J. ERSKINE.

HEATING APPARATUS.

APPLICATION FILED DEC. 19, 1916.

1,342,991.

Patented June 8, 1920.

3 SHEETS—SHEET 1.

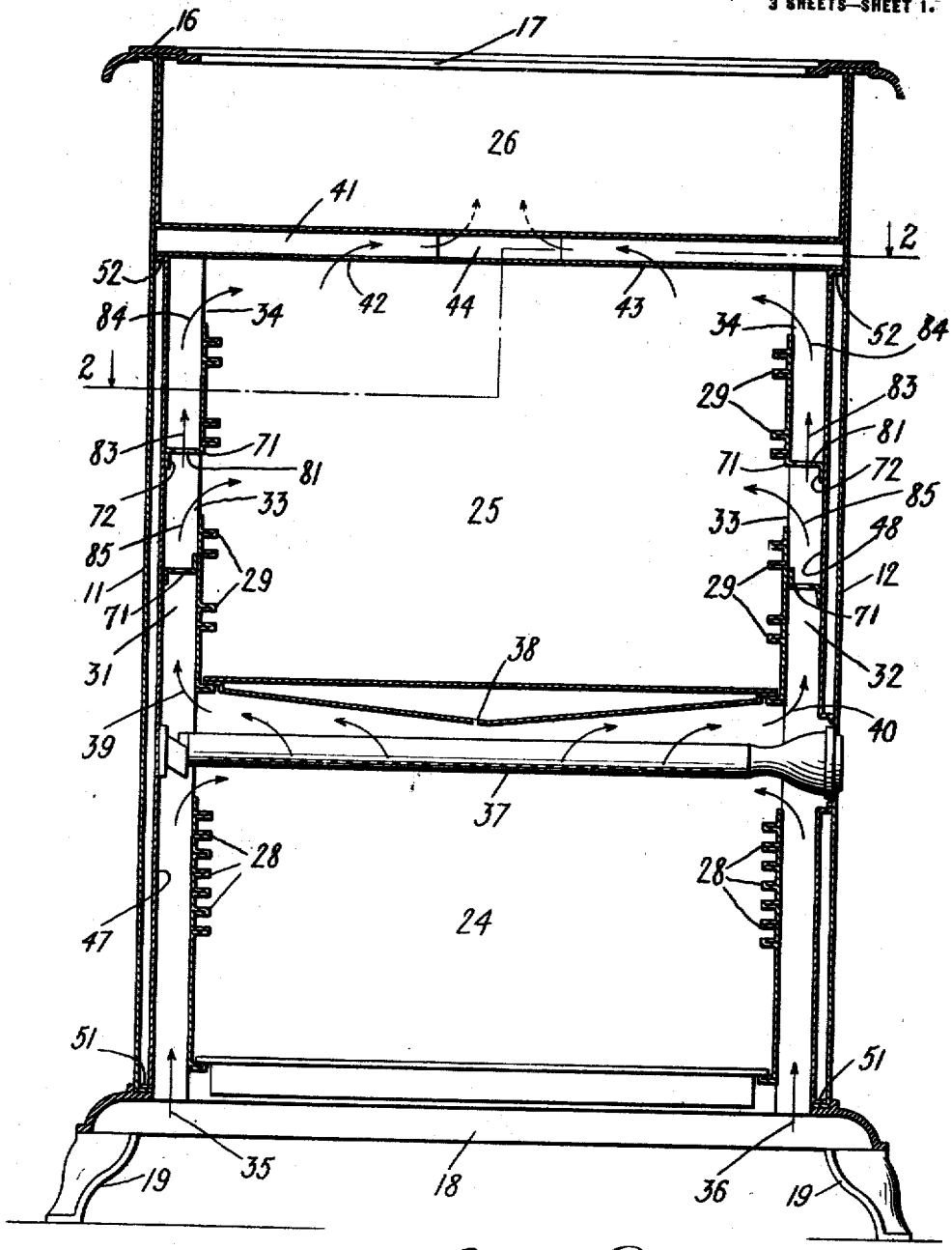


FIG. 1

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By his Attorney Edw. J. Dolan.

