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L. D. HOULIS

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DOOR OPERATING MECHANISM FOR BAKER'S OVENS

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4 Sheets-Sheet 1

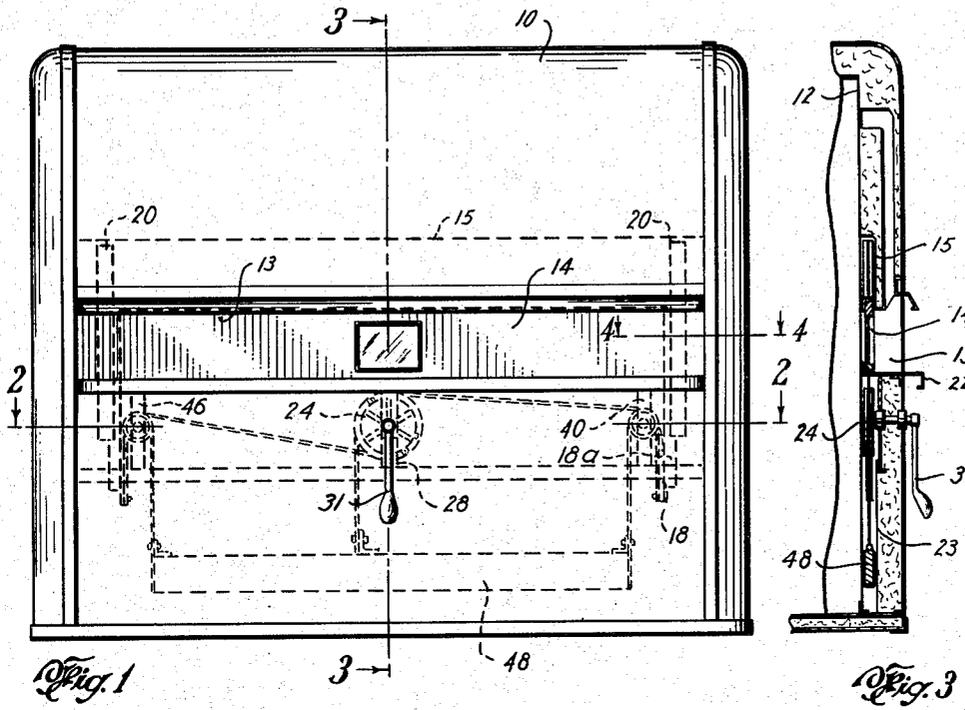


Fig. 1

Fig. 3

