April 23, 1940. E. E. LITTLE 2,198,346

OVEN DOOR AND HINGE STRUCTURE THEREFOR

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Fig. 1.

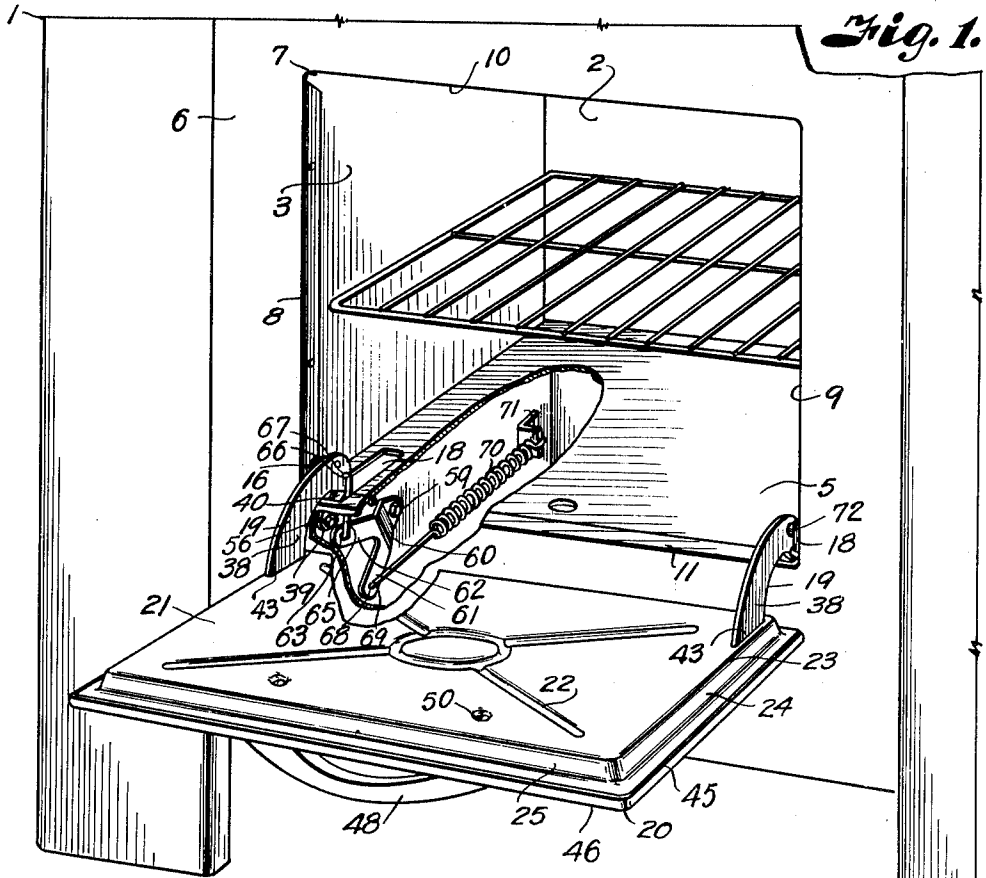


Fig. 2.

