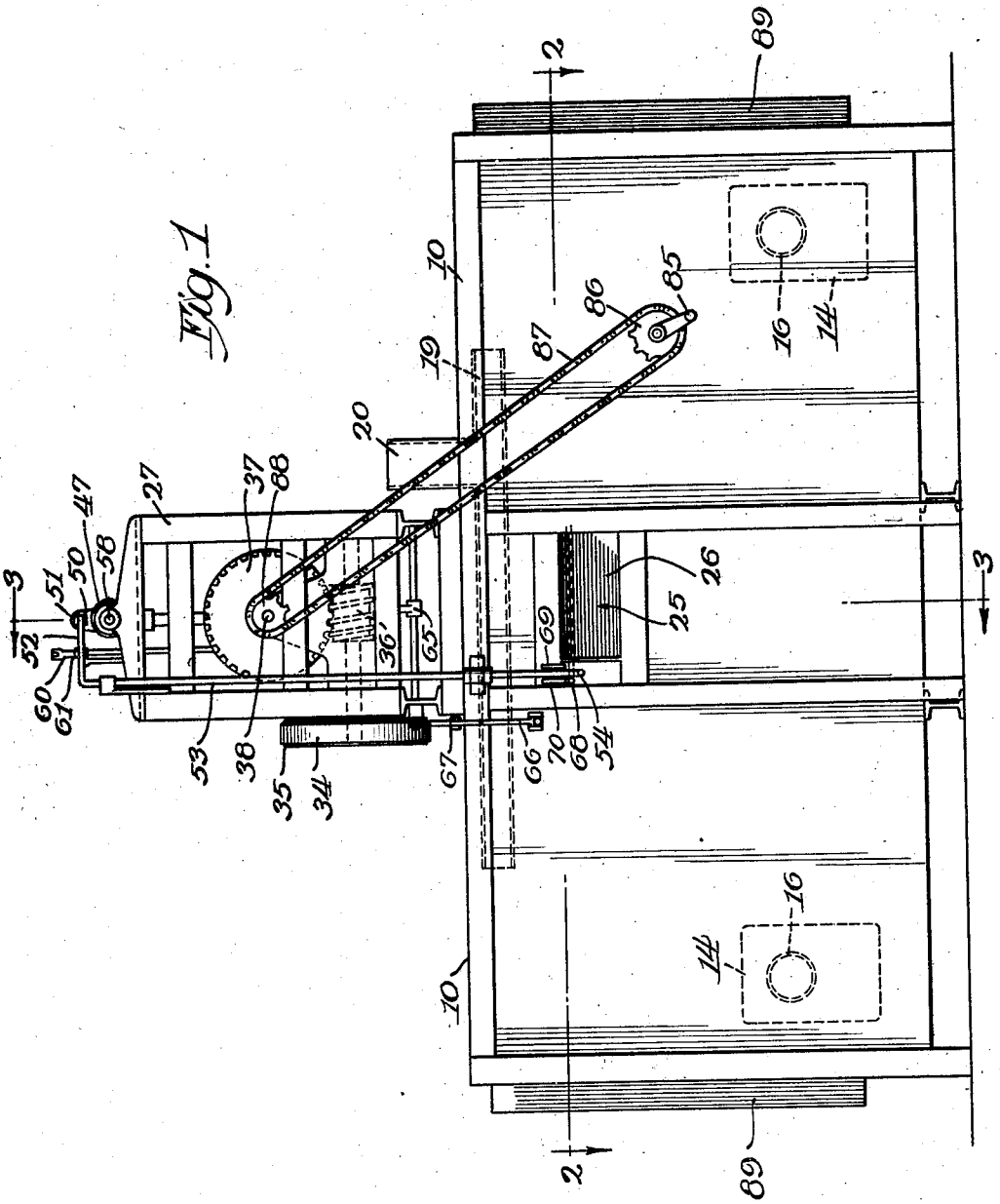
July 29, 1930. J. FAULDS 1,771,885

BAKE OVEN

Filed Aug. 15, 1928 4 Sheets-Sheet 1

Fig. 1



Inventor
John Faulds
By Gilson, Manuel & Gilson Attys