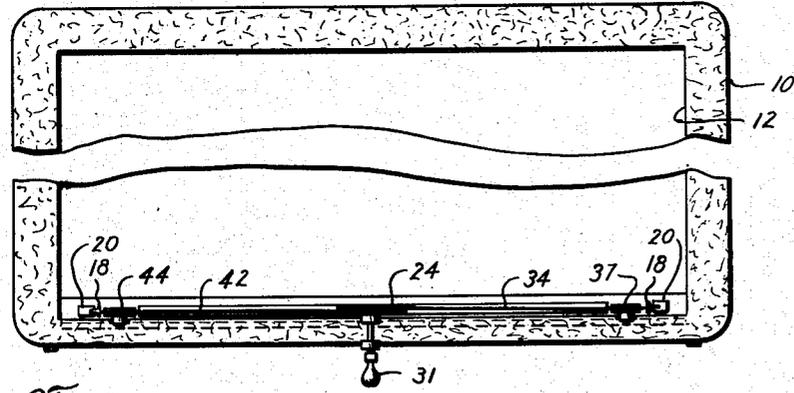


Fig. 2

LOUIS D. HOULIS
INVENTOR

Vincent Martin
and
Joe E. Edwards
ATTORNEYS

Feb. 17, 1953

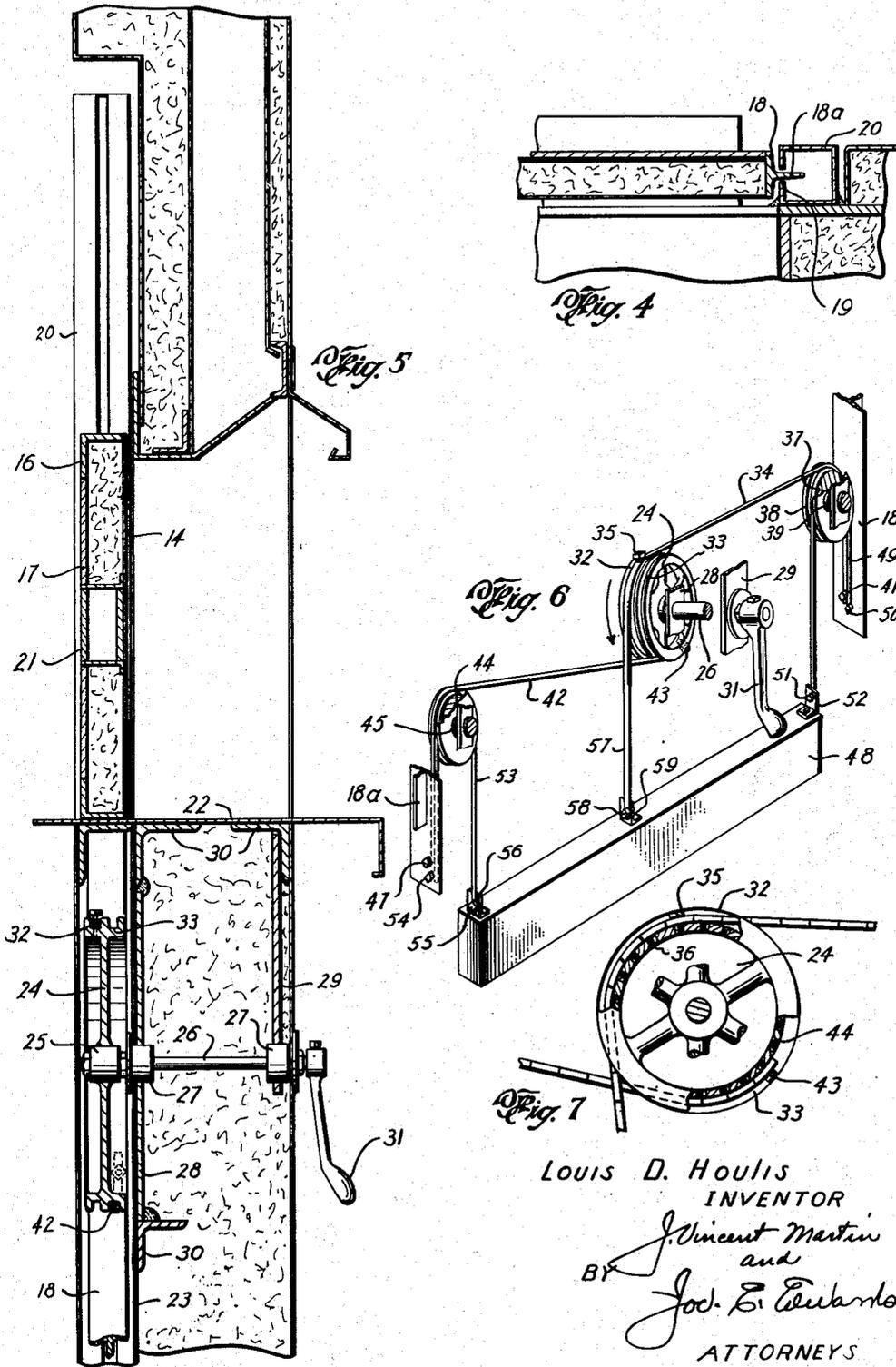
L. D. HOULIS

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Louis D. Houlis
 INVENTOR
 BY *J. Vincent Martin*
 and
Joe. E. Czerwinski
 ATTORNEYS

