May 21, 1940. C. E. CARPENTER 2,201,364

DOUGHNUT MACHINE AND THE LIKE

Filed Feb. 28, 1938 10 Sheets-Sheet 1

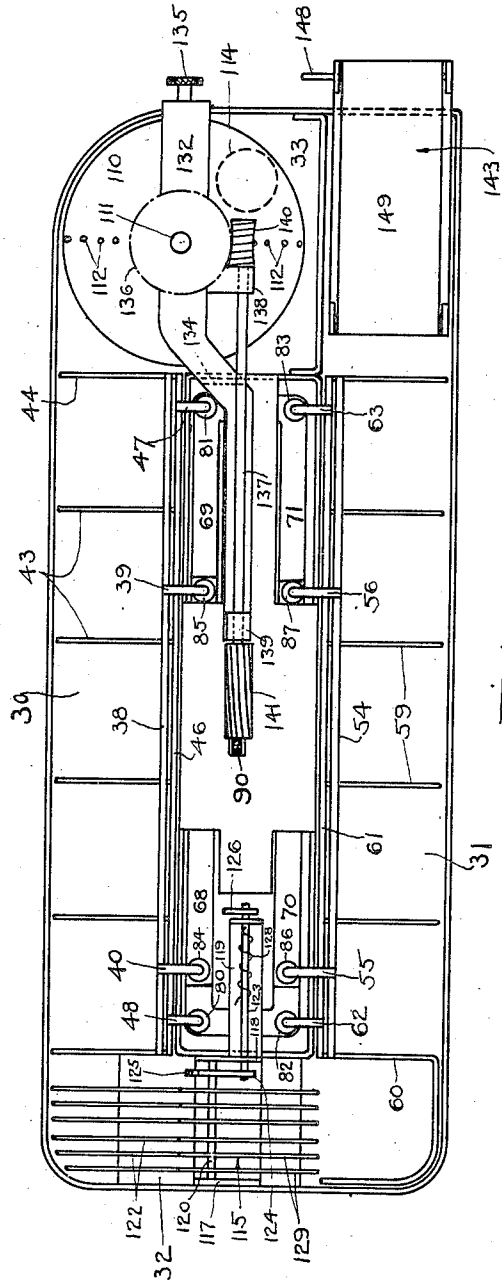


Fig. 1.

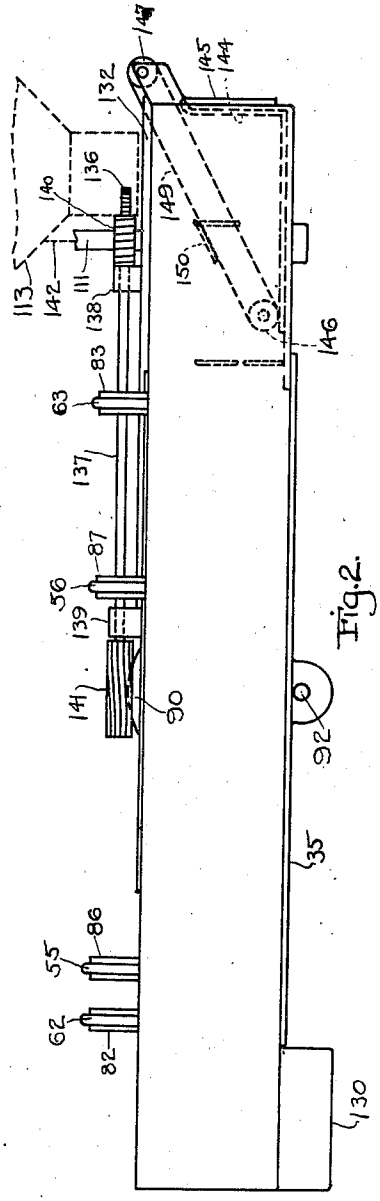


Fig. 2.

Inventor:
Charles E. Carpenter;
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Atty.

May 21, 1940. C. E. CARPENTER 2,201,364

DOUGHNUT MACHINE AND THE LIKE

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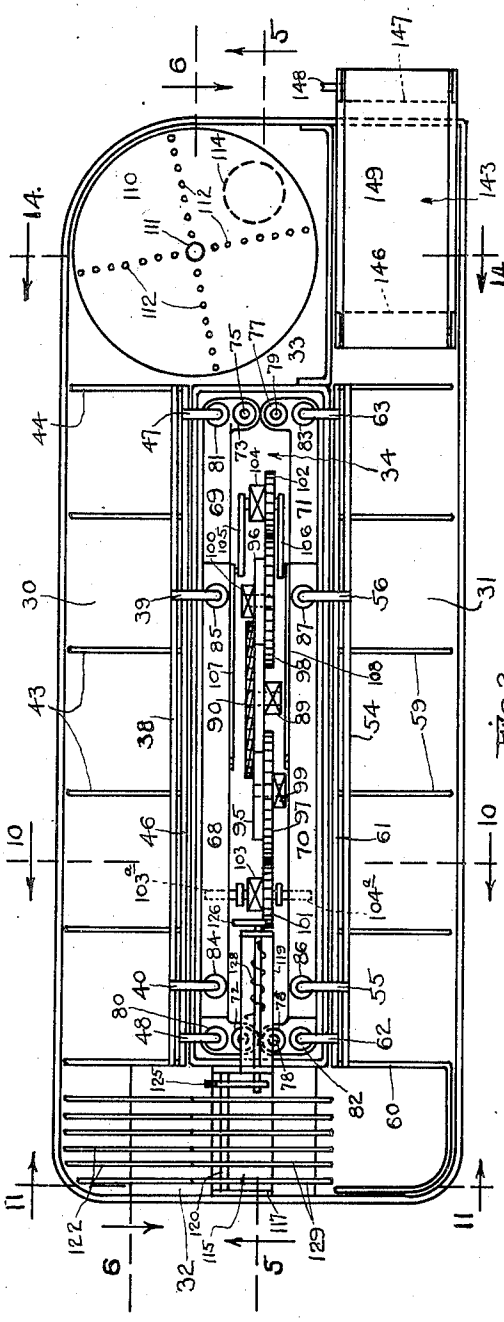


Fig. 3.

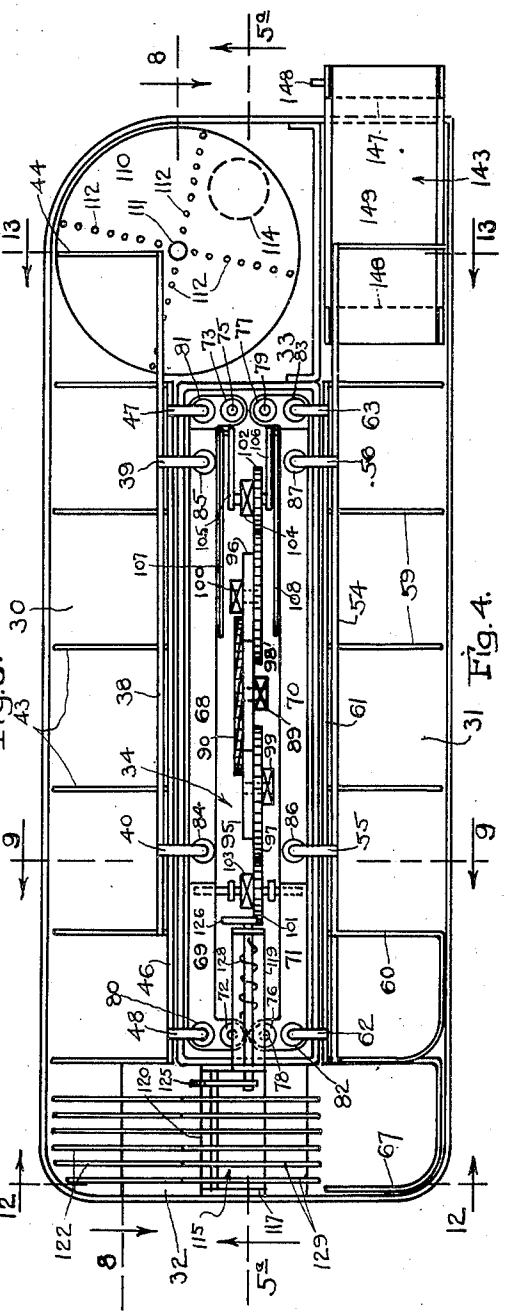


Fig. 4.

Inventor:
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May 21, 1940. C. E. CARPENTER 2,201,364

DOUGHNUT MACHINE AND THE LIKE

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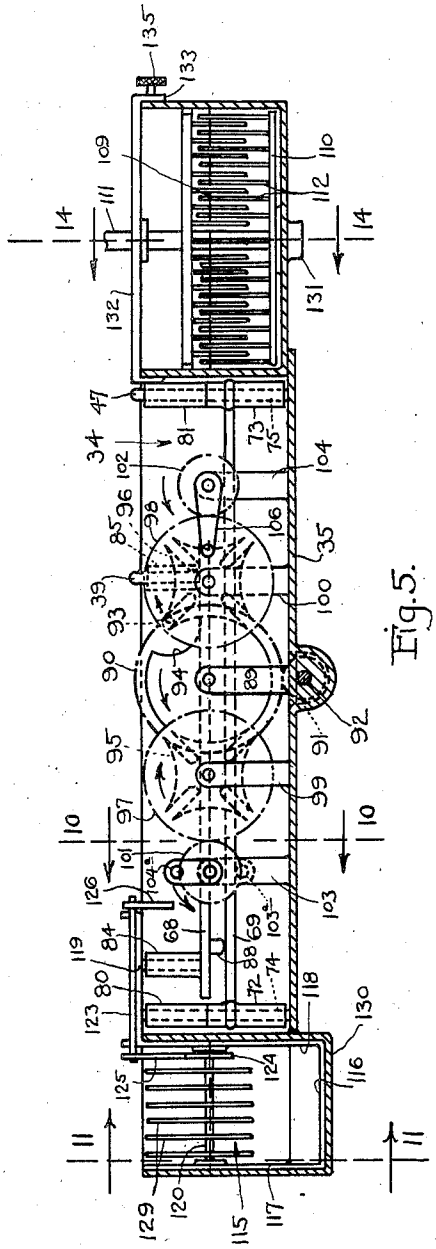


Fig. 5.

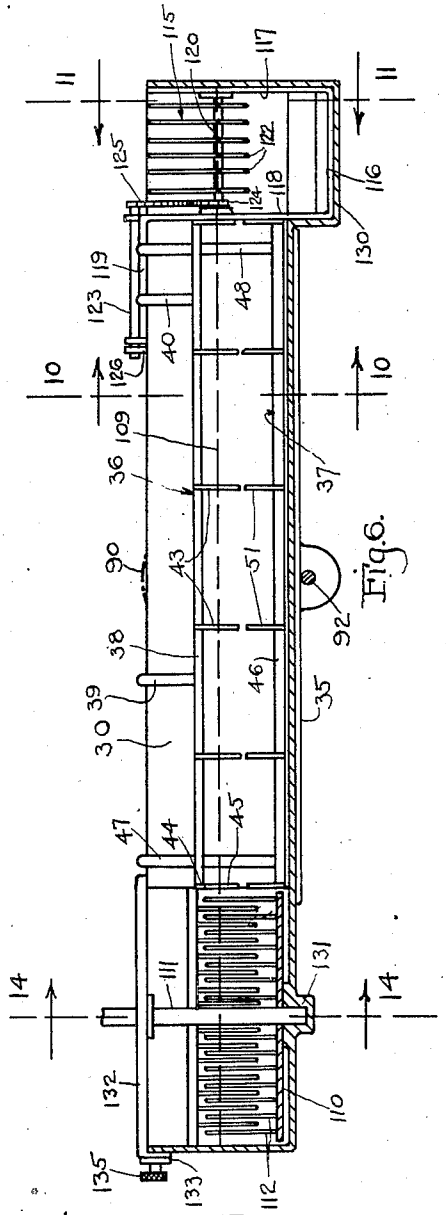


Fig. 6.