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BAKE OVEN

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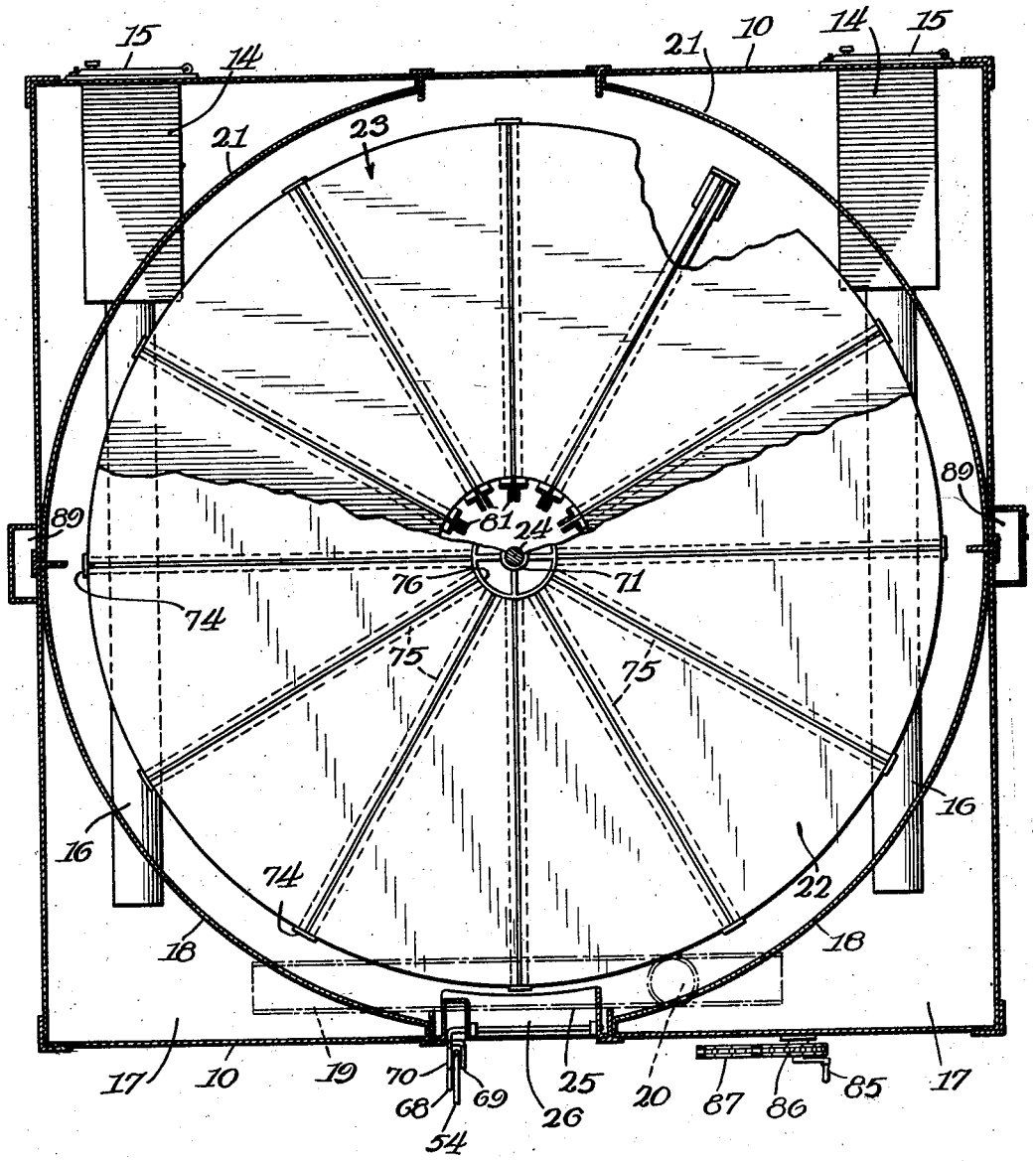
Fig. 2



Inventor.
John Faulds
By Gilson, Manwell & Cox Attys.