Feb. 17, 1953

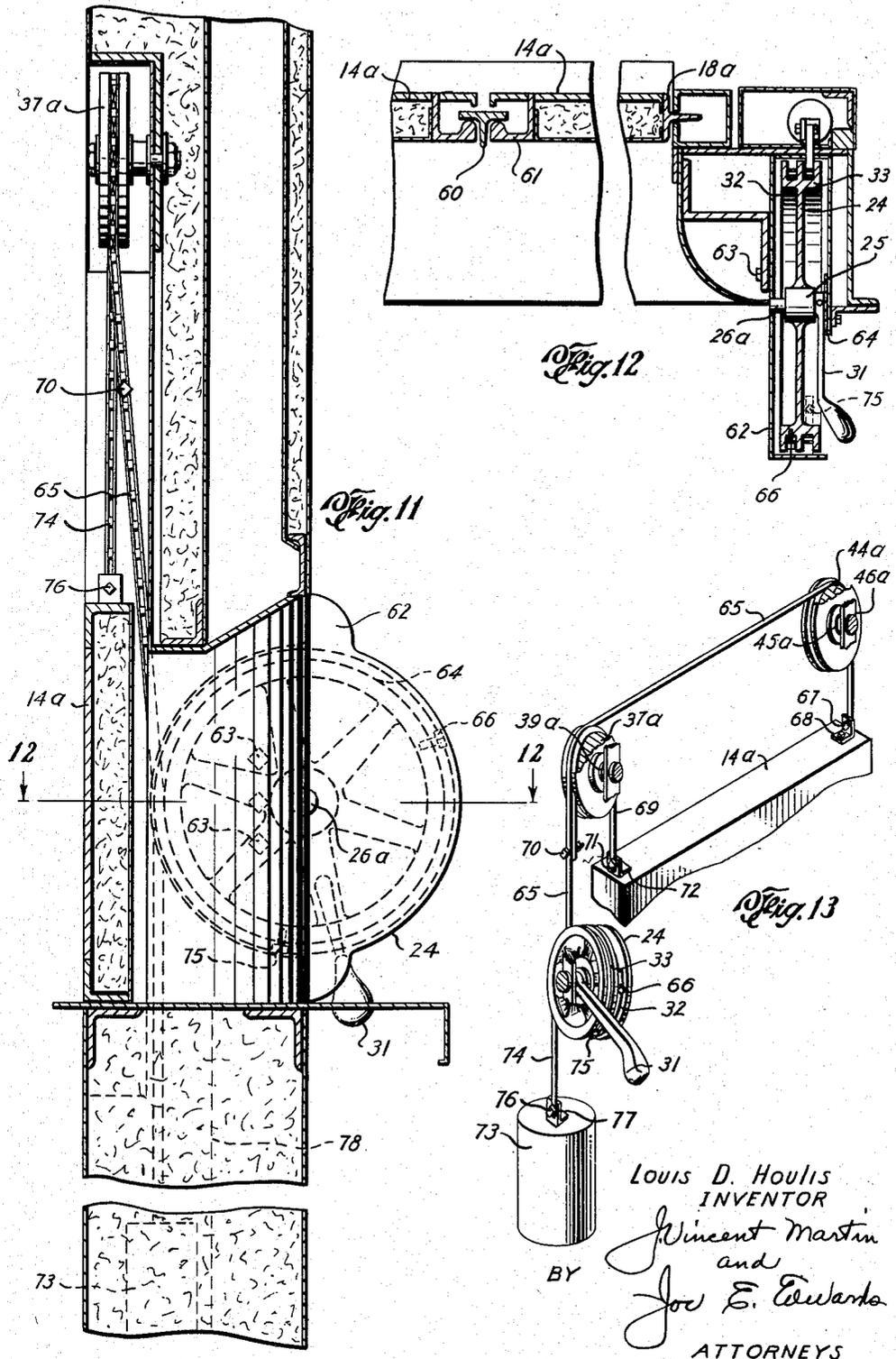
L. D. HOULIS

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DOOR OPERATING MECHANISM FOR BAKER'S OVENS

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4 Sheets-Sheet 4



LOUIS D. HOULIS
INVENTOR
Vincent Martin
and
Joe E. Edwards
ATTORNEYS

UNITED STATES PATENT OFFICE

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DOOR OPERATING MECHANISM FOR BAKERS' OVENS

Louis D. Houllis, Dallas, Tex.

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7 Claims. (Cl. 268—58)

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This invention relates to new and useful improvements in door operating mechanisms for bakers' ovens.

Bakers' ovens now in general use may be provided with either a single or a double door for permitting access to the interior of the oven and ordinarily each door is of the sliding type which moves in a vertical plane. Usually the door is counterbalanced and the manual control for imparting movement thereto is located exteriorly of the oven. Various types of operating mechanisms have been employed but said mechanisms usually have the disadvantage of requiring that the inner wall of the oven be cut into in order to mount said mechanism; as is well known the oven wall is insulated and any cutting of the inner wall results in the escape of heat and steam into the wall area of the oven which is, of course, undesirable. Another disadvantage is that entirely separate or different mechanisms have had to be provided on the double door type of oven as compared to the mechanism for the single door oven.

It is, therefore, one object of this invention to provide an improved door operating mechanism for a baker's oven which may be readily mounted on the interior wall surface of the oven without the necessity of cutting into or otherwise opening the wall of said oven; the disposition of the mechanism making the same easily accessible for adjustment of or repair to the operating elements.

An important object of the invention is to provide an improved door operating mechanism for a baker's oven which is so constructed that its operating parts and components are interchangeably adapted for use in application to either single or double door ovens, whereby the mechanism is universally adaptable to bakers' ovens of the vertically movable or disappearing door type.

Another object of the invention is to provide an improved door operating mechanism, of the character described, wherein a single operating member which is readily accessible from the exterior of the oven actuates the mechanism to properly operate each door.

A further object is to provide a mechanism, of the character described, which permits effective counterbalancing of each door without imposing a binding or causing a misalignment of the door, whereby proper operation of the door is facilitated.