Inventor:
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May 21, 1940. C. E. CARPENTER 2,201,364

DOUGHNUT MACHINE AND THE LIKE

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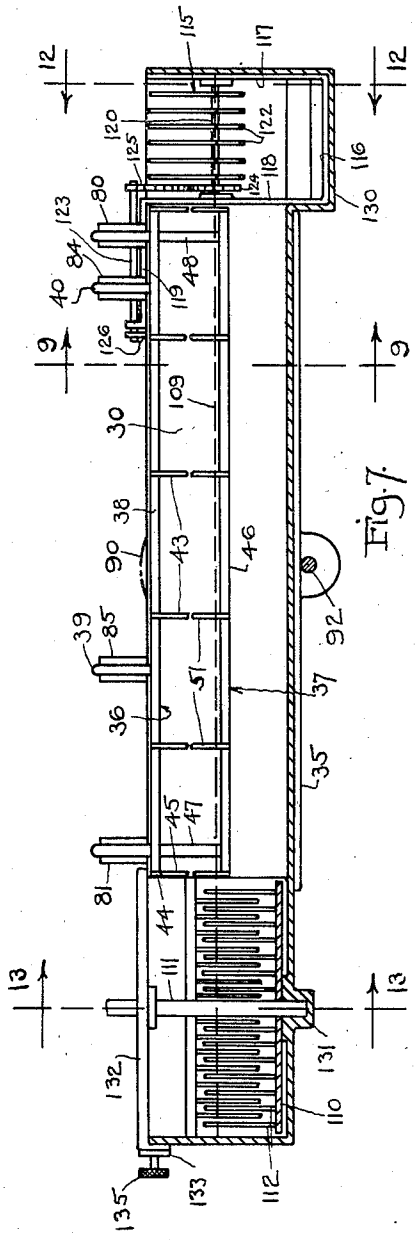


Fig. 7.

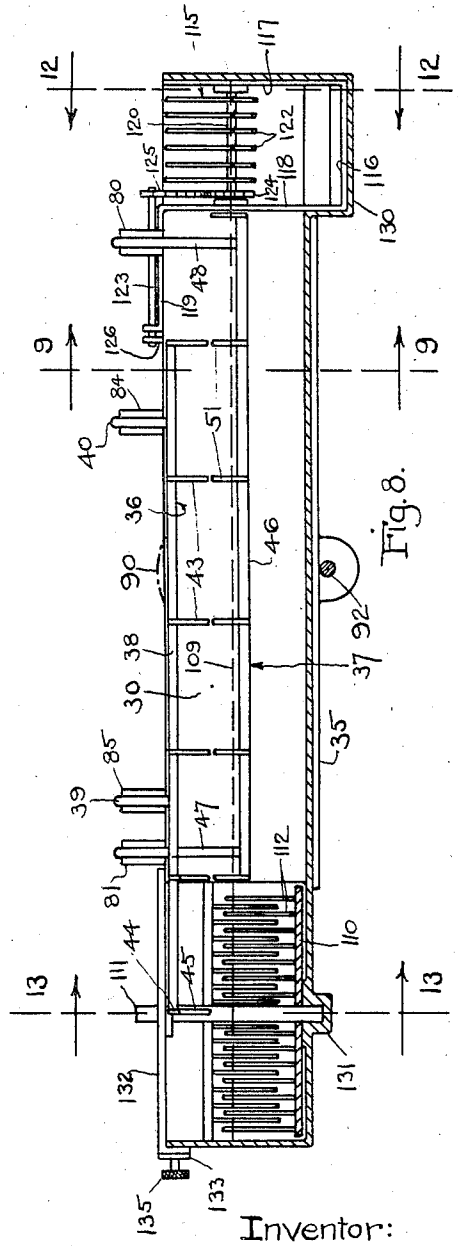


Fig. 8.

Inventor:
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Atty.

May 21, 1940. C. E. CARPENTER 2,201,364

DOUGHNUT MACHINE AND THE LIKE

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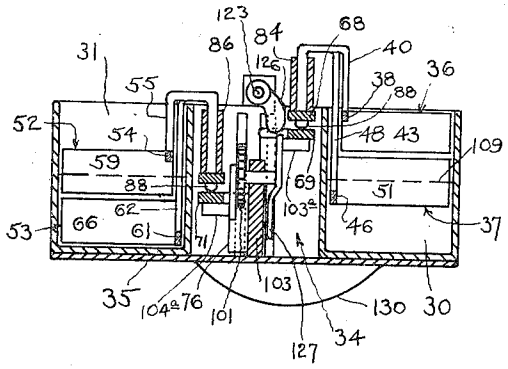


Fig. 9.

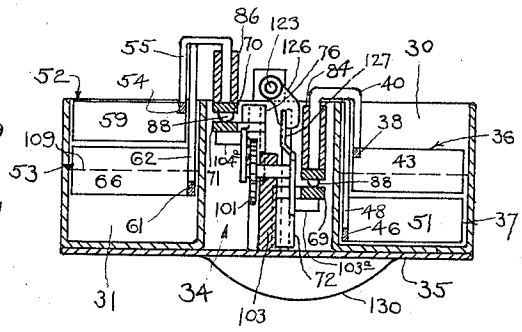


Fig. 10.

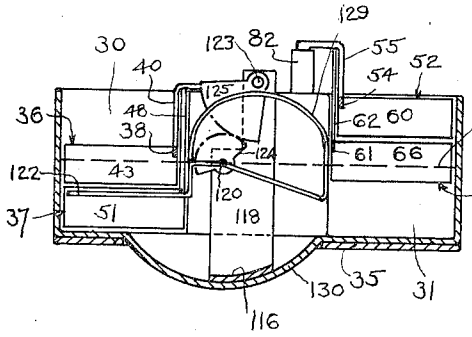


Fig. 11.

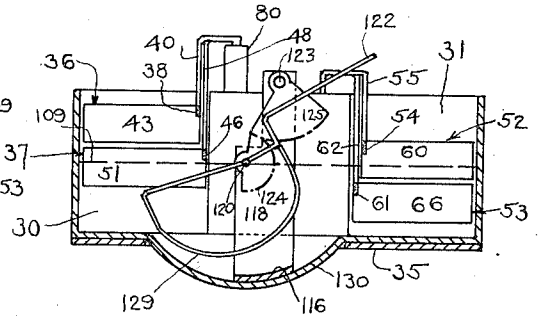


Fig. 12.

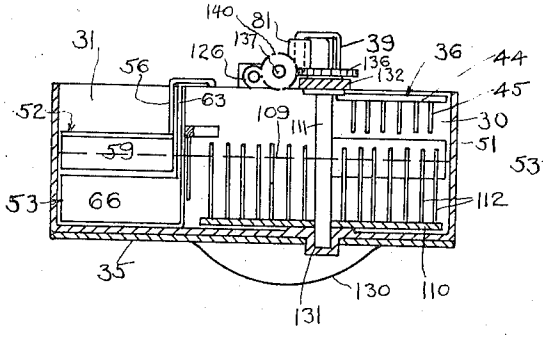


Fig. 13.

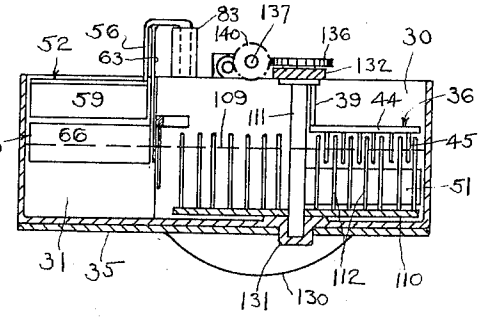


Fig. 14.

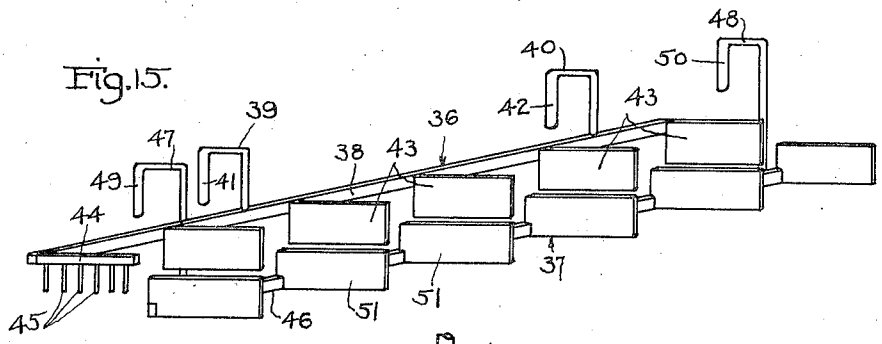
Inventor:
Charles E. Carpenter;
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Atty.

May 21, 1940. C. E. CARPENTER 2,201,364

DOUGHNUT MACHINE AND THE LIKE

Filed Feb. 28, 1938 10 Sheets-Sheet 6

Fig. 15.



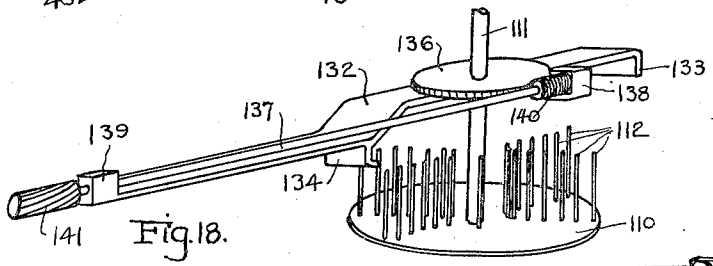


Fig. 18.

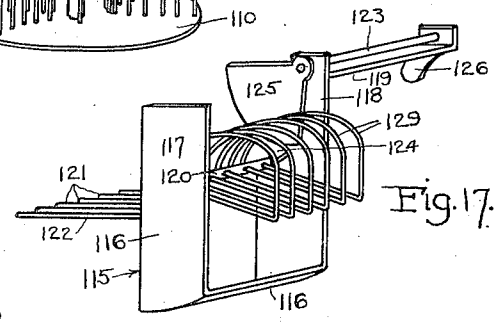


Fig. 17.

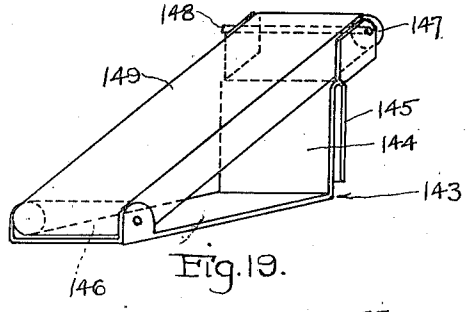


Fig. 19.