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3 SHEETS—SHEET 2.

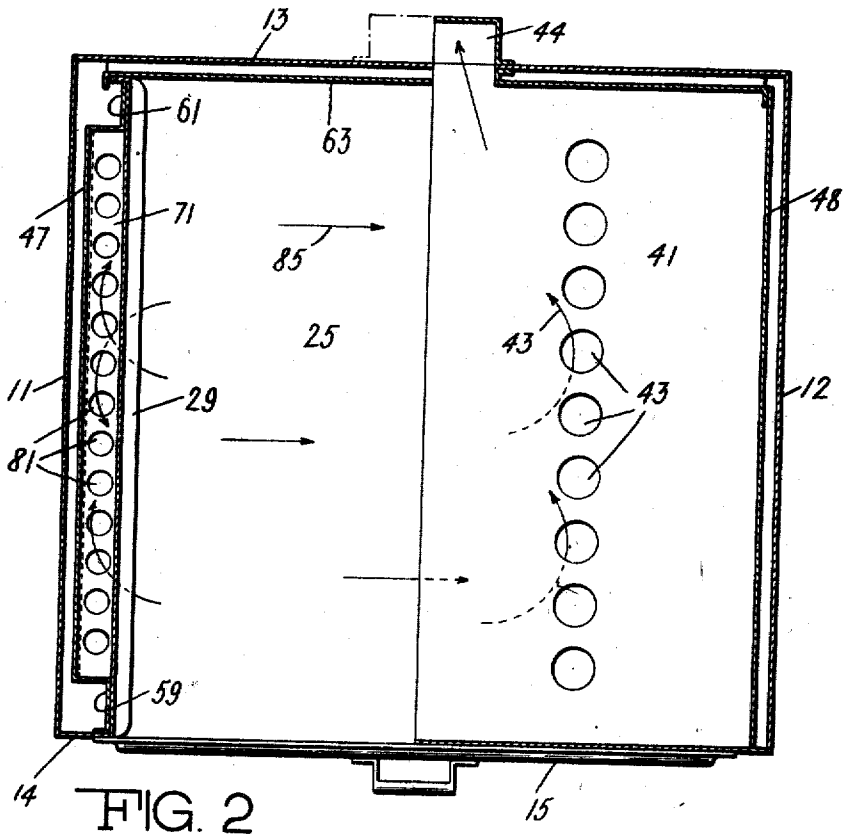


FIG. 2

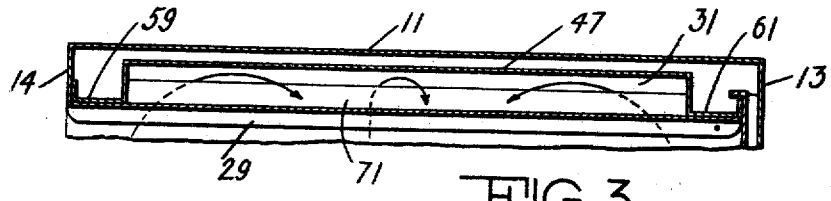


FIG. 3

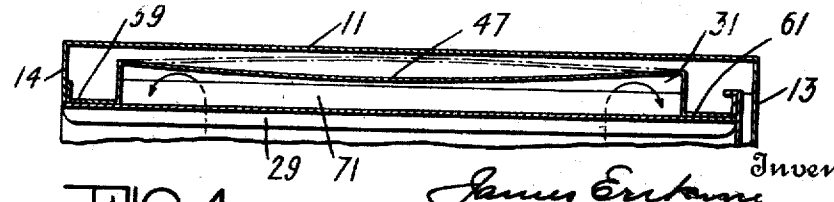


FIG. 4

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3 SHEETS—SHEET 3.