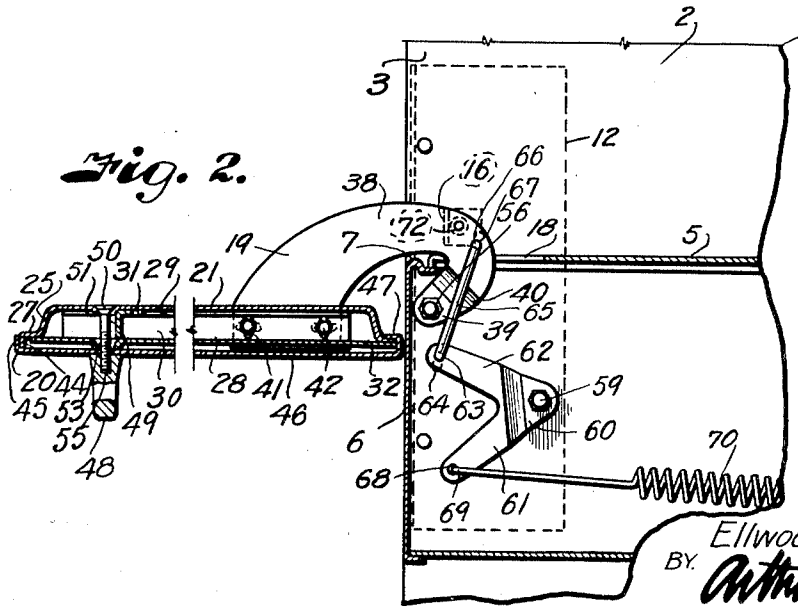
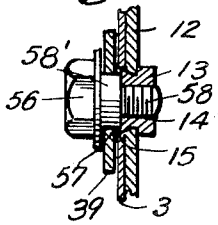


Fig. 7.



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Fig. 3.

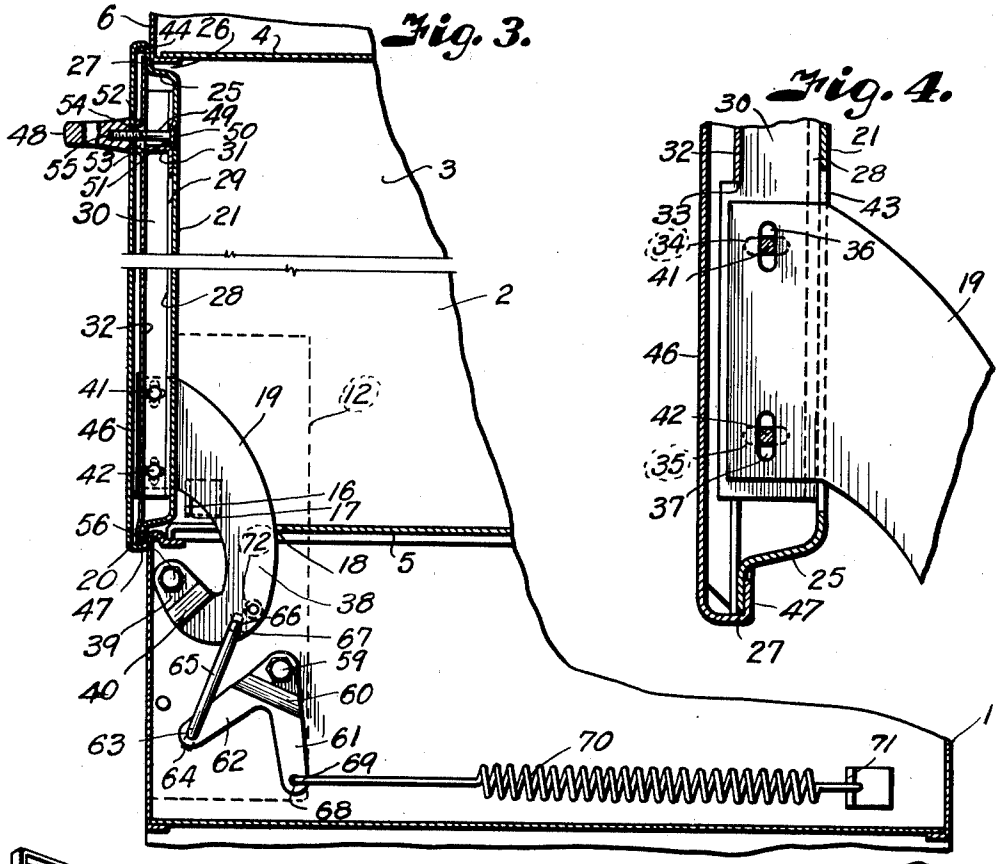


Fig. 4.

Fig. 5.