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BAKE OVEN

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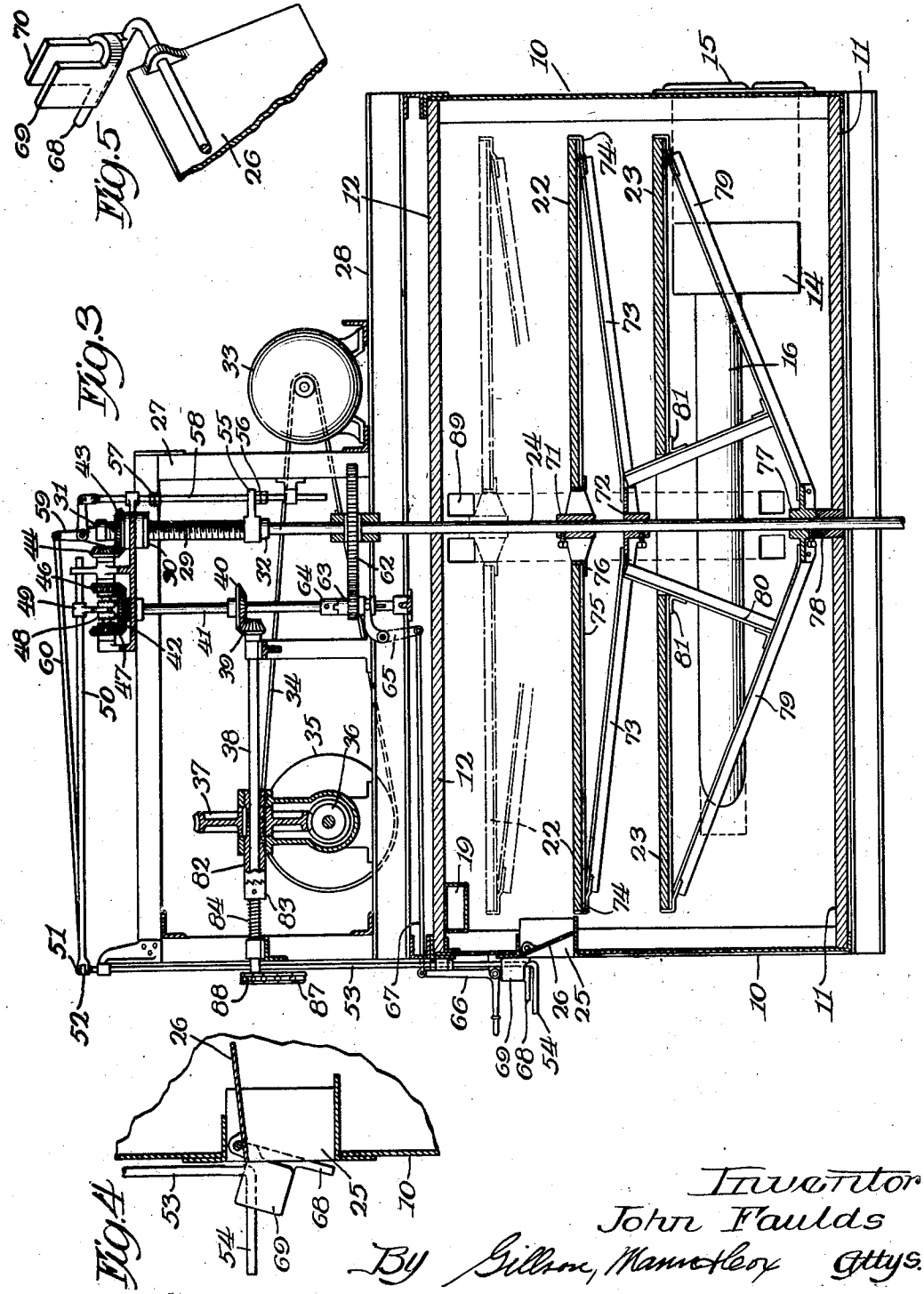

Fig. 5

Fig. 3

Fig. 4

Inventor
John Faulds
By Gillson, Manneloy Attys.