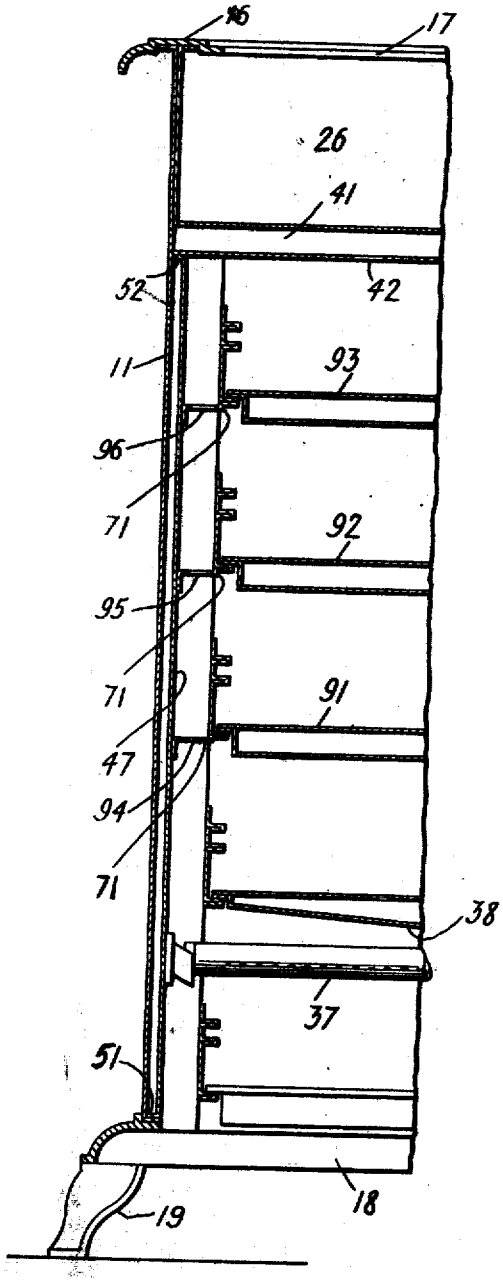


FIG. 5

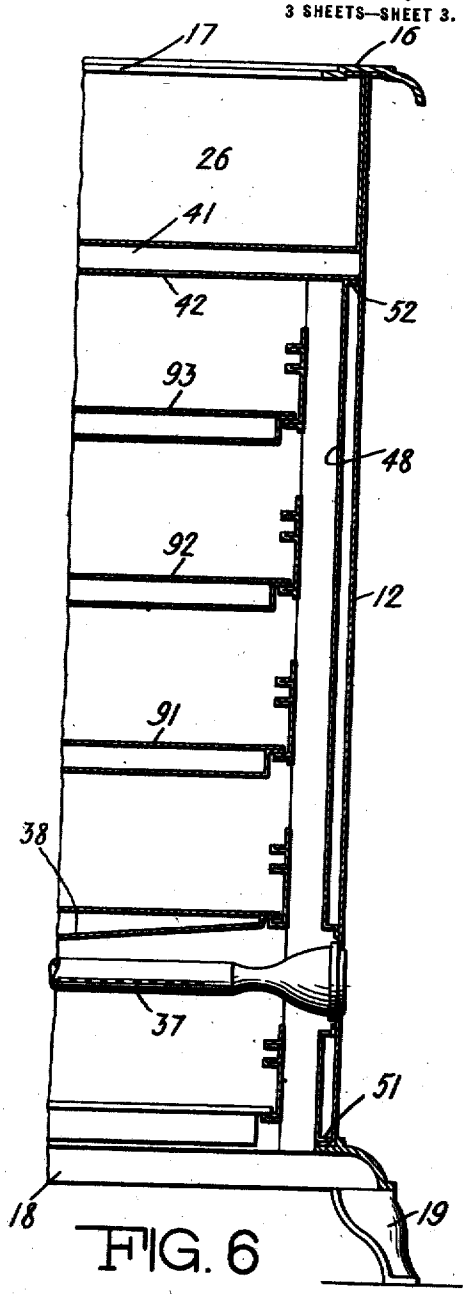


FIG. 6

James Erskine, Inventor

By his Attorney Wm. J. Dolan

UNITED STATES PATENT OFFICE.