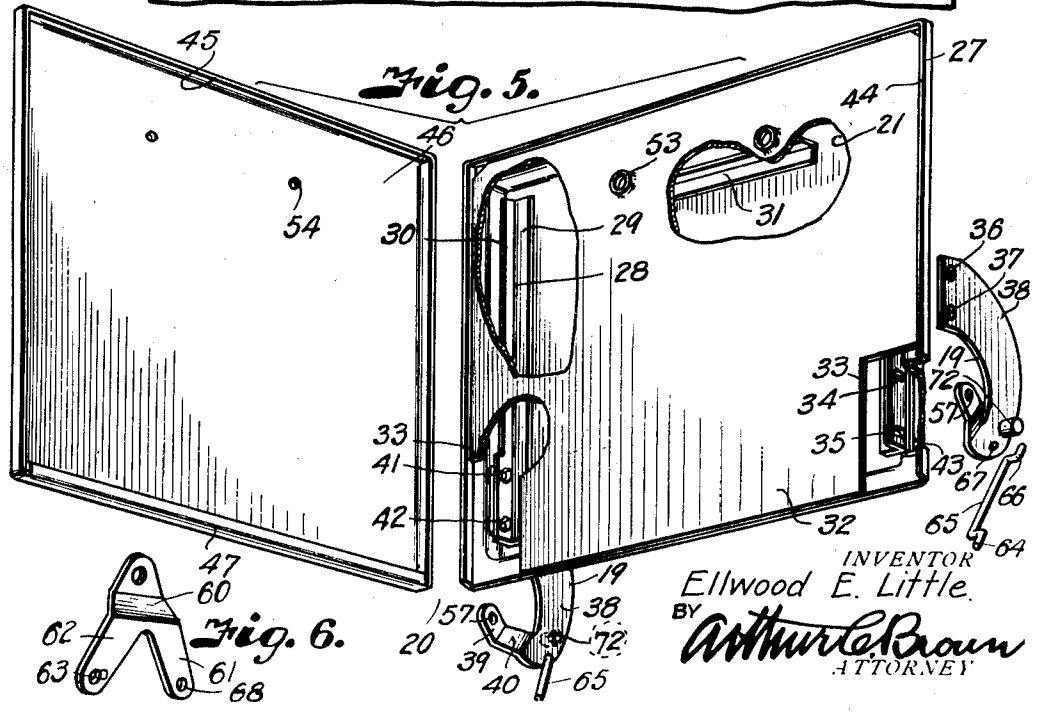


Fig. 6.

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UNITED STATES PATENT OFFICE

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OVEN DOOR AND HINGE STRUCTURE THEREFOR

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Application April 20, 1939, Serial No. 268,886

10 Claims. (Cl. 126—194)

This invention relates to a door and hinge structure particularly suitable for ovens, and has for its principal object to facilitate assembly and adjustment of a door within an oven opening.

Other objects of the invention are to provide a hinge structure which may be adjusted while the door is in closed position and centered within the door opening so as to attain uniform clearance around the periphery thereof; to provide the door with a removable front panel which may be readily applied after the hinging adjustments have been made; and to provide the door with an inner panel free of bolt heads and similar projections usually required in attaching the hinging elements so that pans and the like may readily slide across the open door.

Further objects of the invention are to provide an improved hinge structure; and to provide door balancing means acting on the hinge structure with variable leverages to better control opening and closing movement of the door and for positively retaining the door in open position.

It is also an object of the invention to provide a hinge structure that may be attached independently of the finish panels of a stove thereby avoiding chipping of the enamel incidental to strains applied through the hinging elements.

In accomplishing these and other objects of the invention, as hereinafter pointed out, I have provided improved details of structure, the preferred form of which is illustrated in the accompanying drawings, wherein:

Fig. 1 is a perspective view of a portion of the front of a stove having an oven equipped with a door and hinge structure embodying the features of the present invention, the door being shown in open position and portions of the oven and door broken away to better illustrate the counterbalancing mechanism.

Fig. 2 is a vertical section through the front portion of the oven with the door in open position.