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BAKE OVEN

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Fig. 7

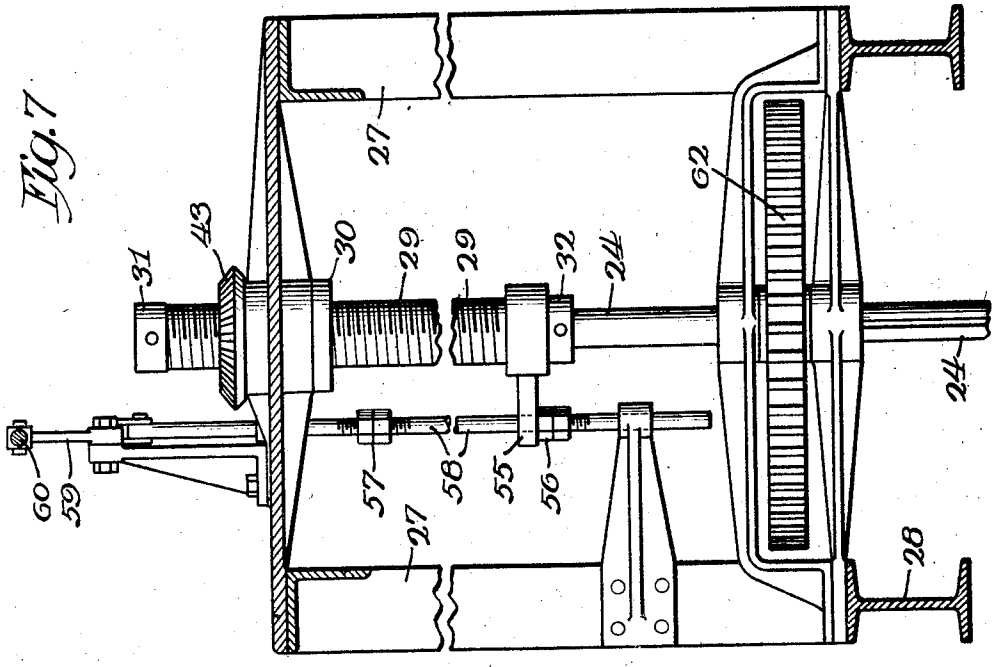
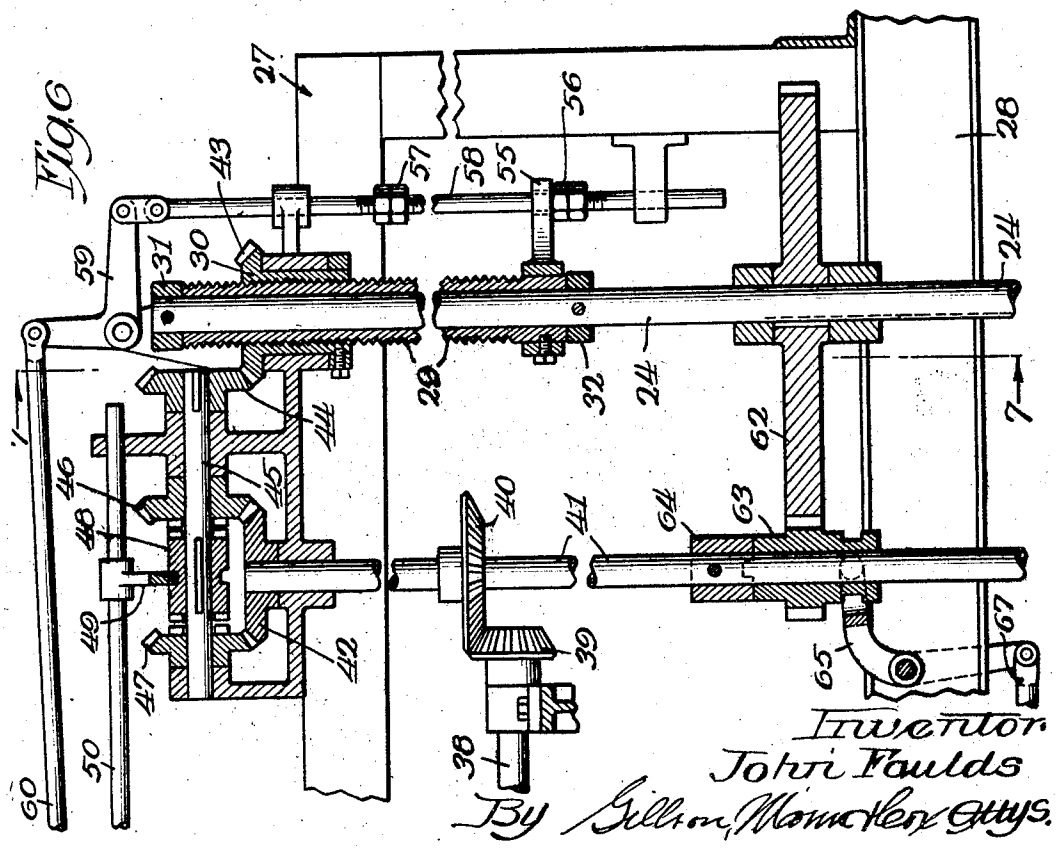


Fig. 6



Inventor
John Faulds
By Gillon, Manchester Attys.