JAMES ERSKINE, OF JERSEY CITY, NEW JERSEY, ASSIGNOR TO WILLIAM M. CRANE COMPANY, A CORPORATION OF NEW YORK.

HEATING APPARATUS.

1,342,991. Specification of Letters Patent. Patented June 8, 1920.

Application filed December 19, 1916. Serial No. 137,825.

To all whom it may concern:

Be it known that I, JAMES ERSKINE, a citizen of the United States, and a resident of Jersey City, Hudson county, State of New Jersey, have invented certain new and useful Improvements in Heating Apparatus, of which the following is a specification.

The invention relates to cooking apparatus made of metal, and particularly to that class which comprises an outer casing provided with a spaced lining or jacket, wherein a baking oven is mounted between vertically disposed flues or heat passages, arranged to convey currents ascending to right and left from a burner or other source of heat connected with some lower part of the apparatus.

As heretofore applied, the lining or inner jacket pertaining to stoves or ranges of the class aforesaid was entirely detached or at least received no adequate support from the oven's sides opposite the same, it being merely held at the edges in spaced relation to the casing in order to provide an insulating air stratum interiorly of the latter and also facilitate the upward flow of caloric currents laterally of the oven. Now, it is known that commercial sheets of iron, such as are employed for the manufacture of these stoves and ranges, all have a certain slackness or warp in them, which is not removed while they are being formed into either jackets or casings. This, if unrestrained, will be aggravated by expansion under the influence of heat. Therefore, as formerly used, the lining was soon affected by the currents that passed up the flues intervening between it and the sides of the oven, and it became unduly flexed or distorted in one part or another. Sometimes the warping would cause the lining to bulge inwardly, and at other times outwardly, according to the lay of the metal sheets composing it. The result of the warping is that it interferes with the proper circulation and distribution of the heat currents, to the extent that it either narrows or widens the flues or passages through which they are flowing. The flow through one flue may thus be restricted so that less heat will be conveyed to the adjacent side of the oven than will be transmitted to the opposite side thereof through the other flue, or the supply of currents will be otherwise unbalanced, which invariably results in uneven cooking. This is a serious defect of the construction previously followed, which it is an object of the present invention to obliterate.

Another object is to provide such means for counteracting the above noted tendency of the lining to warp, in apparatus of the type specified, as not only will insure an even supply of the heat currents on both sides of the oven, but further will serve to graduate the flow of these currents in direct ratio to the height to be reached, so that the heat may be of equal intensity at different levels within the oven and its action rendered uniform throughout.

With the said objects in view, the invention consists in the novel improvements, parts, combinations, and features of construction herein described, and illustrated in their preferred embodiment by the accompanying drawings.

In the said drawings,—

Figure 1 is a front sectional elevation of a gas-range of special design, having an oven apertured for direct admission of heat therein and inclosed in a casing provided with an inner jacket or lining, to which a suitable form of the invention is applied;

Fig. 2 is a sectional plan, taken from the irregular line 2—2 of Fig. 1, looking downward in the direction of the arrows;

Fig. 3 is a fragmentary view, reproducing the left-hand side of the range as seen in the preceding figure, but without the improved support for the lining.

Fig. 4 is a view similar to Fig. 3, showing how the lining will become warped and bulge either in or out, when improperly set up, as before practised;

Fig. 5 is a front sectional elevation of one-half of a gas-range having an oven of the multiple deck denomination, combined with a jacketed casing of the improved species herein disclosed; and

Fig. 6 is a similar elevation of the other half of said range, devoid of the improvements.