Still another object is to provide a door operating mechanism, wherein flexible actuating elements, such as chains, may be employed, and also wherein a single main drive member is uti-

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lized to impart movement to the door through the medium of said actuating elements; the mechanism comprising a minimum number of parts which are simple in construction and readily adjustable, whereby the mechanism is easily mounted in required position within the oven.

A further object is to provide an improved door operating mechanism comprising a main drive member, idler pulleys and operating chains, all of which are constructed so as to be readily interchangeable for use either on a single door oven or a double door oven; a single door oven drive employing only a single drive member disposed at the center front of the oven while a double door oven utilizes two drive members, one for each door and located at opposite sides of the oven on the front wall thereof, whereby the main driver member or members, as the case may be, are always readily accessible to the operator.

Other and further objects of the invention will appear from the description of the invention.

In the accompanying drawings, which form a part of the instant specification, which are to be read in conjunction therewith and wherein like reference numerals are used to indicate like parts in the various views:

Figure 1 is a front elevation of a single door oven, constructed in accordance with the invention,

Figure 2 is a horizontal cross-sectional view, taken on the line 2—2 of Figure 1,

Figure 3 is a transverse, vertical, sectional view, taken on the line 3—3 of Figure 1,

Figure 4 is a horizontal, cross-sectional view, taken on the line 4—4 of Figure 1,

Figure 5 is an enlarged, transverse, vertical sectional view taken through the central portion of the door and illustrating the main operating or drive wheel,

Figure 6 is an isometric view, illustrating the main drive wheel, idler pulleys and chain connections to the door and counterweight,

Figure 7 is a detail view, partly in section and partly in elevation of the main drive wheel,

Figure 8 is a front elevation of a double door oven,

Figure 9 is a horizontal cross-sectional view, taken on the line 9—9 of Figure 8,

Figure 10 is a transverse, vertical sectional view, taken on the line 10—10 of Figure 8,

Figure 11 is an enlarged vertical sectional view, taken through the central portion of one of the doors,

Figure 12 is a horizontal, cross-sectional view, taken on the line 12—12 of Figure 11, and

Figure 13 is a view, similar to Figure 6, showing the mechanism applied to one of the doors of a double door oven.