Patented July 29, 1930 1,771,885

UNITED STATES PATENT OFFICE

JOHN FAULDS, OF OAK PARK, ILLINOIS

BAKE OVEN

Application filed August 15, 1928. Serial No. 299,750.

The invention relates to bake ovens of the rotary shelf type. Its objects are to increase the capacity and efficiency of such ovens, to provide means for raising and lowering shelves and for regulating and controlling the operation.

A preferred embodiment of the invention is hereinafter described and is illustrated in the accompanying drawings in which

Fig. 1 is a front elevation of the oven;

Fig. 2 is a plane section on the line 2—2 of Fig. 1, some parts being broken away;

Fig. 3 is a vertical section on the line 3—3 of Fig. 1;

Figs. 4 and 5 are details of the oven door;

Fig. 6 is a detail in section of the operating mechanism on a plane normal to the plane of Fig. 3; and

Fig. 7 is a detail section on the line 7—7 of Fig. 6.

The improved oven is especially intended for use in quantity production of foods, such as bread, cake, pies, etc. It comprises a casing 10, which may be square, as shown, or of any other preferred form, and which is shown as formed of sheet metal with a suitable framing of angle or other bars, and is provided with a bottom plate 11 and a roof plate 12. The walls of the casing may be heat insulated in accordance with common practice in bake ovens. Furnaces, as 13, 14, as many in number as may be desired, are located within the casing and near its bottom and are provided with suitable doors and dampers as indicated at 15 for access from without the casing. Suitable flues for carrying off the products of combustion are provided. As shown, there is a pipe 16 leading horizontally from each furnace to the remoter side of the casing and discharging into a vertical flue 17 in the corner of the casing, this flue being formed of portions of two of the side walls and a sheet metal partition 18 joining these walls and being transversely concave to provide clearance for the baking shelves. The two vertical flues may discharge into a common horizontal flue 19 from which leads a chimney flue 20. The corners of the casing, in which the furnaces 13, 14 are located, are similarly walled off by curved plates as 21 forming flues through which hot air may rise for equalizing the distribution of heat throughout the chamber. Suitable discharge openings, not shown, permit this heated air to escape at the top into a central chamber of the casing.

A plurality of circular baking shelves, shown as two in number, and designated respectively 22, 23, are located within the baking chamber and are fixed upon a central, vertical, longitudinally movable shaft 24. The oven is provided with a charging opening 25 through which is passed the material for loading and unloading the shelves. The shelves are loaded and unloaded at substantially the same position relative to the opening and for convenience this position will be designated or referred to as the charging station. The opening is controlled by a closure 26 which is preferably, though not necessarily, so mounted as to swing inwardly and upwardly.

The mechanism for raising and lowering the shelves is conveniently located on top of the casing and carried by a frame 27 supported on beams as 28. This mechanism comprises a nonrotatable screw 29 loosely sleeved upon the shaft 24, and a nut 30 engaging the screw and rotatable in an element of the frame 27. Collars 31, 32 keyed upon the shaft 24 respectively above and below the screw 29 prevent relative longitudinal movement of the shaft and screw.

A suitable driving element such as an electric motor indicated conventionally at 33 is provided for turning the nut 30 and is connected therewith by means of suitable gearing. As shown, this connection comprises a belt 34 turning over a pulley on the armature shaft of the motor and a pulley 35 mounted upon the shaft of a worm 36 journaled in suitable bearings mounted upon the supporting frame. The worm 36 drives a worm gear 37 fixed upon a bushing 82 loosely sleeved upon a shaft 38 carrying a bevel pinion 39 meshing with a similar pinion 40 fixed upon a vertical counter shaft 41 which carries upon its upper end a bevel gear 42. The bushing 82 is normally locked to the shaft 38 by a clutch element 83 sleeved upon the shaft, urged against the end of the bushing by a

spring 84, the teeth engaging the clutch element with the bushing being of ratchet type.