Referring first in detail to Figs. 1 and 2, it will be seen that the stove represented therein is of the conventional quadrangular configuration, consisting exteriorly of a body, shell or casing composed of metal sheets, as 11, 12, 13 and 14, which constitute the sides, back, and front thereof, respectively, the front having the usual complement of doors, one of which is indicated

at 15. On the upper end of this casing is placed a light casting 16, which forms a top therefor and is suitably apertured, as at 17, to receive the customary rings, lids, and cross-pieces (not shown). The whole casing is made to rest upon a base 18, which may be raised by means of legs 19, or equivalent corner supports.

The stove shown in the two said figures is of the single oven type and divided into three main sections, for cooking purposes, to wit: a broiler 24, located in the bottom part of the said casing; an oven 25, directly above; and an upper heat-generating chamber 26. The latter may occupy the entire top part of the casing, and usually is fitted with a cluster of gas-burners, which have no bearing on the present invention and therefore are omitted from the drawings hereto annexed. The broiler and the oven are inner structures, conveniently made of sheet-metal, and both may be formed with integral corrugations 28, 29 on opposite sides, which afford runways or guideways for shelves, grids, or slides, such as are ordinarily provided to support the pans or other utensils containing the food to be cooked.

In domestic and other cooking ranges of the species described, a certain method is employed for distributing the heat therein, which includes centering the oven within the casing to form lateral passages, as 31, 32, of equal width, and having transverse slits 33, 34 in the oven's sides to afford direct communication with these passages. Means are thus provided for the rapid conveyance of caloric currents, which will heat the oven both exteriorly and interiorly. If the range contains an oven only, the currents will most conveniently be supplied from the base, by any suitable heating device,—not shown—, and will enter the passages 31, 32 at their lower ends, as indicated by the arrows 35, 36. But, if the range comprises a broiler besides the oven, then the heater is preferably located at some middle distance between them, and may consist of one or more gas-burners 37, as shown in the accompanying drawings. A deflector 38 is placed at the bottom of the oven, directly above this intermediate heater, so that the currents rising from the latter will immediately be led outward into the lateral passages 31, 32, as indicated by the arrows 39, 40. The deflector 38, it will be noted, is suspended at opposite edges from the lowermost corrugations 29 on the oven's sides, and rests thereon. In the form of range herein exemplified, the heat currents that flow into the oven from the passages 31, 32, through the slits 33, 34, ascend into a horizontal flue 41, overlying the top of the oven and communicating therewith by means of openings 42, 43. From the flue 41, the currents are led to the rear of the range, where a suitable outlet is provided, as at 44.

Ordinarily, the several walls of the outer casing are lined with similar sheet-metal in order to prevent loss of heat by radiation and conserve the caloric intensity of the currents circulating in and about the oven. For this purpose, it is considered advantageous to leave air-spaces between the different walls and their linings, so that the range may remain comparatively cool on the outside, though a strong heat be produced inside. This forms an economical insulation, which is effective as long as maintained in a fair state of preservation. However, experience has demonstrated that, as they were formerly applied, the linings provided for the side walls of the casing, and forming the outer sides of the heat passages adjacent to the oven, could not long retain their original uniformity of spacing, and soon became subject to buckling in the middle, owing to the nature of the sheet-metal utilized, the defective application thereof, and the absence of appropriate support. To overcome these defects, the present invention provides an improved form of lining, and a bracing means for this lining designed to impart thereto the requisite warp-resisting qualities, without interfering in any manner with the heat distribution, as above outlined.