Fig. 3 is a similar section with the door in closed position.

Fig. 4 is an enlarged detail section through the door particularly illustrating attachment of one of the hinge elements.

Fig. 5 is a detail perspective view of the door with the front panel removed and showing one of the hinge elements in disassembled spaced relation.

Fig. 6 is a detail perspective view of one of the bell crank levers of the counterbalancing mechanism.

Fig. 7 is a detail section through one of the hinge trunnion screws.

Referring more in detail to the drawings:

1 designates a stove having an oven 2, the side walls of which are formed by metal sheets 3 and the top and bottom by transverse sheets 4 and 5. The sheets thus described are appropriately connected with a front sheet 6 which has a door opening 7 therein. The sides 8 and 9 of the opening substantially align with the plane of the side sheets 3 and the upper and lower edges 10 and 11 align with the top and bottom sheets 4 and 5.

Fixed to the outer faces of the side sheets, exteriorly of the oven chamber and at points adjacent the bottom of the door opening, are hinge brackets 12 each of which consists of a sheet metal plate of suitable size to suitably reinforce the side sheets. Fixed to the plates are reinforcement nuts 13 having threaded openings 14 for receiving trunnion screws later described (see Fig. 7). The nuts 13 are two in number, one of which is located adjacent the forward edges of the respective plates about midway the lengths thereof, and the other is located below and near the opposite edge so that when the brackets are in position the nuts 13 register with openings 15 of the side sheets which are below the door opening. The reinforcement plates also carry lugs 16 which project through slots 17 in the side sheets of the oven at a point above the lower edge of the door opening. Formed in the sides of the oven bottom sheet 5 are slots 18 to pass the arms of hinge elements 19 later described.

The door 20 for closing the oven opening includes an inner panel 21 having instruck reinforcement ribs 22 and an offset perimetrical portion 23 to provide the door with side wall portions 24 freely movable into the door opening, and upper and lower wall portions 25 similarly movable between the upper and lower edges of the door opening so that a clearance space is provided entirely around the door as indicated at 26, Fig. 3 The terminal portions of the offsets form flanges 27 which overlap the edges of the door opening.

Fixed to the inner face of the panel are hinge attaching members 28 in the form of angles having one of their flanges 29 spot welded to the panel in parallel relation with the offset side edges of the door as shown in Fig. 5, and their other flanges 30 projecting forwardly to attach the hinge elements. The inner face of the panel also carries a transversely extending reinforce-

ment angle 31 that is attached near the upper portion of the door as shown in Fig. 3. Seated within the outstruck flange portion and resting on the offset edges of the door is a liner sheet 32 cooperating with the inner panel to retain a suitable insulating material (not shown) therebetween. The lower corners of the liner sheet are notched, as at 33 (Figs. 4 and 5), to expose the lower portions of the hinge attaching angles as shown in Fig. 5. The free flanges 30 of the angles are preferably notched so that they engage against the inner face of the liner sheet and the lower ends project through the notches with the edges lying flush with the outer face of the liner sheet 32 as shown in Fig. 5. The portions of the angles exposed through the notches have spaced slotted openings 34 and 35 registering with transversely arranged slotted openings 36 and 37 in hinge elements 19.

Each hinge element 19 includes a substantially arcuate arm 38 having a hook-like end 39 offset from the arcuate portion as indicated at 40. The other ends of the hinge elements, having the slots, are secured to the angles 28 by fastening devices such as bolts 41 and 42 having their shanks extending through the registering slotted openings.

The rear panel of the door 21 has slots 43 through which the hinge elements project as clearly shown in Figs. 1 and 4. The edges of the flanges 27 at the sides and top of the door are flanged outwardly as at 44 to receive a mating flange 45 extending along corresponding edges of an outer cover or finish panel 46. The bottom edge of the cover panel has a coextensive hook-like flange 47 that engages over the flange 27 at the bottom of the door. When the cover panel is in position a handle member 48 is secured to the door by fastening devices 49 having heads 50 countersunk in openings 51 of the inner plate and arranged with their shanks 52 extending through flanged openings 53 in the liner and through registering openings 54 in the outer plate into threaded sockets 55 of the handle.