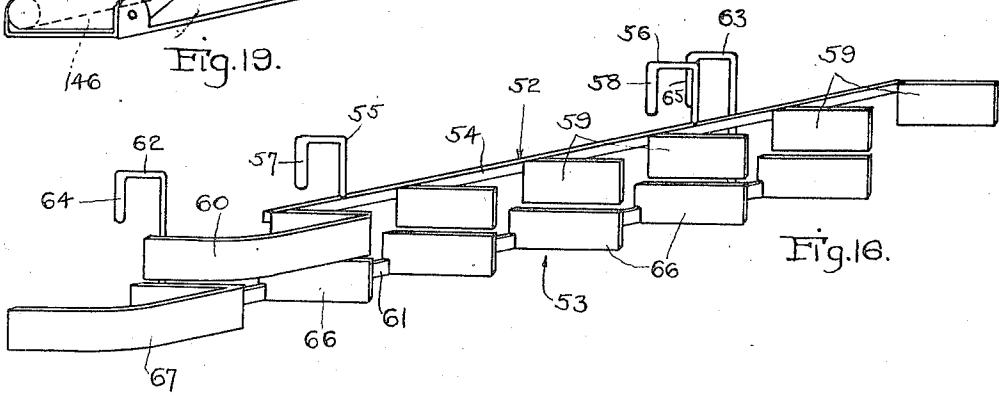


Fig. 16.

Inventor:
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by Thos. A. Banning Jr.
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May 21, 1940. C. E. CARPENTER 2,201,364

DOUGHNUT MACHINE AND THE LIKE

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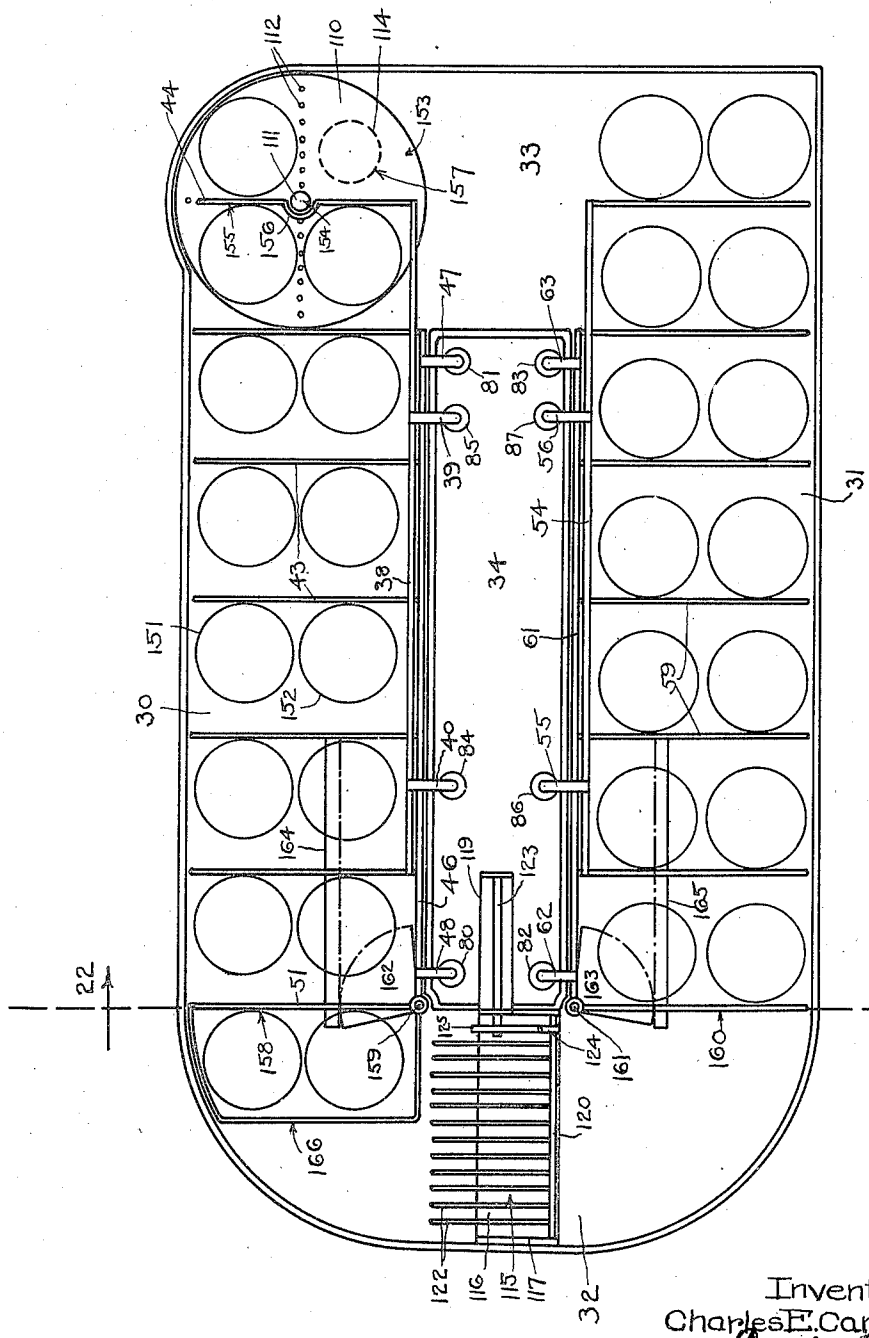


Fig. 20.

Inventor:
Charles E. Carpenter
by Thos. A. Banning
Atty

May 21, 1940. C. E. CARPENTER 2,201,364

DOUGHNUT MACHINE AND THE LIKE

Filed Feb. 28, 1938 10 Sheets-Sheet 8

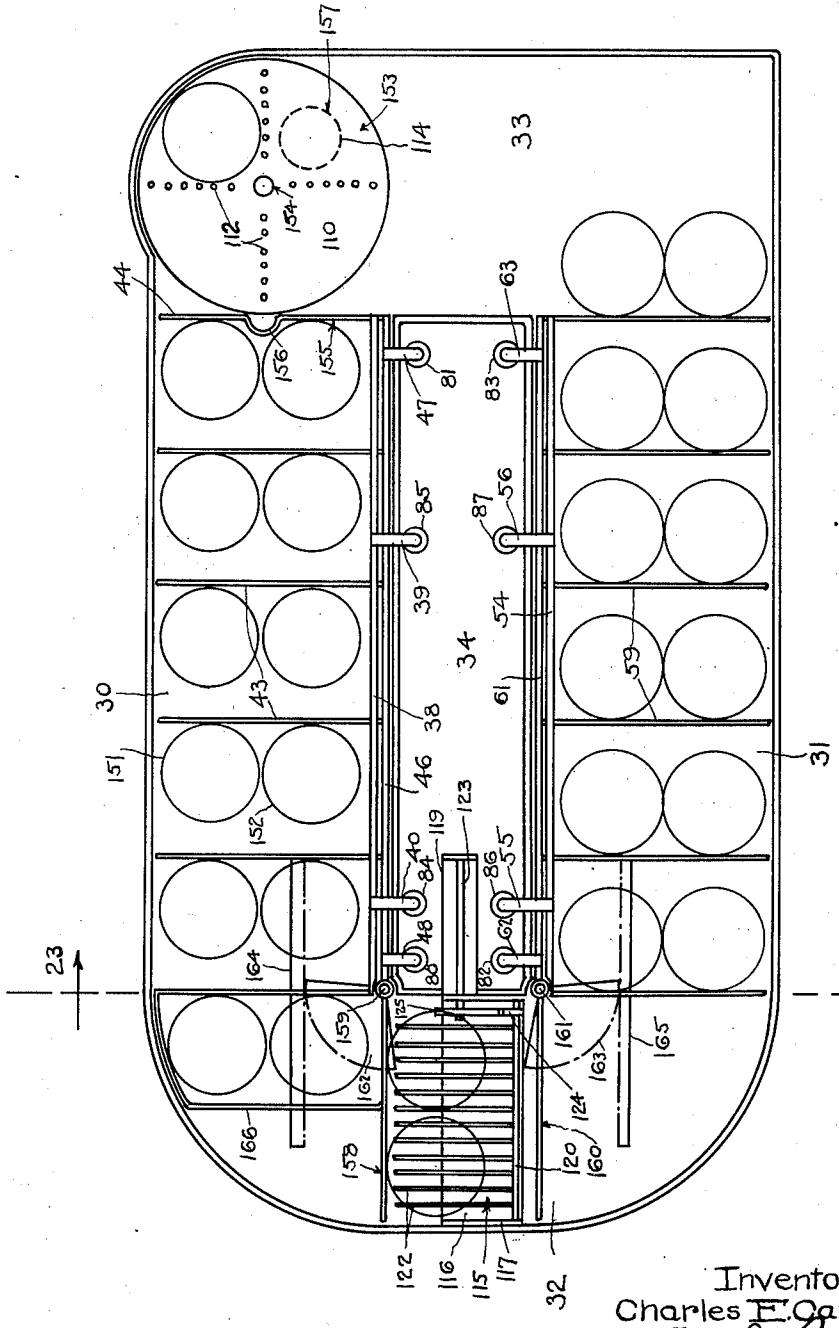


Fig. 21.

Inventor:
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May 21, 1940. C. E. CARPENTER 2,201,364

DOUGHNUT MACHINE AND THE LIKE

Filed Feb. 28, 1938 10 Sheets-Sheet 9

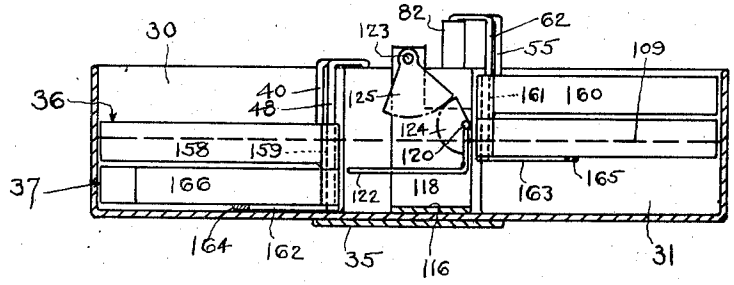


Fig. 22.

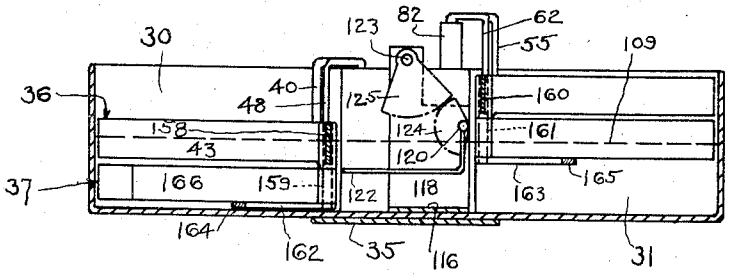


Fig. 23.

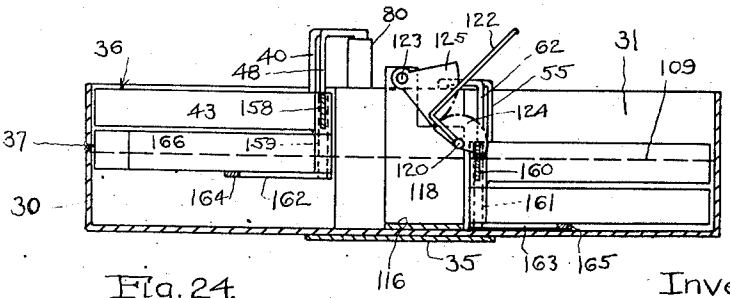


Fig. 24.