In the drawings, the numeral 10 designates a baker's oven which may be of any desired construction. The oven is ordinarily of welded construction with its frame work formed of angle bars and channel members and having an outer wall surface 11 and an inner wall surface 12 formed of sheet metal welded or otherwise secured to the main frame. As is usual practice, the walls top and bottom of the oven are suitably insulated. The particular details of construction form no part of the present invention and therefore the particular manner in which the oven is constructed is subject to variation.

In Figures 1-7 the oven 10 is illustrated as a single door oven and is provided with a longitudinally extending access opening 13 in its front wall. A slidable door 14 which is movable in a vertical plane is adapted when in a lower position to close the opening 13 and when in an upper position to move upwardly within a recess 15 formed in the inner wall of the oven so as to be out of alignment with the access opening 13. The door is constructed of an angle frame 16 having sheet metal sides 17 with suitable insulation therebetween and for guiding the door in its vertical movement vertically extending T-shaped bars 18 are attached to each end of the door. The rib 18a (Figure 4) of each T-shaped guide bar is movable within a vertical slot 19 formed in a door frame member 20 and obviously, movement of the door in a vertical plane is guided by the coaction of the ribs 18a within their respective slots 19. The central portion of the door may be formed with the usual window 21 whereby when the door is in a closed position the interior of the oven may be viewed through said window.

With the door in its fully lowered position, as illustrated in Figures 3 and 5, the lower end of the door rests upon a shelf 22 which spans the lower portion of the access opening 13 and the T-shaped guide bars 18 extend downwardly from the door into a recessed area 23 which is provided on the inner wall surface of the front wall of the oven. Since the guide members are attached to opposite ends of the door it will be evident that said members are spaced from each other by substantially the length of the door (Figure 1).

For imparting a vertical movement to the door 17 in order to operate the same, a main drive wheel 24 is mounted centrally of the front wall of the oven and is disposed within the recessed portion 23 in the inner wall surface. The operating wheel 24 has an axial collar 25 which is suitably secured upon a rotatable shaft 26. The shaft is supported in bearing collars 27 which are mounted within supporting straps 28 and 29, said straps being secured to certain of the angle bars 30 which form part of the oven frame. The shaft 26 extends entirely through the front wall of the oven and has an operating crank 31 attached to its outer end. By manually swinging the crank handle it will be evident that a rotation will be imparted to the main operating wheel 24. The outer rim or periphery of the main operating wheel 24 is formed with a pair of annular grooves 32 and 33 (Figure 5).

For converting the rotation of the main operating wheel 24 into vertical motion which may be transmitted to the oven door 14 an operating chain 34 is attached by a bolt 35 within the an-

nular groove 32 of the drive wheel. The base or bottom of the groove is formed with a plurality of spaced threaded openings 36 whereby the bolt 35 may be attached in any one of various positions with respect to the wheel 24. The operating chain 34 passes over an idler pulley 37 which is formed with a deep annular groove 38. The idler pulley 37 has its shaft 39 supported in a supporting strap 40 similar to the strap 28 which is mounted between the angular frame members 30 of the oven. The idler 37 is located contiguous to one of the depending guide members 18, and the operating chain which is passed over said idler has its end attached by means of a fastening bolt 41 with the lower end of said guide member.