The hooked ends of the door hinge elements are pivotally connected with the upper of the nuts 13 by shouldered trunnion screws 56 extending through openings 57 in the hinge elements and having threaded shanks 58 engaging the threaded openings 14. The shouldered portions 58' of the trunnion screws thus form bearings on which the hinge elements pivot when the door is moved to and from open position.

Pivotally mounted on similar trunnion screws 59 having their shanks threaded into the lower nuts at the opposite side of the hinge brackets are bell crank levers 60 having arms 61 and 62 projecting toward the front of the stove. The arms 62 have an opening 63 therein to receive the hooked ends 64 of rod-like connecting links 65. The other ends of the connecting links have similar hooked ends 66 engaging in openings 67 of the respective hinge elements as best shown in Figs. 2 and 3. The lower arms 61 of the bell crank levers have openings 68 in which are engaged the hooked ends 69 of coil springs 70 extending alongside the oven walls and which have their opposite ends anchored to angle-shaped clips 71 as shown in Fig. 1. The door when open is supported in horizontal position, as shown in Fig. 2, by means of lugs 72 on the hinge arms engaging the lugs 16.

In attaching the oven door on the stove, the hinge elements 19 are secured to the flanges 30 of the angles 28 by bolts 41 and 42 that are extended through the crossed openings 34—36 and 35—37. The bolts may be partially tightened so that the door may be later adjusted. This is effected prior to application of the cover panel 46. The trunnion screws 56 are then extended through the openings 57 in the hooked ends 39 of the hinge elements and the shanks thereof are threaded into the nuts 13. The bell cranks 60 are applied by inserting the trunnion screws 59. The arms 62 of the bell cranks are connected by the links 65 with the hinge elements and the arms 62 are then connected with the hooked ends of the springs 70 which have their other ends secured to the clips 71. The door structure minus the front cover panel is then moved to closed position in the door opening and shifted laterally and vertically until the space 26 is uniform around the door. This adjustment is readily effected by reason of the transversely arranged slots in the hinge arms of the hinge elements. The door is also adjusted so that the flanges thereof are parallel with the front of the stove. This is readily effected by reason of the slots in the angles 29. When the door is in proper position, the bolts 41 and 42 may then be tightened by manipulation with a wrench through the notches 33 as shown in Fig. 5.

It is thus obvious that the door is readily adjusted when in closed position so that it is not necessary to fit the door by trial and error as is the case where the adjustment must be made with the door in open position. After the adjustment has been made and the bolts 41 and 42 securely tightened, the hooked lower edge of the cover panel is engaged over the lower edge of the rear or inner panel and the flanges thereon are moved into telescoping relation. The handle 48 is then applied to the front panel and the fastening devices 49 extended through the rear panel and threaded into the handle to securely retain the front panel.

When the door is assembled and moved to open position the bell cranks 61 are rocked on their trunnion screws 59 to extend the springs 70. By observing the position of these parts in Fig. 3, it will be noted that when the door is closed and the springs are in contracted position the spring applies full leverage on the bell cranks and the bell crank applies maximum leverage on the hinge elements to compensate for the springs and retain the door in closed position. As the door opens the springs are extended and the effective leverages are shortened to compensate for the increasing power of the springs to effectively balance the door. When the door has approached horizontal position the effective leverages of the arms of the bell cranks are so short that the weight of the door preponderates over the stored up tension of the springs and the door is positively retained in open position. There is, therefore, no danger of the springs slamming the door to closed position.

From the foregoing it is obvious that the door and hinge structure is readily assembled and that the hinge elements are adjusted with the door in closed position. It is also obvious that the door is effectively balanced by the springs and that the door will remain in open position until it is manually closed by the operator.