Inventor:
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May 21, 1940. C. E. CARPENTER 2,201,364

DOUGHNUT MACHINE AND THE LIKE

Filed Feb. 28, 1938 10 Sheets-Sheet 10

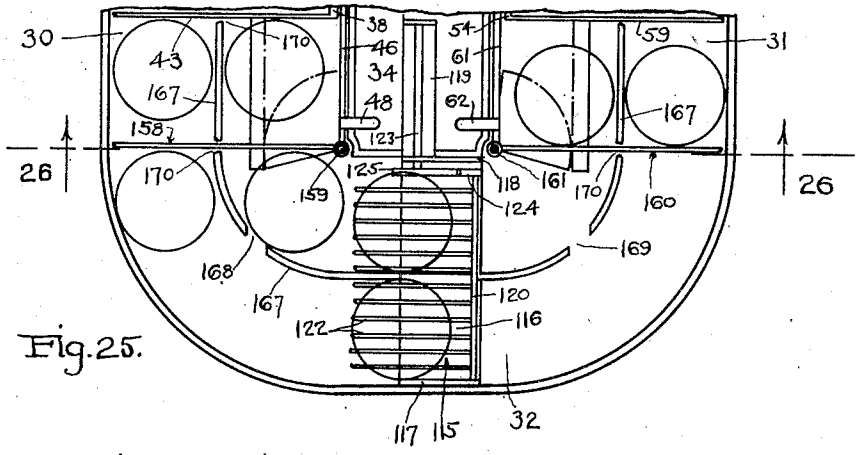


Fig.25.

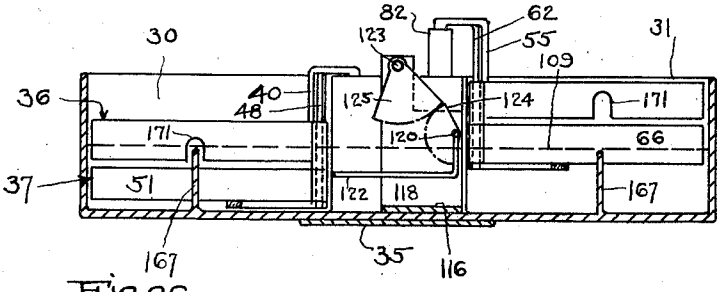


Fig.26.

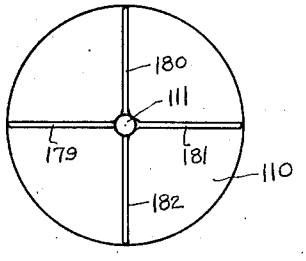


Fig.27.

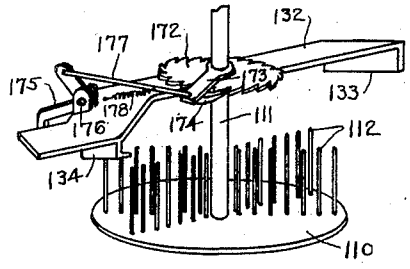


Fig.28.

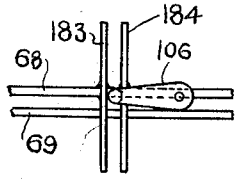


Fig.29.

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Patented May 21, 1940 2,201,364

UNITED STATES PATENT OFFICE

2,201,364

DOUGHNUT MACHINE AND THE LIKE

Charles E. Carpenter, Chicago, Ill.

Application February 28, 1938, Serial No. 192,920

19 Claims. (Cl. 53—7)

This invention relates to improvements in doughnut machines and the like, that is, automatic machines for frying or cooking doughnuts and similar articles. The machine is of that general type in which the frying doughnuts are advanced periodically from an insertion or initial position, along the bath of hot grease or oil, to and past a turning position, and to a delivery position where the completely fried articles are delivered up from the bath.

One feature of the invention relates to an improved arrangement and means for advancing the frying articles along the bath, with an intermittent movement, and regardless of any natural flowage of the liquid along such bath. In this connection it is an object of the invention to provide an arrangement in which the individual doughnuts (or groups of the doughnuts) are retained within individual pockets or cells during their advancing movement so as to retain complete control over them at all times, and also to avoid the uncertainties attendant on advancement by means of the current of hot grease. It is a very distinctive feature of the invention to establish these cells and to ensure the transferring movement of the doughnuts by a novel arrangement of parts; this arrangement being such that there are established companion sets of cells, one set being at higher level than the other set, together with means for periodically raising and lowering the two sets of cells, and also for periodically moving one set of the cells back and forth through a distance required to advance the frying articles a complete step of movement, the other set of cells remaining unadvanced during such operation. Specifically, it is an object to provide companion upper and lower sets of partial cells, the upper set being capable of longitudinal as well as vertical movement, and both sets being capable of vertical movements, together with means for periodically and step by step intermittently raising and lowering both sets of partial cells, with intermediate longitudinal movements of the upper set of partial cells, such longitudinal movements being alternately back and forth.

It may also be stated that this feature of the invention relates to the provision of a set of partial cells capable of longitudinal as well as vertical movements, together with means to advance these partial cells in the forward doughnut movement direction while the partial cells are in lowered position so as to partially engage the doughnuts and cause them to advance a proper distance, thereafter raising said partial cells to a position such that they will no longer engage the doughnuts, then moving said partial cells backwardly above another set of doughnuts, and then lowering said partial cells into a new engagement with the doughnuts, preparatory to a new advancing movement. In connection with the foregoing elements and movements, it is a further feature that I have also provided a lower set of partial cells which can be raised and lowered but do not advance back and forth; and which when lowered occupy a position below the floating doughnuts so as not to interfere with doughnut advancements by the first mentioned set of partial cells, and which when raised come to an elevation to enclose the floating doughnuts and retain them against improper advancement during the interval while the first mentioned set of partial cells is being raised away from the doughnuts and is being returned backwardly to a position above another set of doughnuts, and also until such partial cells are again lowered to position to re-engage with the floating doughnuts so as to again control them.

It may also be stated that this feature of the invention consists in the provision of two sets of partial cells which complement each other, and between which the doughnuts are exchanged periodically by vertical movements thereof, one set being also capable of horizontal movements to intermittently advance the frying articles with return movements in which said partial cells are disengaged from the doughnuts floating on the grease; the other set of partial cells comprising means to retain the floating frying doughnuts under control while the first set of partial cells is so disengaged from the floating articles.

A further feature of the invention relates to a very simple and effective means for causing the proper movements of the two sets of partial cells with regularity for performing the functions set forth above. In this connection it is an object to secure the alternate up and down movements of both sets of partial cells by one set of devices, such as cranks, and to secure the alternate back and forth movements of the one set of partial cells, in proper timing between the up and down movements, by another set of devices, such as another set of cranks; and specifically, it is a further object of the invention to actuate these two sets of cranks by means of Geneva movements, working alternately, so that the vertical movements come at intervals between the horizontal movements; and still more specifically it is an object to so relate these two Geneva movements that a single Geneva pin and wheel may alternately actuate both of the Geneva notched wheels.

In connection with the foregoing, it is a further object of the invention to so arrange the parts that the operating devices, including the Geneva wheels, etc., may be located at a position between two grease channels lying side by side, the doughnuts travelling along one said channel to a cross connection, and being returned along the other channel to a delivery point. By this

arrangement, the operating devices are brought into very compact compass, and are located at the most central position for actuation and control of all the partial cell groups, and a very pleasing appearance is provided for the entire structure.

A further feature of the invention is to provide means for receiving and retaining the freshly cut and dropped doughnut batches, and for retaining them within individual cells during the initial stages of the frying operation, and until they have become cooked to a condition such that they may thereafter be manipulated and advanced from cell to cell without danger of deformation. In this connection it is noted that the cell advancements are accomplished by a step by step movement, with intervals of rest between the advancing movements; and it is noted that such a series of movements necessarily involve accelerations and decelerations of the doughnut movements, and such accelerations require the exertion of lateral pressures of the floating doughnut forms. Such lateral pressures will deform the doughnuts unless the doughnuts have been given a preparatory frying operation sufficient to give them a resisting crust; and it is an object of this feature of the invention to initially drop the freshly cut doughnut forms onto a rotating "dropping plate," which generally rotates at uniform speed so that it is not subject to intervals of acceleration and deceleration, and the doughnuts are allowed to remain in individual cells of this dropping plate until the lapse of such an interval of time as will ensure the formation of the necessary crust above referred to, whereupon the doughnut forms are able to receive and resist the lateral forces to which they are subjected during their subsequent step by step advancements.

In connection with the foregoing, it is a further object of the invention to provide a machine which is capable of very high speeds of operation, measured in doughnuts dropped and fried per hour, and which speed greatly exceeds those speeds heretofore permissible in such devices. In this connection, it is noted that there are doughnut cutters available which can cut and drop single doughnuts into the frying bath at such close intervals that said freshly cut dough batches could not be step by step advanced away from the dropping position without serious deformation; but by my improved form of dropping plate arrangement in which the freshly cut forms are retained and advanced uniformly until they are crusted I am enabled to speed up the cutting and dropping of the doughnut forms to take full advantage of the ability of such cutters to perform their work, and thus to greatly increase the output of a machine of given size and cost. Sometimes I shall drive this dropping plate with a step by step movement, but even in such case I am enabled to perform these step by step movements of the dropping plate with a much lower rate of accelerations and decelerations than those necessary for the back and forth cell movements, so that even with such step by step movement of the dropping plate I am enabled to greatly exceed previous performances of such machines, measured in doughnuts per hour.

In connection with the foregoing, it is a further object of the invention, as one feature, to provide an arrangement such that two or more rows of doughnuts may be simultaneously taken from a single dropping plate onto which they have been previously dropped from a single cutter, and simultaneously advance said rows along the cooking channel or channels, and simultaneously turn over the doughnut forms of both rows in turning operations. By this arrangement the capacity of the machine may be still further increased, and the full advantage of the high speed of the cutter be made available.

In connection with the foregoing, it is a further object of the invention to provide means for causing the doughnuts advancing along both aisles of the channel to simultaneously turn right angled corners at the end or cross connection where the two channels join together, turning both doughnut forms simultaneously by a single turner, and again causing both doughnut forms to execute another right angle turn into the return channel. Sometimes I provide means for sub-dividing the channels into companion sub-channels lying parallel to each other, with one set of doughnuts traveling along one sub-channel, and the other set of doughnuts travelling along the other sub-channel.

Another feature of the invention relates to the provision of a construction such that the various operating assemblies may be removed from the grease channel for cleaning or other operations, leaving the channel itself entirely clear and free of any such devices, so that it too can be readily cleaned. In this connection, I have provided an arrangement such that each of the partial cell structures may be lifted away from the channels and from the operating mechanisms; such that the turner is a complete self-contained device which may be lifted away from the channels and from the operating mechanisms, or may be thereafter set into place without special operations; such that the dropping plate assembly may be lifted away from the channels and from the operating devices, or may be again set back into place and readily brought into proper timing therewith; and such that the delivery device may also be readily lifted away from the channels and from the operating devices, or be again set into place without special adjustments. Each of these assemblies is completely self-contained, and may be readily set into place or removed from the channels and operating mechanisms without the need of using special tools, or making special manipulations.

