for the constantly changing force exerted by gravity upon the door as it moves from open to closed position. This arrangement substantially counterbalances the door in all positions and prevents slamming of the door in opening and closing. In order to yieldingly hold the door tightly closed, slightly ajar or fully open three spaced shoulders are provided in the upper edge of the lever. When the door is closed one of these shoulders engages the roller rearwardly thereof. When the door is slightly ajar another shoulder engages the roller forwardly thereof, and when the door is fully open the third shoulder engages the roller. In order to restrict the operation of the counterbalance means when it is desired to remove the door an aperture is provided in the lever adjacent the fulcrum therefor through which a detent is inserted when the door is in fully open position. Then when the door is moved towards closed position the spring rocks the lever in a counterclockwise direction until the detent engages a stop on the door and prevents further rocking movement of the lever in that direction. The door and with it the lever can then be readily removed.

The principal object of the invention is to provide improved hinge means for removably mounting a door on a cooking range in front of the oven therein.

Another object of the invention is to provide improved and simplified means for restricting the operation of the counterbalance mechanism for a removable door when it is desired to remove the door.

Other and more limited objects of the invention will be apparent from the following specification and the accompanying drawings forming a part thereof wherein:

Fig. 1 is a fragmentary vertical section through a cooking range showing a counterbalance mechanism yieldingly holding the oven door in fully open position, the plane of the section being indicated by the line **1—1** of Fig. 5;

Fig. 2 is a view similar to Fig. 1 showing the oven door being yieldingly held in closed position;

Fig. 3 is a view similar to Fig. 1 showing the oven door being yieldingly held slightly ajar;

Fig. 4 is a view similar to Fig. 1 showing one means by which the operation of the counterbalance mechanism is restricted preparatory to removing the door from the range;

Fig. 5 is a fragmentary horizontal section taken on the line **5—5** of Fig. 1;

Fig. 6 is a fragmentary vertical section taken on the line **6—6** of Fig. 2;

Fig. 7 is a detail vertical section through a modified type of hinge;

Fig. 8 is a section taken on the line **8—8** of Fig. 7;

Fig. 9 is a view similar to Fig. 4 showing a slightly different means for restricting the operation of the counterbalance mechanism;

Fig. 10 is a view similar to Fig. 5 showing the restricting means of Fig. 9;

Fig. 11 is an enlarged section taken on the line **11—11** of Fig. 10;

Fig. 12 is a fragmentary detail view showing still another means for restricting the operation of the counterbalance mechanism;

Fig. 13 is a view similar to Fig. 1 showing a modified means for limiting the opening movement of the door; and

Fig. 14 shows a slightly modified form of lever for use with the form of the invention shown in Fig. 13.

Referring now to the drawings by reference characters, the numeral 1 indicates a cooking range having an oven compartment 2 which is closed by an oven door 3. The front wall of the range is designated by the numeral 4 and one of the side walls is shown at 5. The numeral 6 designates the bottom of the oven and the numeral 7 designates one of the side walls of the oven which is spaced from the end wall 5 to provide a chamber 8 therebetween.

The oven door 3 comprises an inner rectangular wall 9 having an outwardly extending annular flange 10, and an outer wall 11 having an inwardly extending flange 12 which telescopes the outwardly extending flange 10 and is suitably secured thereto. The walls 9 and 11 are spaced from each other to provide a chamber 13 therebetween. The door 3 is secured to the front wall 4 of the range 1 by a pair of hinge members 14, one of which is disposed at each side of the door adjacent the lower end thereof. In opening, the upper end of the door 3 swings outwardly and downwardly from the front wall 4 of the range.

Each hinge member 14 comprises a bracket 15 and a pivot pin 16. The brackets 15 are rigidly secured to the front wall of the range and extend outwardly therefrom and into the chamber 13 of the door 3 through slots 17 therein. The brackets 15 each have a downwardly and inwardly inclined slot 18 therein which terminates in a seat 19 for one of the pivot pins 16. The pivot pins 16 are secured to and between one wall 20 of cages 21, secured to the door 3 within the door chamber 13, and a leg 22 secured to and spaced from the wall 20 by a bridge 23. This hinge construction permits the ready removal and replacement of the door 3 when desired as will be hereinafter explained.

In order to limit the opening movement of the door 3, to yieldingly hold it in fully open position, slightly ajar, or closed, and to substantially counterbalance the door in all positions between closed and fully open, counterbalance means which comprises a lever 26, a flanged roller 27, a fixed abutment 28 and a tension spring 29, is provided.

The flanged roller 27 is rotatably mounted upon a fixed shaft 30 carried by a U-shaped bracket 31 which is rigidly secured between the walls 5 and 7 within the chamber 8 in the range 1. The abutment 28 is also carried by the bracket 31, below and slightly inwardly of the roller 27.