Attention is further directed to the fact that the hinge attachment is entirely independent of the front panel of the stove as well as the cover panel of the door so that strains applied to the hinge attaching connections cannot be

transmitted to the finished panels to cause chipping of the enamel or other finish applied to the panels.

What I claim and desire to secure by Letters Patent is:

1. In an oven having a door opening, a door for said opening, hinge brackets fixed to said door, hinge members, and means securing the hinge members to said brackets including fastening devices extending through openings in said brackets and said hinge members, said fastening devices having vertical and lateral movement with said members respectively for adjusting the door in two directions within said door opening

2. In an oven having a door opening, a door for said opening, hinge brackets fixed to said door and having slots, hinge elements having registering slots extending transversely of said bracket slots, and fastening devices extending through said slots to retain and adjustably position the door in a selected position within said opening.

3. In an oven having a door opening, a door for said opening, hinge brackets fixed to said door and having slots, hinge elements having registering slots extending transversely of said bracket slots, fastening devices extending through said slots to retain and adjustably position the door in a selected position within said opening, and means connected with the hinge elements for counterbalancing said door.

4. In an oven having a door opening, a door for said opening including an inner panel, a liner secured to the inner panel and having notched portions, hinge attaching brackets between said inner panel and liner and having portions exposed through said notched portions of the liner, means rigidly fixing the hinge brackets to said inner panel, hinge elements having portions adjustably connected with said hinge brackets, and a cover panel removably fixed to the inner panel.

5. In an oven having a door opening, a door for said opening including an inner panel, a liner fixed to the inner panel and having notched portions, hinge attaching brackets exposed through said notched portions, means rigidly fixing the hinge brackets to said inner panel, hinge elements having portions positionable on said hinge brackets for adjustment of the door in two directions in said opening, clamping devices retaining said hinge element portions in a selected adjusted position on the hinge brackets, and a cover panel fixed to the inner panel.

6. In a stove having an oven chamber provided with a door opening, an oven door, arcuate shaped hinge arms carried by the door, trunnions mounting said arms within the confines of said oven chamber, bell crank levers, means pivotally supporting the bell crank levers with the arms thereof directed downwardly when the door is closed, links connecting one of the arms of the bell crank levers with said hinge arms, and tension springs connected with the other of said arms for counterbalancing the door.

7. In an oven having a door opening, a door for said opening including an inner panel, a liner fixed to the inner panel and having notched portions, hinge attaching brackets exposed through said notched portions, means rigidly fixing the hinge brackets to said inner panel, hinge elements having portions positionable on said hinge brackets for adjustment of the door in said opening, and a cover panel fixed to the inner panel in covering relation with said liner and adapted to be applied after adjustment of the door in said opening.

8. In an oven having a door opening, a door for said opening including an inner panel, hinge attaching brackets having fixed attachment to the inner panel, hinge elements fixed to said hinge brackets, a liner sheet fixed to the inner panel in covering relation with said hinge elements and arranged for access to said hinge elements, and a removable outer panel fixed to the inner panel in covering relation with the liner sheet and adapted to be applied to the inner panel after connection of said hinge elements with the hinge brackets.

9. In a stove oven, an oven door, spaced upper and lower trunnions projecting from sides of the oven and inset from said door, arcuate shaped hinge arms carried by the door and pivoted on the upper of said trunnions, bell-crank levers pivotally mounted on the lower trunnions with the arms thereof directed downwardly when the door is closed, a rigid link connecting one of said arms with the arcuate shaped arms at a point substantially in a plane extending through the axes of said upper and lower trunnions when the door is closed, and tension springs connected with the other of said arms for counterbalancing the door.

10. In a stove having an oven, a finish frame for framing a door opening to said oven and having attachment to the stove, hinge elements, means pivotally connecting the hinge elements with sides of the oven independently of the finish frame, a door for said opening, hinge attaching brackets fixed to the door, means adjustably connecting said hinge elements to the hinge brackets, and a finish panel removably mounted on the door and independent of said hinge connections.

ELLWOOD E. LITTLE.