In connection with the foregoing, it is also an object of the invention to provide an arrangement in which the operating devices themselves are also built onto a base plate as a self-contained and independent structure, so that they may also be removed or set into place as a unit, and without special adjustments or manipulations thereon.

Other objects and uses of the invention will appear from a detailed description thereof, which consists in the features of construction, and combinations of parts hereinafter described and claimed.

In the drawings:

Figure 1 shows a plan view of one embodiment of my invention, the same being a single doughnut channel arrangement, and the upper sets of partial cells being in the advanced position on the primary channel, or the returned position on the secondary channel;

Figure 2 shows a side elevation corresponding to Figure 1, and it shows the doughnut cutter in dotted lines;

Figure 3 shows a plan view similar to that of Figure 1, but with the doughnut cutter removed,

and also with the top plate and the connections to the dropping plate removed; the upper sets of partial cells being in the advanced position of the primary channel and the returned position of the secondary channel;

Figure 4 shows a view similar to that of Figure 3, but with the upper sets of partial cells reversed from the position of Figure 3;

Figure 5 shows a longitudinal section on the lines 5—5 of Figures 3 and 4, and it shows the Geneva movements for operating the raising and lowering and also the back and forth devices;

Figure 6 shows a longitudinal section on the line 6—6 of Figure 3, with the sets of partial cells of the primary channel in the lowered position so that the upper set will engage the floating doughnut forms, and with said upper set in its advanced position, that is, closest to the turner and away from the dropping plate;

Figure 7 shows a view similar to that of Figure 6 but with the partial cells raised so that the upper set is carried away from the floating doughnuts, and so that the lower set is brought into position to engage the doughnuts and retain them against displacement until the upper set again is lowered;

Figure 8 shows a view similar to that of Figure 7 but with the upper set of partial cells returned towards the dropping plate and away from the turner; preparatory to engaging with the doughnut forms when again lowered;

Figure 9 shows a transverse section on the line 9—9 of Figure 4 looking in the direction of the arrows, the partial cells of the primary channel being in raised position, and those of the secondary channel being in lowered position;

Figure 10 shows a transverse section on the line 10—10 of Figure 3, looking in the direction of the arrows; being a view similar to that of Figure 9 but with the partial cells reversed vertically;

Figure 11 shows a transverse section on the line 11—11 of Figure 3, showing the turner device in its normal or unturned position; and with the partial cells of the primary channel in lowered position and those of the secondary channel in raised position;

Figure 12 shows a transverse section on the line 12—12 of Figure 4 similar to that of Figure 11 but with the turner turned over to deliver the doughnut into the secondary channel in turned over condition; the partial cells of the primary channel being substantially raised, and those of the secondary channel being substantially lowered;

Figure 13 shows a transverse section on the line 13—13 of Figure 4, looking in the direction of the arrows, showing the rotating dropping plate, and with the partial cells of the primary channel in raised position, and those of the secondary channel in lowered position;

Figure 14 shows a transverse section on the line 14—14 of Figure 3, looking in the direction of the arrows, showing the rotating dropping plate, and with the partial cells of the primary channel lowered, and those of the secondary channel raised;

Figure 15 shows a perspective view of the partial cells of the primary channel removed from the channel, and from the operating devices, the upper set being in the restored position such as that which it occupies closest to the dropping plate and ready to receive a doughnut from the dropping plate;

Figure 16 shows a perspective view of the partial cells of the secondary channel removed from the channel, and from the operating devices, the upper set being in the position which it occupies when a doughnut has been delivered to the delivery device;

Figure 17 shows a perspective view of the turner unit removed from the cross-connection of the channels, and with its parts in their normal or unturned position;

Figure 18 shows a perspective view of the dropping plate unit removed from the primary channel, and showing the operating shaft therefor which engages at one end with the drive gear of the driving mechanism;

Figure 19 shows a perspective view of the delivery device removed from the secondary channel;

Figure 20 shows a plan view of a double or twin channel arrangement embodying the features of the present invention, and with "wings" on the ends of the upper sets of partial cells, to sweep the doughnuts around the corners at the cross-connection of the channels, the lower set of partial cells of the primary channel being provided with an end trap to hold the doughnuts therein until they shall be swept around the corner by the wing;

Figure 21 shows a view similar to that of Figure 20 but with the upper sets of partial cells shifted towards the turner, thus also sweeping the wings around their respective corners;

Figure 22 shows a transverse section on the line 22—22 of Figure 20, looking in the direction of the arrows, the wings being in their normal or unturned position;

Figure 23 shows a transverse section on the line 23—23 of Figure 21 looking in the direction of the arrows, the wings being swept around their respective corners into the cross-connection between the channels;

Figure 24 shows a view similar to that of Figure 23 but with the turner turned over to deliver the two doughnuts into the secondary channel;

Figure 25 shows a fragmentary plan view of a modified arrangement of the twin or double channel arrangement, including central longitudinally extending partitions to define sub-channels for the two rows of advancing doughnuts;

Figure 26 shows a transverse section on the line 26—26 of Figure 25, looking in the direction of the arrows, showing the notches on the lower edge portions of the upper partial cell partitions or flights, to accommodate the mid-partition of the channel when the partial cells are lowered;

Figure 27 shows a modified dropping plate in which use is made of solid or continuous partitions instead of pins or the like to define the cells thereof;

Figure 28 shows a perspective view of a modified form of dropping plate unit in which provision is made for intermittent advancement of the plate instead of for continuous advancement thereof as in the previous arrangement; and

Figure 29 shows a modified form of connection between the crank which causes horizontal shifting and the upper bar for one of the upper sets of partial cells.

I shall first describe the arrangement shown in Figures 1 to 19 inclusive. In that arrangement there is provided a frying or cooking pan including the two parallel channels 30 and 31, the channel 30 being termed the primary channel and the channel 31 the secondary channel,

for convenience. These channels are connected at one end by the cross-connection **32**, being termed the turner connection for purposes of convenience. Generally, also, there is a cross-connection **33** at the other end, being at the delivery end of the secondary channel, or the introduction end of the primary channel. This frying or cooking pan is a self-contained unit, and may be cast or otherwise formed in simple manner.

Between the two channels there is a central channel or chamber **34** in which the various driving and operating devices are located. This channel is generally formed without any floor, in which case a plate or floor **25** may be removably connected to the lower portions of the channels **30** and **31**, which plate will constitute a floor for said central chamber or channel **34**, and which floor will support the principal driving and operating devices. Upon removing this floor plate **35** the principal operating and driving devices are removed from the rest of the structure.

Within the primary channel **30** there are located the upper and lower sets of partial cells **36** and **37** respectively. The upper set **36** comprises the longitudinally extending bar **38** which is provided with the upwardly extending inverted U-shaped brackets **39** and **40**, the pins **41** and **42** of which are adapted to be received in suitable sockets of the driving and operating mechanism presently to be described. The bar **38** has the outwardly extending paddles or blades **43** which are spaced longitudinally along the bar at the same spacing as that between the doughnuts advancing along the channel. Preferably, the end blade is replaced by the outwardly extending finger **44** from which the pins **45** depend; this arrangement being useful at the location of the dropping plate presently to be described, so as to allow for proper removal of the doughnut forms from the dropping plate notwithstanding the rotation of the said plate during the action of such removal.

The lower set of partial cells for the primary channel includes the longitudinally extending bar **46**, having the upwardly extending inverted U-shaped brackets **47** and **48**, the pins **49** and **50** of which are adapted to be received in suitable sockets of the driving and operating mechanism. It is noted that the brackets **47** and **48** are spaced much farther apart than the brackets **39** and **40**, so that considerable longitudinal movement of the upper set may be effected, the lower set not making such movement, and notwithstanding that the pins **41**, **42**, **49** and **50** are all in alignment. The bar **46** carries the outwardly extending paddles or blades **51** which are formed at the same spacing as that between the paddles or blades **43** of the upper set; whereby registry of the blades of the upper and lower sets may be effected either when the end blades of the two sets are in vertical registry, or when the upper set has been shifted endwise the distance of spacing between blades, that is, one cell.

Within the secondary channel **31** there are located the upper and lower sets of partial cells **52** and **53** respectively. The upper set comprises the longitudinally extending bar **54** which is provided with the upwardly extending inverted U-shaped brackets **55** and **56**, the pins **57** and **58** of which are adapted to be received in suitable sockets of the driving and operating mechanism presently to be described. The bar **54** has the outwardly extending paddles or blades **59** which are spaced longitudinally along the bar at the same spacing as that between the doughnuts advancing along the channel. Preferably the end blade is replaced by the special hook shaped cell **60** which faces towards the turner device, and serves to permit the ready movement of the turned over doughnuts thereinto.

The lower set of partial cells for the secondary channel includes the longitudinally extending bar **61**, having the upwardly extending inverted U-shaped brackets **62** and **63**, the pins **64** and **65** of which are adapted to be received in suitable sockets of the driving and operating mechanism. It is noted that the brackets **62** and **63** are spaced much further apart than the brackets **55** and **56**, for a reason similar to that explained in connection with the brackets of the partial cells for the primary channel. The bar **61** carries the outwardly extending paddles or blades **66** which are formed at the same spacing as the spacing between the blades **59** of the upper set; whereby registry of the blades of the upper and lower sets may be effected either when the end blades of the two sets are in vertical registry, or when the upper set has been shifted endwise the distance of spacing between blades, that is, one cell. The end blade of the lower set is also of special form or hook shaped as shown at **67** so as to permit proper co-relation between the turner and the partial cell so established, as will presently appear.

Means are provided for raising or lowering the partial cells of each channel simultaneously, and also for shifting the upper set of partial cells of either channel longitudinally while in either raised or lowered condition, and without such shifting of the cells of the lower set. I shall now explain the same.

Within the chamber or channel **34**, there is, adjacent to each of the primary and secondary channels, a pair of bars **68** and **69**, for the primary channel, and **70** and **71** for the secondary channel. The bar **69** has the end vertical socket members **72** and **73** which work on vertical pins **74** and **75** of the plate **35** and serve to guide said bar **69** in its vertical movements, and prevent it from tilting endwise, that is, these pins keep the bar in a level condition as it moves up and down, and at the same time prevent it from moving endwise of the machine. Likewise the bar **71** has the end vertical socket members **76** and **77** which work on the vertical pins **78** and **79** of the plate **35** and serve to guide said bar **71** in its vertical movements, and prevent it from tilting endwise, and also prevent said bar from moving endwise of the machine.

The bar **69** has the end sockets **80** and **81** which are spaced to receive the pins **50** and **49** respectively of the lower set of partial cells for the primary channel, so that said set of partial cells can be readily set into place or removed therefrom without disturbance to other parts of the machine. Likewise, the bar **71** has the end sockets **82** and **83** which are spaced to receive the pins **64** and **65** of the lower set of partial cells for the secondary channel, so that said set of partial cells can be readily set into place or removed therefrom without disturbance to other parts of the machine.

The bar **68** has the end sockets **84** and **85** which are spaced to receive the pins **42** and **41** respectively of the upper set of partial cells for the primary channel; and the bar **70** has the end sockets **86** and **87** which are spaced to receive the pins **57** and **58** of the upper set of partial cells for the secondary channel; whereby both said sets of partial cells may readily be set into place

or removed from the machine without disturbance to other parts thereof.