A similar operating chain 42 has one end disposed within the second groove 33 of the operating wheel 24 and is fastened thereto by a bolt 43 which may be received in any one of a number of threaded openings 44 provided in the bottom of said groove. The opposite end of the operating chain 42 passes over the groove of an operating pulley 34 which has its shaft 45 mounted upon a supporting strap 46 and which is located contiguous to the other depending guide member 18. The end of the operating chain 42 is attached by a bolt 47 with the lower end of the guide member. Since both operating chains 42 are attached to the rotatable operating wheel with their other ends attached to the lower portions of the guide members 18, it will be evident that a rotation of the operating wheel will wind the chains 34 and 42 upon the wheel and will result in an upward movement of the guide members 18. The guide members, being attached to the ends of the oven door 14, will thereby impart a vertical movement to said oven door. The diameter of the operating wheel is such that approximately one third turn of the operating wheel will result in a complete lifting or lowering of the oven door, and said wheel may be readily operated from the exterior of the oven through the crank handle 31.

For counterbalancing the weight of the door a counterbalancing weight 48 is movable within the lower portion of the recessed area 23 below the operating wheel and below the idler pulleys 37 and 44. The guide member 18 which is attached to the operating chain 34 has a second chain 49 attached thereto by a bolt 50 and this chain passes over the idler pulley and has its opposite end bolted at 51 to an angular bracket 52, the latter being secured to one end of the elongate counterweight 48. It is noted that the groove in the idler pulley 37 is of sufficient depth to accommodate both chains 49 and 34. A similar chain 53 has one end attached by a bolt 54 to the opposite guide member 18 and this chain passes upwardly over the groove of the second idler pulley 44 and has its opposite end attached by a bolt 55 to a bracket 56 which is fastened to the opposite end of the counterweight 48. For attaching the central portion of the counterweight to the rotatable operating wheel 24 a chain 57 has its lower end bolted at 58 to a central bracket 59 fastened to the upper surface of the counterweight. The chain 57 may be attached to the wheel 24 at the bolt 35 and as illustrated, this chain may be a continuation of the operating chain 34; however, if desired, it could be a separate connecting element.

Because the various chains which connect the operating wheel 24 to the door members 18 and also in view of the particular type of connections

between the chain elements connecting the counterweight with the door members and with the operating wheel it is possible to quickly adjust the connections to obtain the desired operation. In other words, any slack may be readily taken up by merely changing the particular link with which the various fastening bolts are connected. This makes the mechanism quickly and easily adjustable to obtain the proper or desired amount of movement in accordance with a predetermined swinging of the manual crank handle 31. The operation of the mechanism is clearly evident from the foregoing. Referring to Figures 5 and 6, it will be obvious that when the crank handle 31 is swung a rotation will be imparted to the operating wheel, such rotation being in the direction of the arrow in Figure 6. As the operating wheel 24 rotates the operating chains 34 and 42 are wound further about the wheel and an upward vertical movement is imparted to the guide members 18 of the door, thereby resulting in an upward vertical movement of the door which will move the same to an open position. At the same time that the door moves upwardly the particular chain connects with the counterweight permitting said counterweight to move downwardly, and thus the door will be counterbalanced in all positions of its movement. When it is desired to close the door a reverse swinging movement of the crank handle 31 will rotate the wheel 24 in an opposite direction and this will result in a raising of the weight 48 with a lowering of the door 14. It will be evident that the mechanism is extremely simple and has a minimum number of working parts. The mechanism may be mounted within the recessed area 23 within the front wall of the oven and it is not necessary to cut into said wall in order to mount the various working parts. The only opening through the front wall is that which is provided for the operating shaft 26 and this may be properly sealed off within the bearing collars 27. When the door 14 is opened the operating wheel and chains are readily accessible through the access opening 11 for adjustment or repair.