The nut 30 carries a bevel gear 43 driven by a similar gear 44 on a horizontal shaft 45 upon which are loosely mounted a pair of bevel gears 46, 47, which are at all times in engagement with the gear 42. A clutch element 48 splined upon the shaft 45 cooperates with suitable clutch teeth on the gears 46, 47. A shipper element 49 cooperates with the clutch 48 and is fixed upon a slide rod 50 attached at 51 to a crank arm 52 carried by a vertical rock shaft 53 suitably journaled to the frame 27 and the casing of the oven and having at its lower end a hand crank 54. By turning the shaft 53 the desired direction, the rotation of the nut 30 is secured by engaging the clutch element with either of the gears 46, 47. As the nut 30 is turned in one direction, the screw 29 and shaft 24 and with them the shelves 22, 23 are raised, and by turning it in the opposite direction, they are lowered. The clutch element 47 is automatically shifted to central position when the shelves have reached the intended limit of movement either up or down by means of a lug 55 attached to the lower end of the screw 29 and engageable with tappets 56, 57 carried by a suitably journaled, vertical, slide shaft 58 which is connected at its upper end with a bell crank lever 59 attached by means of a link 60 to the crank arm 52 intermediate of its ends as shown at 61, the tappets 56, 57 being located respectively for engagement by the lug 55 when the desired limit of the downward and upward movements of the shaft 24 is reached.

The shaft 24 turns freely in the screw 29 and the latter is held against rotation by the lug 55 which is provided with an eye through which the shaft 58 passes. For the purpose of turning the shaft 24 and with it the shelves 22, 23, there is splined upon the shaft a gear wheel 62 which meshes with a pinion 63 loose upon the shaft 41 and engageable with a clutch element 64 keyed to this shaft. A shipper lever 65 cooperates with the pinion 63 to control its engagement with the clutch element 64. A bell crank hand lever 66 mounted upon the front of the casing of the oven is connected with the shipper lever 65 by means of a link 57.

The desirable slow raising and lowering and turning of the shelves is secured by a suitable gear ratio of the connecting elements and also by use of the worm gear transmission. The turning movement is desirably slower than the raising and lowering movements, and this action is secured by properly proportioning the gear wheel 62 and pinion 63.

In charging and discharging the oven, the shelves 22, 23 are brought successively to the charging station, which, as shown, is at the level of the lower margin of the door opening and there held by disengaging the clutch element 49 from both of the pinions with which it cooperates, and provision is made for preventing the accidental or inadvertent re-engagement of the clutch element while the door 26 is open. To this end, the door controlling handle 68 shown as attached to the door pintle is so disposed that it is in horizontal position when the door is closed and is provided with a pair of lugs 69, 70 which engage between them the crank arm 54 of the shaft 53 when the door is open, as shown in Fig. 4, but which ride above it when the door is closed, as shown in Fig. 3.

During charging and discharging operations, the shelves may be turned either continuously or intermittently by the manipulation of the bell crank hand lever 66.

The faces of the shelves may be of mineral material such as soap stone and made up of a number of sector shaped plates which are carried by a suitable framing. As shown, the upper shelf is provided with a pair of hubs 71, 72 spaced apart and fixed to the shaft 24. From the lower hub 72 radiate upwardly inclined angle bars 73, each being provided at its outer end with a seat 74 upon which rests an inverted T-bar 75, the inner end of which is supported by a chair 76 carried by the upper hub 71. The soap stone plates are carried by adjacent T-bars and are held against outward movement by the upturned ends of the seats 74.

The lower shelf 23 is preferably centrally apertured to provide for the circulation of air between the two shelves. The lower shelf is supported in part from the hub 72 and in part by a hub 77 fixed upon the shaft 24 and so located thereon that as the shelves reach their lowest position, it may come into contact with a bearing box 78 carried by the floor of the oven casing and in which the shaft turns. Upwardly inclined angle bars 79 radiate from the hub 77, their outer ends forming supports for the framing of the face of the shelf. A set of angle bars 80 rise from the inner end portions of the bars 79, and are attached to the hub 72, each carrying a chair 81 for the inner end of one of the T-bars of the framing of the face of the shelf.