Plain metal sheets, as 47, 48, are preferably used for the linings of the walls 11 and 12 of the casing which face the opposite sides of the broiler 24 and oven 25. At the sides, the lining sheets are preferably bent as shown in Figs. 2, 3 and 4, first inwardly at right angles to effect a contact with each side of the broiler and oven near the front and rear, and form therewith the passages 31, 32, aforementioned. These passages, consequently, are produced by simple apposition of inwardly-bent portions of the lining sheets against the opposite sides of the broiler and oven, the assembled parts constituting rectangular flues functioned to convey the heat currents from the bottom to the upper part of the range. Transversely, the said passages or flues 31, 32 extend for the full working depth of the oven, or approximately so, as represented in the drawings. Forwardly of the flues or passages, the sheets 47, 48 are made to run for a short distance along the sides of the broiler and oven, where they form parallel abutting strips, as 59. Similar abutting strips, as 61, are fashioned from the sheets rearwardly also, the same extending alongside the oven and broiler to a back lining sheet 63, of ordinary type, provided for the rear wall 13 of the casing.

It will be observed that, owing to their peculiar conformation, the linings 47, 48 have each a three-sided or channeled mid-

dle portion, with edges reversely disposed in hollow columnar arrangement which together operate to render them quite stable, irrespective of any fastening or other extraneous support, when standing on end about the broiler and oven within the casing. At the same time, they may be left sufficiently loose to permit a certain freedom of movement, particularly at the side edges, which of itself is antagonistic to warping. Nevertheless, these side linings by themselves are unable fully to resist the tendency to buckle due to the wide extent of sheet-metal which is exposed to the heat within the passages 31, 32. The repeated expansion and contraction of the metal would cause them sooner or later to bulge either in or out, as represented by the curved lines in Fig. 4, unless fortified thereagainst by the bracing, anti-warp, heat-distributing instrumentalities hereinbefore referred to and next to be described.

The said bracing instrumentalities include a diaphragmal partition 71, for each side flue or heat passage. In the preferred embodiment of the invention, and as shown, the partition 71 is made from a strip of sheet-metal, placed in the side flue and arranged therein transversely of the middle channel of the side lining. This strip is large enough to constitute a blocking device well adapted to prevent distortion of the latter. Such a strip is conveniently struck out of the oven side or runner facing the said channel, and thence drawn laterally outward so as to reach fully across the channel, in contact with the three sides thereof that pertain to the lining. Or, any other suitable method of producing such strip may be followed. By preference, the strip is cut out of sufficient width to admit of being bent downward at the outer edge, to produce a supporting flange 72, through which it can be rigidly secured to the lining on the side opposite the oven, by spot welding or otherwise. The construction is the same on both sides of the oven.

In stoves having a single oven, like that represented in Fig. 1, it is deemed preferable to locate the said partitions 71 approximately midway between bottom and top flanges 51, 52 of the lining sheets 47, 48. As shown, the partitions are placed parallel to these flanges in the vertical plane of the channels in the side linings. Double braces are thereby provided, which serve to strengthen the linings at suitable points in a transverse direction and preclude their warping, buckling, or collapsing.

Apertures 81 are made in the partitions 71, in order to allow a certain amount of the heat to pass therethrough and reach the upper part of the oven by way of the slits 34, as the arrows 83, 84 indicate. The remainder of the heat currents, blocked by the solid portions between the apertures, are thereby diverted into the lower or central part of the oven through the slits 33, as indicated by the arrows 85. The apertured partitions thus are adapted to perform the additional function of reducing diaphragms, preventing accumulation of the currents at the upper ends of the flues 31, 32, and operating instead to divide them between the upper and lower halves of the oven. In the structure herein exemplified, the apertures 81 preferably consist in a line of perforations or slots or passageways disposed longitudinally of each partition, but it is obvious that they may be of different shape and number, and also varied as to location. Of course, their positions and combined areas require to be carefully calculated before the stove or range is sent out for use, since the mount of blocking necessary in the side flues to insure uniform distribution of the heat in the interior of the oven depends on the aggregate sizes of the apertures and the respective distances therebetween in each partition. The apportionment of the heat is determined by having one or more apertures of requisite magnitude in each diaphragmatic partition, allowing a certain quantity of the caloric currents to rise to the upper part of the oven through the flues formed by the oven's sides and the inner walls of the jacket or lining sheets, the other portion of the currents being directed into the lower part of the oven by the imperforate sections that constitute the blocking elements of the partitions. Now, it is manifest that the division of currents would be seriously affected and at once become uneven, if the flues were deformed by the heat causing either one of their sides to buckle, as the warp would render the flow through them unequal, change the amount of blocking, and alter the predetermined heat distribution. But, this is obviated by bracing such flue with a diaphragmal partition which bears internally edgewise against all walls thereof, while reducing the flow through it so as to divide the heat currents evenly between the portions of the oven respectively situated above and below.