In Figures 8-13 the invention is illustrated as applied to a double door oven, as compared to the single door oven shown in Figures 1-7. The oven 10a is formed with a pair of access openings 13a in its front wall and these openings are adapted to be closed by a pair of movably vertical doors 14a. In this type of oven a single elongate door is in effect divided into two separate doors and a central supporting post 60 (Figure 12) is located between the doors 14a. Each door has a T-shaped guide member 18' mounted at its outer end and is formed with a channel guide member 61 coacting with the central post 60 whereby vertical movement of each door 14a is efficiently guided.

The operating mechanism for each of the doors 14a is identical in construction and it is believed that a description of one will suffice. It is noted that the particular operating unit for each of the doors 14a utilizes substantially the same elements as the elements employed in the mechanism for a single door oven. Referring to Figure 13, the operating wheel 24 having the double grooves 32 and 33 is mounted at one end of each door and functions as the main operating member for that door unit or mechanism. In this form the operating wheel is disposed within a housing or casing 62 which is fastened by bolts 63 to one of the frame members of the oven.

The shaft 26 of the first form is replaced by a stub shaft 26a and the axial collar 25 of the operating wheel 24 is secured to the stub shaft. The crank handle 31 is attached to the stub shaft and may, if desired, be attached to the wheel 24, and this handle extends outwardly through an arcuate opening 64 formed in one side of the casing 62. The axis of the stub shaft 26a is at a right angle to the axis of the shaft 26 of the first form and also the operating wheel 24 is disposed at the end of the door which it controls rather than centrally of the oven.

For operating the door 14a upon rotation of the operating wheel 24 an operating chain 65 has one end bolted at 66 within the groove 32 of the operating wheel. This chain passes upwardly over an idler pulley 31a which is constructed in exactly the same manner as the idler 37 of the first form. The idler has its shaft 39a supported in a strap 40a which is welded to one of the angle bars of the oven frame. The operating chain 65 then passes over a second idler pulley 44a which is constructed in an identical manner to the idler 44 of the first form. This pulley has its shaft 45a suitably journaled in a supporting strap 46a. After passing over the pulley 44a, the operating chain 65 has its extremity bolted at 67 to a bracket 68 at one end of the door 14a. A second operating chain 69 may have one end bolted at 70 to the first operating chain 60 with its opposite end bolted at 71a to the opposite end of the door 14a. A rotation of the main operating wheel 24 through the crank handle 31 will result in a simultaneous movement of the operating chains 65 and 69 whereby the door 14a will be moved vertically.

For counterbalancing each door 14a a cylindrical weight 73 is connected by a flexible chain 74 with the operating wheel 24, said chain passing around the groove 33 of the operating member and being bolted thereto at 75. The chain 74 has connection with the weight by a bolt 76 which fastens said bolt to a bracket 77. The weight 73 is movable within a vertical recessed portion or area 78 (Figure 8) which is formed in the inner surface of the front wall of the oven.

The operation of this form of the invention is obvious. As a rotation is imparted to the main operating wheel the operating chains 65 and 69 will lift or lower the door 14a from each end thereof and since the attachment of the chains is to the ends of the door movement of the door will be without any binding action. The counterweight 73 being attached to the main operating wheel 24 will obviously raise and lower in accordance with the door movement and will therefore counterbalance the door in all positions. It is, of course, understood that an operating unit such as shown in Figure 13 is provided for each of the doors 14a of the double door oven.

One of the important features of the present invention is the provision of a door operating mechanism which has component parts which are readily applicable to either a single or double door oven. From the foregoing, it will be apparent that the main operating elements of the mechanism comprise the main operating wheel 24, the idler pulleys and the flexible chain elements. Actually, the only difference between the two mechanisms resides in the fact that in the first form an elongate counterweight is employed, whereas in the second form a cylindrical type counterweight for each door is provided. The pulleys, chains and main operating wheel are readily interchangeable ir-

respective of the type of doors employed in the oven. In both instances, the mechanism is mounted on the interior wall of the oven and is readily accessible through the access opening or openings of the oven for adjustment and repair.