In order to promote the circulation of air within the casing, one or more return flues, as 89, may be provided. They may be desirably located externally of the casing and may be formed of sheet metal, and are open to the interior of the casing both at the top and bottom.

In charging the oven, the shelves are brought to the solid lines position of Fig. 3, the raising gearing being thereby automatically disengaged and locked against re-engagement as the door 26 is opened for charging. The turning movement of the shelves may be stopped until the accessible portion

of the shelf 22 is loaded, and then turned by the manipulation of the bell crank 66 to bring another portion thereof before the door opening. This shelf having been fully loaded, the raising gearing is manually re-engaged elevating the shelf 22 to the dotted lines position of Fig. 3 and bringing the lower shelf 23 to the level of the door opening, the gearing being thereby automatically disengaged. The lower shelf now receives its load whereupon the clutch 49 is suitably shifted to cause the descent of the shelves, and shelf 22 is thereby returned to the level of the door opening and may be discharged of its load and re-loaded. The shelves being again raised, the lower one may be discharged of its load and re-loaded. Should the baking operation not be fully completed during this cycle, the re-charging may be delayed, the rotation of the shelves being either continued or interrupted as may be preferred.

In order to provide for quick access to the baking shelves in case of emergency, the turning and elevating mechanism may be operated by means of a hand crank 85 carried by a shaft suitably journaled in the front wall of the oven casing and provided with a gear wheel 86 connected by means of a sprocket chain 87 with a gear wheel 88 mounted on the end of the shaft 38. The gear ratio of the wheels 86, 88 may be such as to provide for a rapid drive. When the shaft 38 is thus turned by hand, the ratchet element 83 clicks over the teeth on the end of the bushing 82.

The hand crank 85 cannot be turned in the wrong direction because in that event the ratchet teeth would be positively engaged and the shaft would be locked against rotation by the worm gear.

Obviously this manual drive may be so associated with the power means that it will not be actuated by the latter, but will automatically engage it when relied on for use.

While the mechanism for controllably moving the shelves, as disclosed, is of high efficiency for the performance of the various intended functions, other mechanism for accomplishing the results may be substituted therefor, within the scope of the invention, or changes in detail may be made in the mechanism as disclosed.

I claim as my invention:

1. A bake oven comprising a casing having a charging opening, a baking shelf vertically movable within the casing, power means for imparting vertical movement to the shelf within the oven, a clutch for connecting the power means with the shelf moving means, and automatic means for disengaging the clutch when the shelf is at the level of the charging opening.

2. A bake oven comprising a casing having a charging opening, a vertically movable baking shelf, power means for imparting vertical movement to the shelf, a clutch for connecting the power means with the shelf moving means, automatic means for disengaging the clutch when the shelf is at the level of the charging opening, a door for the opening, and means associated with the door for locking the clutch in disengaged position when the door is open.

3. A bake oven comprising a casing having a charging opening, a vertically movable baking shelf, power means for imparting vertical movement to the shelf, a clutch for connecting the power means with the shelf moving means, automatic means for disengaging the clutch when the shelf is at the level of the charging opening, a door for the opening, and means associated with the door for engaging the clutch control means for locking the door in closed position when the clutch is engaged.

4. In a bake oven, in combination, a suitable casing, a vertical rotatable, longitudinally movable shaft within and extending above the casing, a baking shelf within the casing and fixed to the shaft, means for turning the shaft, means for longitudinally moving the shaft, a countershaft, independent means for connecting the countershaft to the two named shaft moving means, and power means for driving the countershaft.

5. A bake oven having a vertically movable baking shelf, power means for raising and lowering the shelf within the oven, means for connecting the power means, comprising a pair of oppositely driven gears on a transmitting shaft, a clutch cooperating with the gears to lock them to the shaft alternatively, manual means for shifting the clutch to engage either of the gears and to a neutral position, and automatic means for actuating the named means for releasing the clutch.

6. In a bake oven, in combination, a suitable casing, a movable baking shelf within the casing, a vertical shaft carrying the shelf, a screw rotatably sleeved on the shaft and longitudinally movable therewith, a nut fixed against vertical movement and cooperating with the screw, a gear wheel splined upon the shaft, power means for driving the nut and gear wheel and comprising a countershaft and independent means for releasably connecting the countershaft with the nut and with the gear.