In a multiple baking oven, that is, one having a plurality of decks, like that illustrated in Figs. 5 and 6, there may be a number of diaphragmal partitions 71, and preferably a pair of such partitions for each deck provided, as at 91 92, 93, above the oven's bottom. The partitions have been omitted from Fig. 6, but this was done to establish a contrast between the structure therein represented and the improved construction appearing in Fig. 5. It is understood that in practice the partitions are duplicated for both sides of the oven, one diaphragmal partition 71 being located at

each side of every deck among those specified. In this way an adequate support is obtained for the lining sheets forming part of the side flues or heat passages, which are thereby preserved from distortion. The method followed in constructing the range shown in these figures is the same as that exemplified in the other views, and for that reason similar reference numerals are employed to designate corresponding parts in the two species of cooking apparatus selected herein for illustration.

The superposed partitions in Fig. 5, it will be observed, are formed with apertures 94, 95, 96, varying in size in proportion to the height of each. In other words, the several apertures are progressively increasing in size from the level of the lower deck 91 upward. Preferably, the apertures are lines of perforations or slots or runways similar to those previously described, save that the superlying rows are of graduated dimensions corresponding to the respective heights of the various partitions. It will be readily perceived that each line or row of these graduated apertures allows its own quota of the heat currents to pass through, to wit, a fairly large volume thereof at the lowermost deck, and greater amounts as the ascending currents reach one deck after another thereabove. The upward flow of the currents is thus regulated, so that the heat is delivered with the requisite degree of intensity in every part or section of the oven, where it is properly diffused and acts uniformly upon the food cooked at the different levels.

In its broader aspect the invention is not limited to the precise construction shown and described, nor to any particular structure by which the same may be carried into effect, as many changes may be made in the details without departing from the main principles of the invention and without sacrificing its chief advantages.

I claim:

1. A stove including, in combination, a casing, an oven disposed therein in spaced relation to the casing, flues for directing heat currents around the oven, a flue disposed above the oven and communicating with the aforementioned flues, said oven being provided with openings communicating with the flues, and diaphragmal partitions extending across certain of the flues and provided with openings graduated to correspond with the respective heights of the partitions in the flues.

2. A stove including, in combination, a casing, an oven therein provided with openings, a lining for said casing formed with passages for heat currents around the oven, a flue disposed above the oven and provided with openings communicating with the oven, means for directing heat currents into the oven and out through the top thereof, and partitions between the oven and the lining and provided with openings graduated in size to correspond to their respective heights.

3. A stove including, in combination, a casing, an oven disposed therein in spaced relation to the casing, flues for directing heat currents around the oven, a top flue disposed above the oven and communicating with the aforementioned flues, said oven being provided with openings communicating with the flues, diaphragmal partitions extending across certain of the flues and provided with openings graduated to correspond with the respective heights in the flues, and means for directing a portion of the heat currents into the oven and a portion through openings in the diaphragm.

4. A stove including, in combination, a casing, an oven disposed therein, side and end flues disposed around the oven, a flue disposed above the oven, said oven being provided with openings communicating with the flues, diaphragms disposed in proximity to certain of the openings in the oven and between the oven and the casing, said diaphragms being provided with openings graduated to correspond to their respective heights in the flues, and means for directing a portion of the heat currents through the openings into the oven, out through the top thereof and down around the oven.

In testimony whereof I have signed my name to this specification.

JAMES ERSKINE.