From the foregoing it will be seen that this invention is one well adapted to attain all of the ends and objects hereinabove set forth, together with other advantages which are obvious and which are inherent to the structure.

It is noted that the unit which is described as applied to a double door oven in Figures 8 to 13 could be applied to a single door oven, in which event the main operating wheel 24 would be located at one side of the oven rather than at the center thereof.

Having described the invention, I claim:

1. The combination with a baker's oven having insulated walls and also having a door movable in a vertical plane to open and closed positions, of a door operating mechanism including, a rotatable main operating wheel mounted on the oven wall and having an operating shaft accessible from the exterior of the oven, a pair of idler pulleys mounted within the interior of the oven in the same vertical plane as the path of movement of the door, each idler pulley being disposed in vertical alignment with one side portion of the door, a flexible connecting element having one end attached to one side of the door and passing over one of the idlers and attached to the main operating wheel, a second flexible element having one end attached to the opposite side of the door and passing over the second idler and also attached to the main operating wheel, whereby rotation of the wheel through its operating shaft winds said flexible elements about the operating wheel to impart vertical movement to the door to open and close the same.

2. The combination as set forth in claim 1, together with means for mounting the operating wheel within the wall of the oven centrally below the door and in the same vertical plane as the path of movement of the door.

3. The combination as set forth in claim 1, together with a counterweight movable within the inner portion of the front wall of the oven, and a flexible connection connecting the counterweight to the operating wheel.

4. The combination as set forth in claim 1, together with a counterweight movable within the inner portion of the front wall of the oven, a flexible connection connecting the counterweight to the operating wheel, and means for mounting the operating wheel centrally within the front wall of the oven above the counterweight and in alignment with the vertical plane in which the door is movable.

5. A door operating mechanism for ovens having an opening in its front wall and also having a single door adapted to close said opening and movable in a vertical plane, said mechanism in-

cluding, a rotatable operating wheel mounted in the front wall of the oven below said oven and having a rotatable operating shaft extending outwardly from said wall and accessible from the exterior of the oven, a pair of idler pulleys, means for mounting each idler pulley on a horizontal axis adjacent one end of the door below the opening in the front wall of the oven but at a point above the extreme lower end of the door, a flexible connecting element extending over one of the idler pulleys and having one end connected to the door and its opposite end connected to the operating wheel, and a second flexible connecting element extending over the other idler pulley and having one end connected to the door and its opposite end connected to the operating wheel, whereby rotation of the operating wheel imparts vertical movement to the door by means of said connecting elements.

6. A door operating mechanism as set forth in claim 5, together with a counterweight movable within the front wall of the oven below the opening and also below the operating wheel, and a flexible connection connecting the counterweight to the operating wheel.

7. A door operating mechanism as set forth in claim 5, together with an elongate counterweight disposed below the operating wheel, a flexible connection connecting the central portion of the counterweight with the operating wheel, a flexible connection between one end of the counterweight which passes over one of the idler pulleys and has connection with one side of the door, and another flexible connection connected with the other end of the counterweight and passing over the second idler pulley and having connection with the opposite side of the door.

LOUIS D. HOULIS.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
22,954	Huey	Feb. 15, 1859
49,134	Merrymon et al.	Aug. 1, 1865
105,330	Hamilton	July 12, 1870
1,228,143	Shockley	May 29, 1917
1,448,480	Bedell	Mar. 13, 1923
1,522,047	Cragun	Jan. 6, 1925
1,612,232	Strandt	Dec. 28, 1926
2,017,012	Morgan	Oct. 8, 1935
2,030,223	O'Brien	Feb. 11, 1936
2,260,013	Elvers	Oct. 21, 1941
2,282,914	Vetterlein	May 12, 1942

FOREIGN PATENTS

Number	Country	Date
352,430	Great Britain	Dec. 31, 1929
731,075	France	Aug. 29, 1932
874,292	France	Aug. 3, 1942