It is noted that the bars 68 and 70 are supported by the bars 69 and 71, respectively, either by roller bearings or otherwise, as shown, for example at 83 in various figures, so that as the bars 69 and/or 71 are raised or lowered, the bars 68 and/or 70 rise or fall with them; but it is noted that the bars 68 and 70 are sufficiently shorter than the bars 69 and 71 to permit of endwise movement of the bars 68 and 70 equal in amount to the distance between doughnuts, that is, the spacing between cells. Thus it happens that when either of the bars 69 or 71 is raised or lowered, the corresponding bar 68 or 70 as the case may be will also rise or fall, but such bar 68 or 70 may be shifted backward or forward in either direction an amount equal to the cell spacing when in either the raised or lowered condition. Thus it also appears that when either lower set of partial cells is raised or lowered, the upper set corresponding thereto also rises or falls, and that the upper set may be shifted backward or forward in either direction the distance between cells, when in either raised or lowered condition.

On the central portion of the plate 35 there is the bearing stand 89 which provides bearing for the main or driving gear 90. This gear is driven by the pinion 91 on the drive shaft 92. The gear 90 also constitutes the pin disk for the pin 93 of a Geneva movement, the gear being of extra thickness for that purpose, and being recessed at the position of the pin 93 as shown at 94. At opposite sides of the Geneva gear drive thus provided, are the Geneva wheels 95 and 96, each having four slots so that each will execute a quarter turn each time the pin 93 comes around. Also, the advancements of the Geneva wheels 95 and 96 will occur alternately, first one, and then the other, and always with continuous rotation of the gear 90.

The two Geneva wheels 95 and 96 are provided with the side gear wheels 97 and 98; and the Geneva wheels and their said side gear wheels are properly journalled in stands 99 and 100 extending up from the plate 35. The gears 97 and 98 mesh with the companion pinions 101 and 102 which are of half size compared with the gears, and therefore will rotate double angular distance; and said pinions are journalled in the stands 103 and 104 on the plate 35. It is here noted that since the Geneva wheels are provided with four slots each, they will each execute a quarter turn at each pin operation; but since the gears 97 and 98 are double size compared with the pinions 101 and 102, said pinions will in turn execute half turns with corresponding pin operations of the Geneva movement; and said half turns will occur in alternation, first the pinion 101 and then the pinion 102, etc.

The shaft of the pinion 101 has at its ends the cranks 103^a and 104^a which underlie the bars 69 and 71, respectively, so that said bars are supported and raised or lowered by said cranks. Also, these parts are so placed that said bars are in either the raised or lowered condition when the pinions are at rest, so that each bar moves either from its top to its bottom position, or vice versa. The shaft of the pinion 102 has on its ends the cranks 105 and 106, which are connected by the connection links 107 and 108 with the bars 68 and 70, respectively. It is also noted that said cranks are normally in the horizontal positions when at rest so that the bars 68 and 70 are normally projected to either one extreme or the other. It is also noted that the cranks 103^a and 104^a are placed in opposition to each other, that is, one is up when the other is down, so that the cells at one side of the machine, or in one channel, rise as those at the other side, or in the other channel fall. It is, however, noted, that the cranks 105 and 106 are in phase so that both of the bars 68 and 70 travel in the same direction, that is, either to the right or to the left, at the same time.

It will now be noted that the cells at each side of the machine, that is, in each channel, execute the following movements: In the primary channel, assuming that the partial cells are up, and that the upper set is projected towards the dropping plate, the first movement is to drop both the upper and lower sets of said partial cells, thus causing the upper set of cells to take the doughnut from the dropping plate, and causing the upper set of cells to trap the floating doughnuts. It is here noted that the level of the hot grease is shown at the line 109 in various figures. The lowering of the cells brings the upper set to a low enough position to trap the floating doughnuts between its blades. The next movement is to cause the so lowered upper set of cells to shift away from the dropping plate and towards the turner, so that all of the so trapped doughnuts are shifted towards the turner the distance of one cell or doughnut. The next movement is for both the lower and upper sets of cells to be raised again, so that now the upper cells are raised above the grease level, and the lower cells come high enough to trap the so shifted doughnuts, to thereby retain them in such shifted position. Finally, while so raised the upper set is again shifted towards the dropping plate, leaving the doughnuts floating in the cells of the lower set. Thus it appears that the vertical movements serve to transfer the doughnuts from one set to the other, and the horizontal movements of the upper set, while lowered, serve to move the doughnuts towards the turner and away from the dropping plate; and the horizontal movements of the upper set, while raised, serve to merely transfer the partial cells of said set to position for engagements with the next doughnuts when said cells are again lowered.

Now it will be found, that since the cells of the secondary channel move down while those of the primary channel move up, and since the horizontal movements of the cells of both sets are always in the same direction, either to the right or to the left, the transferences of doughnuts in the secondary channel will be accomplished from the turner towards the delivery device, that is, in direction contrary to that occurring in the primary channel.

It is also to be noted that the movements of the paddles or blades are such, when they are lowered, that a current of the hot grease is naturally created around the circuit of the channels and end connections, flowing from the dropping plate towards the turner in the primary channel, and from the turner towards the dropping plate in the secondary channel; but due to the fact that the doughnuts are at all times trapped in distinct cells, and therefore under complete control, they will not float to positions not intended, but their movements are at all times definitely determined in the advancing cells. It is also noted that the principal functions of the lower sets of partial cells is to trap the doughnuts during the intervals when the upper sets

are raised, so that at such times the doughnuts do not float to improper positions. Also, that the functions of the upper sets of partial cells are to cause the advancements of the doughnuts under control.

It is also noted that since the total horizontal movement of doughnut advancement takes place during the relatively small interval in which the Geneva pin 93 travels through a slot of the Geneva wheel 96, a very rapid acceleration and deceleration of the upper sets of partial cells occurs, with, of course a correspondingly long interval of rest between such movements. To meet the condition thus created, I have provided a slowly moving dropping plate which I shall now describe. The same includes the circular plate 110, carried by the vertical shaft 111, which shaft is slowly rotated, preferably with a continuous motion; said dropping plate having the cells defined by the vertical pins 112, or otherwise, as hereinafter shown. The dough batch cutter 113 is located in position to drop batches above the plate 110 at the position of the circle 114 (see Figures 3 and 4), and being so timed that each dough batch is dropped into one of the cells of the rotating dropping plate. Then, as the dropping plate rotates counterclockwise these dough batches are carried around with the dropping plate to the position where the pins 45 of the finger 44 of the upper set of partial cells 36 may engage the earliest dropped dough batch and commence the travel thereof along the primary cooking channel. It is noted that when the upper set of partial cells 36 has been raised and moved back towards the dropping plate, it rests at such position until the Geneva pin comes around to position to engage the Geneva wheel 95 and lower the partial cells, and then there is a further rest at that position until the Geneva pin comes around to engage the Geneva wheel 96 and shift the so-lowered partial cells towards the turner, thus advancing the floating doughnuts. During these intervals of time the dropping plate has rotated some angular distance, due to the fact that it is being driven continuously (or in some cases, intermittently, but with a continuous intermittent movement), so that the particular dropping plate cell from which the doughnut is to be removed has also advanced considerable angular distance. For example, it may move from the position of Figure 4 to that of Figure 3. In order to avoid interference between the pins 45 of the finger 44 and the cell of the dropping plate I stagger the pins 45 as compared to those of the dropping plate, so that the two sets come between each other, and it is thus possible to permit the finger 44 to move to a backward position where it will definitely engage the doughnut in the dropping plate cell, without such interference.

When the dough batches travelling along the primary channel have reached the end of such channel they are to be turned over and transferred to the secondary channel. For this purpose I have provided the turner designated in its entirety by the numeral 115. It includes the inverted U-shaped plate 116 having the vertical arms 117 and 118 which are received snugly between the front and rear walls of the cross connection 32 between the primary and secondary channels, but the turner unit may nevertheless be readily removed from the said channel member without need of special tools. Said plate 116 has the extension 119 which reaches over the central chamber 34 far enough to support the turner actuating shaft presently to be described.

The turner proper includes the shaft 120 journalled in the arms 117 and 118, and the wire fingers 121 are connected to this shaft so that when the shaft is rocked said fingers are also rocked for the turning operation. Reference to Figures 11, 12 and 17 in particular shows that these wire fingers include the horizontal doughnut supports 122 which are preferably offset at a point close to the shaft 120 to bring said fingers lower down at the doughnut receiving position; and also to provide a shelf on which the turning doughnut will be supported during the turning operation. The turner also includes an actuating shaft 123 which is journalled in the upper end of the bracket arm 118 and also in the end portion of the extension 119, as well shown in Figures 5, 11, 12 and others. The shaft 120 has the segmental gear 124 which is engaged by the segmental gear 125 on the shaft 123, so that rocking the shaft 123 through a comparatively small angular movement rocks the shaft 120 through a sufficient movement to accomplish the doughnut turning operation. The inner end of the shaft 123 carries the cam shaped plate 126 which is in position to be engaged by an arm 127 carried by the shaft of the pinion 101, said arm 127 being located more or less in opposition to the throw of the crank 103a which raises and lowers the partial cells of the primary channel. The arrangement is such that when the gear 101 is given its half turn to raise the partial cells of the primary channel, and simultaneously to lower the partial cells of the secondary channel, shortly before such movement is completed the finger 127 engages the cam 126 and rocks the turner to perform a turning operation and transfer the doughnut which it carries over to the beginning of the secondary channel. A spring 128 is provided to restore the turner to its original position ready to receive another doughnut from the primary channel, such spring operating as soon as the finger 127 disengages from the cam 126.

Now it will be noted that by the time the turner is rocked to deliver its doughnut to the secondary channel, the partial cells of the secondary channel have been lowered, so that the doughnut thus turned over and delivered will properly enter the beginning cell of the partial cells of the secondary channel. This is the hook shaped cell 60 of the upper set, or 67 of the lower set, and it is noted that these are open at the side adjacent to the turner so that the turner may enter into them, if need be, for proper delivery of the doughnut thereinto, and without interference between the parts. It will also be noted that, due to the fact that the turner immediately returns to its original position after the completion of the turning operation, the subsequent longitudinal movement of the upper set of partial cells of the secondary channel is accomplished without interference from the turner.

Since the end cells of the secondary channel are open at the turner side, there might be possibility of doughnuts contained therein floating backwardly away from the direct alignment with the secondary channel before the longitudinal movement of the upper set of cells in the secondary channel commenced. In order to prevent such possibility, I have provided each of the turner wires 122 with a backward extension

129 of generally cam shaped form, the radius whereof increases as the turner rocks backwardly. These wire extensions constitute a cam which will force the turned over doughnut laterally from the turner position towards the secondary channel and will hold such doughnut at such laterally moved position until the hook shaped upper partial cell 60 moves the doughnut along the secondary channel to its next position.

It is noted that the turner unit is a completely self-contained unit, which may be set into the cross connection 32 or may be removed therefrom as a unit. Also, that there is no need of performing any special timing of parts when the turner is set back into place, since the timing of parts occurs automatically; whenever the finger 127 comes around it will engage the cam 126, and at the proper time.

Sometimes, as shown in several of the figures, it will be necessary to provide a slight pocket 130 in the bottom of the cross-connection 32 to accommodate the rocking movements of the extensions 129, due to their radius, but such pocket is not generally objectionable.