The lever 26 is rotatably mounted upon a shaft 34 between a pair of ears 35 which extend out through a slot 36, in the inner wall 9 of the door, from the cage 21 within the door chamber 13. The lever 26 consists of a short section 38 disposed on one side of the pivot pin 34 and a relatively long section 39 disposed on the other side of the pivot pin 34 at an angle to the section 38. The section 38 of the lever 26 extends into the door chamber 13 through the slot 36 and is connected to one end of the tension spring 29. The other end of the spring 29 is connected to a nut 40 on a tension adjusting screw 41 rotatably mounted in a cross bar 42 carried by the cage 21 adjacent one end thereof. Access is had to the screw 41, for adjusting the tension of the spring 29, through an axially aligned aperture 43 in the annular door flanges 10 and 12. The other section 39 of the lever 26 extends through a slot 45 in the front wall 4 of the range into the chamber 8 and between the roller 27 and the abutment 28. The spring 29 always yieldingly holds the upper edge 50 of the lever 26 in engagement with the roller 27.

As the door 3 moves from closed position as shown in Fig. 2 to fully open position as shown in Fig. 1 the force exerted by gravity urging the door towards fully open position progressively increases. Conversely as the door is moved from the fully open position shown in Fig. 1 to the closed position shown in Fig. 2 the force exerted by gravity upon the door progressively decreases. Consequently in order to substantially counterbalance the door in all positions between closed and fully open positions it is necessary that the counterbalance mechanism be so constructed and arranged that the counter force exerted thereby against the force exerted by gravity will also progressively change in direct proportion to the change in the force exerted by gravity as the door is moved back and forth between closed and fully open positions. To this end we make the contour of the upper edge 50, of the lever 26, which bears against roller 27 as in the form of a concave compound curve. The curvature thereof is such that the normal to the point of contact thereof with the periphery of the roller 27 progressively varies from substantially vertical to substantially horizontal as the door 3 is moved from closed to fully open position as shown at 51 in Fig. 1 and 2. The roller 27 and the lever 26 cooperate to progressively vary the effective force exerted by the spring 29 during opening and closing of the door. When the door is closed with the normal 51 substantially vertical as shown in Fig. 2 the effective force of the spring 29 is at its minimum; and when the door is fully open with the normal 51 substantially horizontal the effective force of the spring 29 is at its maximum.

In order to limit the opening movement of the door 3 to substantially horizontal position a notch 52 is provided, in the lower edge of the lever 26, which engages the fixed abutment 28 when the door is in open position. As the door approaches fully open position the roller 27 forces the lever 26 downwardly until the notch 52 engages the abutment 28 after which the roller 27 and the abutment 28 cooperate with each other and with the lever 26 to prevent further opening movement of the door.

In order to yieldingly hold the door 3 tightly closed, slightly ajar or fully open three spaced shoulders 53, 54 and 55 in upper edge 50 of the lever 26 are provided. When the door is closed the shoulder 53 engages the roller 27 as shown in Fig. 2; when slightly ajar the shoulder 54 engages the roller 27 as shown in Fig. 3, and when fully open the shoulder 55 engages the roller 27 as shown in Fig. 1. During the initial opening movement of the door sufficient extra force must be manually applied to the door to depress the lever 26 until the shoulder 53 passes the roller 27. During the final closing movement of the door 3 from the slightly ajar position shown in Fig. 3 sufficient extra force must be manually applied to the door to depress the lever 26 until the shoulder 54 passes the roller 27; and during the initial closing movement of the door sufficient extra force must be manually applied to the door to move the shoulder 55 away from the roller 27.

In order to restrict the operation of the counterbalance means in order to facilitate the removal of the door 3 from the range I provide an aperture 56 through the lever 26 close to the shaft 34, and a detent 57 which is adapted to be inserted through the aperture 56 as shown in Fig. 5. When it is desired to remove the door 3 from the range 1 the door is first moved to fully open position as shown in Fig. 1. The detent 57 is then inserted through the aperture 56 as shown in Fig. 5 and then the door is moved to the position shown in Fig. 4. In this position the spring 29 has rocked the lever 26 in a counterclockwise direction until the detent 57 engages stops 58 carried by the ears 35. The spring 29 and detent 57 will hold the lever 26 stationary in this position. The door 3, and with it the lever 26, can then be easily removed from the range by lifting the door upwardly until the hinge pins 16 are withdrawn from their seats 19 through the slots 18 in the hinge brackets 15. The door is then turned slightly and moved outwardly to withdraw the lever 26 from between the roller 27 and the abutment 28. In replacing the door 3 the lever 26 is first inserted between

the roller 27 and the abutment 28 and then the hinge pins 16 are inserted into the slots 18 and lowered to their seats 19. The door is then moved to the fully open position shown in Fig. 2 and the detent 57 withdrawn from the aperture 56.