7. In a bake oven, a suitable casing having a charging opening, a vertically movable shelf within the casing, power means for moving the shelf, a clutch in the power connection, a rock shaft for controlling the clutch and having a hand crank located adjacent the charging opening, an inwardly swinging door for the opening, and a pair of lugs carried by the door and arranged to inclose between them the hand crank when the latter is in clutch releasing position and

the door is open, and to be disengaged from the crank when the door is closed.

8. In a bake oven, in combination, a suitable casing enclosing a baking chamber having a charging opening, a pair of relatively fixed shelves, means for rotating the shelves, means for vertically moving the shelves to bring them alternately to the level of the opening, and means for automatically disengaging the vertically moving means as either shelf reaches such level.

9. In a bake oven, in combination, a suitable casing enclosing a baking chamber having a charging opening, a pair of relatively fixed shelves, means for rotating the shelves, means for vertically moving the shelves to bring them alternately to the level of the opening, means for automatically disengaging the vertically moving means as either shelf reaches such level, and manual means for controlling the rotating means.

10. In a bake oven, in combination, a suitable casing enclosing a baking chamber having a charging opening, a pair of relatively fixed shelves, means for rotating the shelves, means for vertically moving the shelves to bring them alternately to the level of the opening, means for automatically disengaging the vertically moving means as either shelf reaches such level, a door for the opening, and means associated with the door for locking the disengaging means when the door is opened.

11. In a bake oven, in combination, a suitable casing having a charging opening, a longitudinally movable vertical shaft in the casing, a pair of shelves carried by the shaft with one of the shelves normally at the charging opening, and means to limit the range of movement of the shaft to the distance between the shelves to bring the other shelf at the charging opening.

12. In a bake oven, in combination, a suitable casing having a charging opening, a longitudinally reciprocable vertical shaft in the casing, a pair of shelves carried by the shaft, the range of movement of the shaft being equal to the distance between the shelves, means for moving the shaft and means for automatically arresting the movement of the shaft at the limit of its travel in either direction.

13. In a bake oven having a casing provided with a charging opening, and a rotatable vertically reciprocable shelf, one end of the path of its vertical movement being at the charging position and means for simultaneously rotating the shelf and causing its vertical movement.

14. In a bake oven, in combination, a casing having a charging opening, a plurality of vertically reciprocable shelves within the casing, the path of such movement of each shelf being to and from the charging position, means for causing the reciprocatory movement of the shelves, and means for rotating the shelves independently of the first-named means.

15. In a bake oven, a baking chamber having a charging station, a pair of vertically spaced relatively fixed shelves within the chamber, and means for effecting a predetermined vertical reciprocation of the shelves to bring them successively to the charging station, the paths of movement of the shelves extending in opposite directions from said station.

16. In a bake oven, a baking chamber having a charging station, a pair of vertically spaced, relatively fixed shelves within the chamber, and means for effecting a predetermined vertical reciprocation of the shelves to bring them successively to the charging station.

17. In a bake oven, a baking chamber, a pair of vertically spaced and relatively fixed shelves within the chamber, the chamber having a charging opening common to the shelves, means for effecting a predetermined limited vertical reciprocation of the shelves as a unit to successively bring the shelves into and out of cooperative relation with the common charging opening, and means for rotating the shelves horizontally to bring different portions thereof into cooperative relation with the charging opening.

18. In a bake oven, an oven chamber, heating means within the oven chamber, a pair of vertically spaced and relatively fixed shelves normally stationary and in cooperative baking relation with the heating means, the oven chamber having a charging station, and means for imparting vertical reciprocation to the shelves from and to the charging station limited to the distance between the shelves.

19. In a bake oven, an oven chamber, heating means within the oven chamber, a pair of vertically spaced and relatively fixed shelves normally stationary and in cooperative baking relation with the heating means, the oven chamber having a charging station, means for imparting vertical reciprocation to the shelves from and to the station, limited to the distance between the shelves, and means for rotating the shelves on a vertical axis to bring different portions thereof into cooperative relation with the charging opening.

In testimony whereof I affix my signature.

JOHN FAULDS.