The dropping plate 110, and its shaft 111 are carried by a self contained unit, now to be described. The lower end of the shaft 111 is received in a socket 131 in the floor of the cross-connection 33, and the upper portion of said shaft is journalled in a bracket plate 132 which lies across the cross-connection 33. Said bracket plate 132 has at one end the hook 133 to engage the outer face of the cross-connection 33, and also has the downwardly extending hook 134 to engage the inner face of the end wall of the chamber 34. A set screw 135 may be provided in the hook 133 to lock the bracket in place. A worm gear 136 is connected to the upper portion of the shaft 111; and a shaft 137 is journalled at 138 and 139 to the bracket 132. One end of said shaft carries the worm 140 meshing with the worm gear 136, and the other end of said shaft carries the spiral gear 141. The main drive gear 90 has its periphery provided with the usual spur gear teeth to mesh with the driving pinion 91; and also the periphery of said gear 90 is provided with the spirally cut teeth or grooves as shown in Figures 3 and 4 in particular, so that the spiral gear 141 will mesh therewith. Thus the shaft 137 is driven to turn the dropping plate. It will be noted that the gear ratio thus established should be such that the dropping plate executes one quarter turn for each two turns of the gear 90, since two turns of the gear 90 are needed to execute a complete cycle of movements of the partial cells, corresponding to advancement of one dough batch, and the dropping plate delivers one dough batch with each quarter turn.

It will also be noted that the dropping plate unit may be set into place or removed from the channel as a complete self-contained unit, and without the need of using special tools for such operations. The timing of the spiral gear 141 should be proper with respect to the spiral teeth in the periphery of the gear 90, but such timing may be easily effected by bringing the movements of the partial cells to a given phase, and then setting the spiral gear 141 down into mesh with the spiral teeth of the gear 90.

I may also use the shaft 111 to drive the dough batch cutter 113. For this purpose I have shown the shaft extension 142 connected to the dough batch cutter; and I do not deem it necessary to describe the construction of such connection in greater detail herein since various forms of dough batch cutters are already well known and in extensive use, and are driven in various manners. Suffice it to mention that the timing of the dough batch cutter should be such as to ensure the dropping of one dough batch into each of the cells of the dropping plate, and in proper phase.

Any suitable means may be provided for removing the completely cooked or fried doughnuts from the grease bath. In the present case I have chosen to show a self-contained unit generally designated as 143. It may be set into the end portion of the secondary channel, or removed therefrom readily. This unit includes the bracket 144 having the leg 145 which may be set over the end wall of the secondary channel so as to grip the same in firm manner but nevertheless to permit insertion or removal without special tools. The lower portion of this bracket has the cylinder or wheel 146 journalled thereto, and another cylinder or wheel 147 is journalled to the upper portion of the bracket. The cylinder or wheel 147 is driven by the shaft extension 148 so as to carry the belt or other carrier 149 upwardly and over as shown in Figure 19. The shaft 148 may be driven in any convenient manner as by means of an extension from the shaft 137, or an extension from the shaft 111, but the details of such drive are not set out herein since manifestly many forms of such drive might be used; and also for the reason that it is only necessary to drive the delivery device at such a speed as to ensure removal of the doughnuts from the frying bath as they are brought to the position of the delivery device by means of the upper set of partial cells of the secondary channel.

In connection with the foregoing it may be noted that the final paddle or blade of the upper set 52 serves to move the completed doughnuts onto the delivery device. In order to ensure such a complete movement, this final paddle or blade may be pivoted to the bar 54 so that it may swing about a transverse axis as shown in Figure 2 at the dotted line position 150; or the belt 149 might be in the form of a series of separate narrow lines or tapes, and the paddle or blade 150 might be in the form of a series of fingers working between such tapes, so as to make possible the complete delivery of the doughnut onto the delivery device.

The rate of dropping of dough batches by the cutter 113 in the arrangement so far described is equal to the frequency of cyclic movements of the partial cells, since each such partial cell takes a single doughnut from the dropping plate. This means that the partial cells must be actuated at a high rate of speed, for a large output in doughnuts per hour, once for each doughnut dropped.

In the modified arrangement of Figures 20 to 26 inclusive the channels are of double width so that two rows of doughnuts may be accommodated as shown at 151 and 152. The various paddles or blades are also correspondingly long so as to properly engage both doughnuts at the same time. In this case the dropping plate 153 is located with its shaft 154 centrally of the primary channel, and the end paddle or blade 155 of the upper series for the primary channel is centrally curved as shown at 156 so that it may partially embrace the shaft 154. The frequency of movements of the cells is timed so that a cycle thereof occurs for two cell movements of the dropping plate. As a consequence, each time the upper set of partial cells of the primary channel is moved towards the turner, two doughnuts

are removed from the dropping plate, one at each side of the channel center line, and these two are then advanced along the primary channel as a pair. It is noted that the dough batch cutter drops its batches at the position 157, so that each dough batch so dropped must travel partially around the circular movement of the dropping plate before it is removed therefrom by the end partial cell. Thus there is time for formation of a crust on each dough batch before commencement of actuation by the partial cells. It is, of course understood that the freshly dropped dough batches will remain in the cells of the dropping plate as defined by the wires 112 or otherwise, and they will float up to the surface of the grease shortly after being introduced into the grease, and before they come around to position for actuation by the partial cells.

Each of the upper sets of partial cells has, at the end adjacent to the turner, no paddle or blade; but on the contrary at that location each of the lower sets has a swinging paddle or blade or a wing which is in alignment with the blades of the upper set, and moves up and down with the partial cells, and may swing through a ninety degree movement. These are the wing 158 pivoted to the end of the bar 46 of the lower set for the primary channel at the point 159, and the wing 160 pivoted to the end of the bar 61 of the lower set for the secondary channel at the point 161. Such pivotal connections may be made by small vertical shafts journalled in the end portions of the bars 46 and 61, respectively, the wings being fastened to the upper ends of such shafts. The lower ends of such shafts carry the segmental gears 162 and 163 below the lower partial cells, so as to not interfere therewith; and the upper sets of partial cells or blades thereof, carry the rack bars 164 and 165 which reach along beneath the blades of the lower sets, and engage the segmental gears just referred to. These rack bars are conveniently carried by blades of the upper sets of partial cells, and reach far enough down to pass beneath the lower cells to the positions of the segmental gears. Thus they do not interfere with doughnuts contained in the partial cells of either the upper or lower set.

With this arrangement it will be seen that the wings will rise and fall with the vertical movements of the sets of partial cells, and that when the upper set is away from the turner position the wing is projected outwardly to position across the channel, and that whenever the upper set of partial cells is moved towards the turner position the wing is turned around at a position parallel to the channel length as shown in Figure 21, in comparison to the position of Figure 20. The result is that upon movement of the upper set of partial cells of the primary channel towards the turner, the wing 158 is swept around the corner to swing the two doughnuts into right angles to the length of the primary channel and into proper position to be turned by the turner, as shown in Figure 21. The wing 160 for the secondary channel operates in manner similar to that just explained. That is, when the upper set of blades for the upper partial cells of the secondary channel is moved away from the position of the turner, the wing 160 is swept from the position of Figure 21 to that of Figure 20, and the doughnuts in the cross-connection are swept around the corner into alignment with the secondary channel and ready to be transferred along said channel in the manner previously explained.

It is noted that each of the wings is moved to the parallel position when the upper partial cells are moved towards the position of the turner, and into the right angled position when the upper partial cells are moved away from the turner, due to the relationship established by the rack bars 164 and 165 with the segmental gears 162 and 163; and that such relationships are maintained when the partial cells are in either the raised or the lowered condition.

The turner shown in connection with the arrangement of Figures 20 to 26 inclusive is similar to that already explained, but necessarily the turner of these latter figures is of double width so as to accommodate two doughnut forms at the same time; but said turner is so located that the wing 158 will move the doughnuts directly onto the turner, and when the turner has been turned over the doughnuts are delivered directly into position to be swept around the corner into the secondary channel.

It is to be noted that when a pair of doughnuts is in the position at the left hand end of the primary channel ready for actuation by the wing 158, when the partial cells at that side of the machine are lowered so as to bring the wing 158 behind said doughnuts they might float away to an improper position before the wing sweeping action could be performed. In order to prevent any such undesirable action I have provided the trap in the form of the special end cell 166 on the turner end of the lower set of partial cells for the primary channel. When the partial cells are raised this special end cell will trap the doughnuts therein, and retain them under control until the partial cells are lowered so that the doughnuts come under control of the wing 158.

In the modified arrangement of Figures 25 and 26, there is provided a longitudinally extending partition 167 which extends centrally along each of the channels and across the cross-connection at the turner end; said partition reaching up substantially to the level of the grease surface, and serving to divide each channel into a pair of sub-channels, likewise cross-connected at the turner end. The doughnuts will travel along these sub-channels in individual lines, and will turn around the cross-connection at the turner end while still maintaining their individual lines of travel. This will prevent improper movements and confusion of the doughnuts, especially at the cross-connection, and will promote the regularity of their movements at all times.

It is seen that there are provided the notches 168 and 169 in this partition 167, in line with the rack bars 164 and 165, since when these rack bars are projected towards the cross-connection they will pass the limits defined by the partition 167. It is also seen that this partition is discontinuous at the position of each of the blades of the lower sets of partial cells, as shown at 170, since these lower blades must be capable of lowering movement to a position completely below the top edges of the partition. It is also noted, in Figure 26, that each of the upper blades of the partial cells is notched on its lower edge as at 171, since such blade must be capable of lowering movement to a point where it would interfere with such partition. Sometimes this partition, when provided, may be used only across the end cross-connection, where there is especial danger of improper doughnut movements, due to the effects of the wing movements.

In Figure 28 I have shown a modified arrange-

ment of the dropping plate, in which said plate may be intermittently rotated, as distinguished from a strictly continuously and unvarying movement. In this case, I have provided the ratchet wheel 172 instead of the worm wheel previously described, and I have provided the rocking arm 173 pivoted for rocking movement about the shaft 111, the pawl 174 being carried by said arm and adapted to advance the ratchet wheel. I have also provided the bell crank 175 pivoted on to the bracket plate 132 at the point 176. A link 177 connects one arm of the bell crank with the rock arm 173, and the other arm of the bell crank either directly contacts with the bar 68 or 69, or carries an extension which does so contact with the bar 68 or 69. In either case, as the partial cells at that side of the machine perform a complete up and down movement the bell crank moves up and down to thereby advance the dropping plate. A spring 178 is provided for restoring the bell crank and link to its position after the bell crank has been raised.

It is noted that with the arrangement just described the movements should be so proportioned that the dropping plate will advance the distance of one doughnut cell for each doughnut dropped by the doughnut cutter; that is one cell for each operation of the partial cells, for the arrangement of Figures 1 to 19, inclusive, or two cells for each operation of the partial cells for the arrangement of Figures 20 to 24 inclusive.

In the modified arrangement of Figure 27 I have shown a dropping plate in which the individual wires 112 of the previous structure have been replaced by the more or less solid partitions 179, 180, 181 and 182, reaching up far enough to retain control over the doughnut forms contained within the several cells.