In Figs. 7 and 8 I have shown a slightly different form of hinge means by which the door 3 is removably mounted in place. It comprises the hinge pin 16 and the hinge bracket 60. The hinge pin 16 is the same as that shown in Figs. 1 to 6 and is mounted within the door chamber 13 as previously shown and described. The bracket 60 is integral with an elongated angularly disposed shank 61 which is slidably mounted in a downwardly and inwardly inclined socket 62 disposed in the chamber 8 behind the front wall 4 of the range. The bracket 60 extends outwardly from the upper end of the shank 61 through the open end 63 of the socket 62 and into the door chamber 13 through the slot 17, and is permanently secured upon the operation of the hinge pin 16. In order to remove a door having this type hinge mechanism the counterbalance mechanism is first restricted as previously described and then the door is lifted upwardly until the shank 61 is withdrawn from the socket 62.

Although I have shown the hinge and counterbalance mechanisms applied to only one side of the door 3 it is to be understood that they are duplicated at the other side of the door.

In Figs. 9, 10 and 11, I have shown a slightly different means for restricting the operation of the counterbalance mechanism in order to facilitate removal of the door 3. In this form of the invention I eliminate the aperture 56, in the lever 26, and the detent 57; and I substitute therefor a shoulder 65, on the upper edge of the lever 26 adjacent the pivot pin 34, and a pivoted detent 66. Otherwise the mechanism is the same as that shown and described in Figs. 1 to 8 and the same reference characters are applied to like parts. The detent 66 is pivoted to the inner wall 9 of the door 3, by a rivet 67, beside the lever 26 in position to be swung across the path of the lever 26 and under the shoulder 65. One end of the detent 66 is turned up to provide a finger grip 68. To remove the door 3 with this form of restricting means, the door is first moved to fully open position as shown in Fig. 1. The detent 66 is then turned from the position shown in full lines in Fig. 10 to the position shown in dotted lines therein. The door is then moved to the position shown in Fig. 9. As the door approaches this position the spring 29 rocks the lever 26 in a counterclockwise direction until the shoulder 65 engages the detent 66, after which the lever is held stationary against the detent 66 by the spring 29. The door 3, and with it the lever 26, can then be removed as described in connection with Fig. 4. In order to yieldingly hold the detent 66 in adjusted positions I provide two slight indentations 69 in the door wall 9 in one of which a small boss 70 on the underside of the detent 66 seats when the detent is in inoperative position, and in the other of which the boss 70 seats when latch is in operative position.

In Fig. 12 I have shown the latch 66 slidably supported against the wall 9, by a pair of spaced clips 71, for movement back and forth between full line and dotted line positions. Otherwise the mechanism is the same as shown in Figs. 9 to 11.

In Fig. 13 I have shown a slightly modified means for limiting the opening movement of the door. In this form of the invention I eliminate the abutment 28 within the chamber 8 below the roller 27, and I substitute the lever 75 for the lever 26 used with the other form of the invention previously described. Otherwise this form of the invention is the same as that shown in Figs. 1 to 6 inclusive and like reference characters are applied to similar parts. The lever 75 is mounted upon the pivot pin 34 carried by the bracket 35 and comprises the sections 76 and 77 similar to the sections 38 and 35 respectively of the lever 26. The upper edge 78 of the lever 75 which has substantially the same contour as the upper edge 50 of the lever 50 is yieldingly held in contact with the roller 27 during opening and closing movements of the door 3 by the spring 29 which is connected to the section 76 of the lever 75. The section 77 of the lever 75 terminates in a hook 79 which hooks around the roller 27 when the door 3 is in a substantially horizontal position and holds the door in this position. When the door is closed an arcuate recess 80 in the upper edge 78 of the lever 75 engages the roller 27 to yieldingly hold the door tightly closed. An arcuate recess 81 spaced from the recess 80 in the upper edge 78 of the lever 76 is provided to yieldingly hold the door slightly ajar. An aperture 82 similar to the aperture 56 in the lever 26 is provided for the reception of the detent 57 when it is desired to restrict the operation of the counterbalance mechanism in order to facilitate the removal of the door.

When it is desired to use the lever 75 with the restricting means shown in Figs. 9 to 12 inclusive, I substitute a shoulder 83, similar to the shoulder 65 in Fig. 9, for the aperture 82 as shown in Fig. 14.

From the foregoing it will be apparent to those skilled in this art that I have provided a very simple and efficient mechanism for accomplishing the objects of the invention.

It is to be understood that I am not limited to the specific construction shown and described as various modifications may be made therein within the scope of the appended claims.

What is claimed is:

1. A cooking range comprising a cabinet having a front wall, an oven within said cabinet, an opening into said oven through said front wall, an oven door by which said opening is closed, hinge means by which said door is removably secured to said front wall for movement between a vertical closed position and a substantially horizontal open position, counterbalance mechanism by which said door is yieldingly held in fully open and fully closed positions and is substantially counterbalanced in all positions between said fully open and said fully closed position, and restricting means by which the operation of said counterbalance mechanism is restricted to thereby facilitate the removal of said door, said counterbalance mechanism, and said restricting means for said front wall as a single unit; said oven door comprising a spaced inner wall member and an outer wall and a connecting peripheral wall defining a door chamber therebetween; and said counterbalance mechanism comprising a fixed shaft within said cabinet; a roller mounted on said fixed shaft, a lever member having a generally concave upper edge, a pivotal connection by which said lever member is pivotally secured to the said inner wall member of said door with one end of said lever member being disposed within said door chamber in all positions of said door and the other end of said lever member being disposed within said cabinet with said concave edge in engagement with the under portion of said roller, and a tension spring disposed wholly within said door chamber and having one end thereof connected to the said one end of said lever member within said door chamber and the other end thereof connected to said door within said door chamber, said spring yieldingly biasing the upper edge of said lever into engagement with said roller, and said restricting means comprising a detent which is carried by one of said members and coacts with the other of said members to prevent movement of said lever member beyond a fixed point in one direction by said spring.

2. A cooking range comprising a cabinet having a front wall, an oven within said cabinet, an opening into said oven through said front wall, an oven door by which said opening is closed, hinge means by which said door is removably secured to said front wall for movement between a vertical closed position and a substantially horizontal open position, counterbalance mechanism by which said door is yieldingly held in fully open

and fully closed positions and is substantially counterbalanced in all positions between said fully open and said fully closed position, and restricting means by which the operation of said counterbalance mechanism is restricted to thereby facilitate the removal of said door, said counterbalance mechanism, and said restricting means from said front wall as a single unit; said oven door comprising a spaced inner wall member and an outer wall and a connecting peripheral wall defining a door chamber therebetween; and said counterbalance mechanism comprising a fixed shaft within said cabinet, a roller mounted on said fixed shaft, a lever member having a generally concave upper edge, a pivotal connection by which said lever member is pivotally secured to the said inner wall member of said door with one end of said lever member being disposed within said door chamber in all positions of said door and the other end of said lever member being disposed within said cabinet with said concave edge in engagement with the under portion of said roller, and a tension spring disposed wholly within said door chamber and having one end thereof connected to the said one end of said lever member within said door chamber and the other end thereof connected to said door within said door chamber, said spring yieldingly biasing the upper edge of said lever into engagement with said roller, and said restricting means comprising a stop carried by said inner wall member, an aperture through said lever member adjacent said pivotal connection, and a detent adapted to be removably inserted in said aperture and to engage said stop.

3. A cooking range comprising a cabinet having a front wall, an oven within said cabinet, an opening into said oven through said front wall, an oven door by which said opening is closed, hinge means by which said door is removably secured to said front wall for movement between a vertical closed position and a substantially horizontal open position, counterbalance mechanism by which said door is yieldingly held in fully open and fully closed positions and is substantially counterbalanced in all positions between said fully open and said fully closed position, and restricting means by which the operation of said counterbalance mechanism is restricted to thereby facilitate the removal of said door, said counterbalance mechanism, and said restricting means from said front wall as a single unit; said oven door comprising a spaced inner wall member and an outer wall and a connecting peripheral wall defining a door chamber therebetween; and said counterbalance mechanism comprising a fixed shaft within said cabinet, a roller mounted on said fixed shaft, a lever member having a generally concave upper edge, a pivotal connection by which said lever member is pivotally secured to the said inner wall member of said door with one end of said lever member being disposed within said door chamber in all positions of said door and the other end of said lever member being disposed within said cabinet with said concave edge in engagement with the under portion of said roller, and a tension spring disposed wholly within said door chamber and having one end thereof connected to the said one end of said lever member within said door chamber and the other end thereof connected to said door within said door chamber, said spring yieldingly biasing the upper edge of said lever into engagement with said roller, and said restricting means comprising a shoulder carried by the upper edge of said lever member adjacent said pivotal connection and a detent mounted on said inner wall member and adapted to be moved into and out of position to be engaged by said shoulder.

4. A cooking range as defined in claim 3 in which said detent is pivotally mounted on said inner wall member and is adapted to be swung into and out of position to be engaged by said shoulder.

5. A cooking range as defined in claim 3 in which said detent is slidably mounted on said inner wall member and is adapted to be swung into and out of position to be engaged by said shoulder.

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