Especial attention is directed to the operation of the dropping plate in its relation to the means for advancing the doughnut forms along the channels. This dropping plate may be operated at such a speed as will take the doughnuts dropped by the doughnut cutter, irrespective of the rate at which said cutter is capable of cutting the doughnuts, receiving the individual doughnut forms in the individual cells of the dropping plate, and retaining them in said cells until a later time when the doughnut forms have been encrusted to an extent sufficient to permit them to withstand lateral advancing forces exerted by rapidly travelling conveyors. Thus, for example, there is a form of cutter in successful operation capable of cutting and delivering doughnuts at the rate of substantially one each second; but if these doughnuts were to be advanced by an intermittent conveyor operating at a cyclic movement of one each second, with the necessary starts and stops, and with the necessary intervals of rest between movements, very severe forces would have to be exerted on the sides of the doughnut forms, and if said doughnut forms were to be delivered immediately to the conveyor mechanism before becoming encrusted to a considerable extent they would be deformed into elliptical forms, and otherwise damaged. By my dropping plate arrangement the individual newly dropped doughnut forms are retained within individual cells of a slowly rotating dropping plate which turns at substantially constant speed so that said doughnuts are not subjected to starts and stops, but are allowed to progress continuously and regularly for a considerable interval of time, and until they have become encrusted, and thereafter they are delivered to the intermittently operating conveying mechanism.

The foregoing beneficial effect is especially evident in the modified arrangement of Figures 20 to 24 inclusive wherein the conveying mechanism operates at one half speed as compared with the previous form, since the conveyor has to make a cycle of movements only for each two doughnuts dropped instead of for each single doughnut dropped. This same principle might be still further multiplied, as for example, to accommodate three or even four doughnuts in each cell, and side by side therein, the turner and other mechanisms being similarly proportioned; and if need be, the channels being similarly sub-divided into three or four or more subdivisions. In any such case each line of doughnuts would progress in direct form and order from the dropping plate to the turner, and finally to the delivery device, with the doughnut cutter operating at high speed, and all within a machine of much smaller size than would otherwise be needed for a machine of comparable capacity in forms cut and cooked and delivered per hour.

I wish to emphasize the simplicity and clean cut form of this machine, and the fact that it may be taken apart and cleaned, and again assembled in very simple manner. Also that when the various units are removed from the pan or channel member said member may be readily cleaned, since it is entirely free of operating parts and comprises merely a simple clean-cut channel shaped member. Also, that each of the operating devices may at such time be readily adjusted and repaired or replaced, and may be replaced substantially without need of special adjustments for timing parts.

While I have herein shown and described only certain embodiments of the features of my present invention, still I do not intend to limit myself thereto, except as I may do so in the claims to follow.

If desired, a cover plate may be placed over a portion of the central chamber 34 so as to enclose and protect the same. In such case said cover plate may be provided with suitable edge openings or slots to accommodate the movements of the inverted U-shaped members whereby the various sets of partial cells are supported and operated, and also to give proper access to the turner mechanism, etc. The bracket 132 for the dropping plate mechanism may be placed above such cover plate as shown in Figure 1.

In Figure 29 I have shown a modified arrangement of the connection between one of the horizontal shifting cranks and the upper bar for one of the upper sets of partial cells. In this arrangement the said upper bar is provided with a pair of vertical arms 183 and 184 between which is received the pin of the crank 106, so that as said crank executes its half turn from one horizontal position to the other, the bar 68 is shifted horizontally the distance equal to the throw of the crank. Such horizontal shift will occur always to the same extent irrespective of the elevation of the bar 68, whether up or down, within the limits of the arms 183 and 184; and with this arrangement any effect of angularity such as due to connecting rods of the previous arrangement is eliminated. It will be understood that such an arrangement as that of Figure 29 may be used at each side of the machine, for control of both of the upper bars, and I have only shown one side of the machine in Figure 29 for purposes of simplicity.

I claim:

1. In a machine of the class described, the combination of a frying pan including two channels parallel to each other and connected together at one end, means to introduce articles into one end of one channel, means to turn over the articles at the position of the end connection aforesaid, and means to advance the articles along the two channels, from the position of introduction along one channel to the turning position, and from the turning position along the other channel to a delivery position, said advancing means comprising an upper and a lower set of partial cells in each channel, means to move both sets of partial cells in each channel vertically in the same direction simultaneously, and also to cause such vertical movement of the partial cells in one channel upwards at the same time as downwards in the other channel, and means to shift the upper sets of partial cells in the two channels longitudinally along the channels simultaneously, in one direction when one set is lowered and the other is raised, and in the other direction when the first mentioned set is raised and the other set is lowered.

2. In a machine of the class described, the combination of a frying pan including two channels parallel to each other and connected together at one end by a cross-connection, means to introduce articles into one end of one channel, means to turn over the articles at the position of the cross-connection, and means to advance floating articles along the first mentioned channel towards the turning means, and along the second mentioned channel from the turning means, comprising two sets of partial cells in each channel, one such set above the other, and each including partial cells located lengthwise of the channel at spacings equal to the desired spacing between the frying articles, means to raise both sets of partial cells in one channel simultaneously with lowering of both sets of partial cells in the other channel, and means to shift both sets of upper partial cells towards the turning means simultaneously and to shift both sets of partial cells away from the turning means simultaneously.

3. In a machine of the class described, the combination of a frying pan including two channels parallel to each other and connected together at one end by a cross-connection, means to introduce articles into one end of one channel, means to turn over the articles at the position of the cross-connection, and means to advance floating articles along the first mentioned channel towards the turning means, and along the second mentioned channel from the turning means, comprising two sets of partial cells in each channel, one being an upper set and the other being a lower set, means to raise and lower the two sets in each channel simultaneously, with movements in the two channels in opposition to each other, and means to move the upper sets of partial cells in the two channels back and forth in said channels, with movements in both channels in the same direction simultaneously.

4. In a machine of the class described, the combination of a frying pan including two channels and a cross-connection connecting their ends together, turning means at the position of said cross-connection, means to introduce articles into one channel at its end away from such cross-connection, and means to advance the floating articles along one channel towards the cross-connection and along the other channel away from the cross-connection, comprising two sets of partial cells in each channel, one above the other, means to raise and lower the two sets in each channel simultaneously, and means to move the upper partial cells of each channel longitudinally along such channel, first in one direction and then in the other direction, with movements towards the turning means in the first mentioned channel when the partial cells are in lowered position, and away from the turning means in the other channel when the partial cells thereof are in lowered position.

5. In a machine of the class described, the combination of a frying pan including two channels and a cross-connection connecting their ends together, turning means at the position of said cross-connection, means to introduce articles into one channel at its end away from the cross-connection, and means to advance the floating articles along one channel towards the cross-connection and along the other channel away from the cross-connection, comprising a set of partial cells in each channel, means to raise and lower said sets of partial cells alternately and in opposition in the two channels, and means to move the sets of partial cells back and forth in the two channels, simultaneously in both said channels.

6. In a machine of the class described, the combination of a channel along which frying articles are to be advanced, means to advance said articles along said channel with a step by step movement, a cellular dropping plate at one end of said channel and including a series of cells, means to rotate said dropping plate to bring its cells into registry with the channel in rotation, means to drop a dough batch into each cell of the dropping plate, and means to turn over the articles at the opposite end of the channel.

7. In a machine of the class described, the combination of a channel along which frying articles are to be advanced, means to advance said articles along said channel with a step by step movement, a celled circular dropping plate mounted for continuous uniform rotation about a vertical axis, means to rotate the dropping plate in time with the operations of the advancing means, and means to drop dough batches into the successive cells of the dropping plate.

8. In a machine of the class described, the combination of a channel along which frying articles are to be advanced, means to advance said articles along said channel with a step by step movement, with consequent periods of acceleration and deceleration, a dropping plate at the begininng end of said channel, having a series of cells around its periphery, means to rotate said dropping plate about a vertical axis with a continuous rotary movement, means to drop dough batches into the several cells of the dropping plate in succession, and means to transfer the articles from the cells of the dropping plate to the channel in succession.

9. In a machine of the class described, the combination of a channel along which frying articles are to be advanced, means to advance said frying articles along said channel with a step by step movement with consequent periods of acceleration and deceleration, a continuously moving dropping plate at the beginning end of said channel, and having a series of cells for individual accommodation of freshly dropped articles, means to drop dough batches into the cells of the dropping plate in succession, and means to drive the dropping plate harmoniously

with the movements of the advancing means, whereby each freshly dropped dough batch is accommodated within a cell of the dropping plate for an interval of time prior to being subjected to the accelerations and decelerations of said advancing means.

10. In a machine of the class described, the combination of a channel along which frying articles are to be advanced, means to advance the articles along said channel with a step by step movement with consequent periods of acceleration and deceleration, a continuously moving dropping plate having cells for accommodation of a plurality of individual dough batches therein, means to drop fresh dough batches into said cells of the dropping plate at a location away from the channel, means to move the dropping plate with a continuous movement to carry the said dough batches to position for transfer to the channel, and means to transfer the dough batches from the dropping plate cells to the channel in time with the movements of the advancing means aforesaid.

11. In a machine of the class described, the combination of a channel along which dough batch articles are to be advanced, means to advance the articles along said channel with a step by step movement with consequent periods of acceleration and deceleration, a continuously moving dropping plate in position adjacent to said channel, means to drive said dropping plate with a continuous movement, a series of cells for freshly dropped dough batches in said dropping plate, and means to transfer said dough batches from the dropping plate cells to the channel in time with the movements of the advancing means aforesaid.

12. In a machine of the class described, the combination of a channel along which frying articles are to be advanced, means to advance the articles along said channel with a step by step movement with a consequent series of accelerations and decelerations, a continuously moving dropping plate adjacent to the beginning end of said channel, and having a series of individual cells for accommodation of freshly dropped dough batches, means to drop the dough batches into said dropping plate cells in proper timing, and means to transfer the dough batches from the dropping plate cells to the channel in time with the operations of the advancing means and only after remaining on the plate several periods, whereby each freshly dropped dough batch is retained for a substantial interval of time within a cell of the dropping plate prior to entering the channel.

13. In a machine of the class described, the combination of a channel along which dough batches are to be advanced, means to advance the dough batches along said channel with a step by step movement with consequent periods of acceleration and deceleration, means to drop fresh batches of dough at a point adjacent to the beginning end of the channel where the batches are not subject to periodic acceleration and deceleration, means to retain each said freshly dropped dough batches for an interval of time equal to at least several of said periods prior to entrance into the channel, and means to thereafter transfer the individual dough batches into the channel for action thereon by the advancing means aforesaid.

14. In a machine of the class described, the combination of a channel along which frying articles are to be advanced, means to advance the articles along said channel with a step by step movement with consequent intervals of acceleration and deceleration, a continuously moving dropping plate adjacent to the beginning end of said channel, said droppig plate having a series of cells for individual freshly dropped dough batches, means to drop the dough batches into the dropping plate cells, and means to transfer the dough batches from the dropping plate cells to the channel after an interval equal to a plurality of dough batch dropping operations.

15. In a machine of the class described, the combination of a channel having a turn at one end, means to drop dough batches into the hot grease, means to advance said dough batches along the channel with a step by step movement, and means to sweep the dough batches around said bend, comprising a sweep arm pivoted at the point of the bend, means to raise and lower said sweep arm, and means to sweep the arm back and forth alternately in one direction and then the other between the raising and lowering movements.

16. In a machine of the class described, the combination of a channel having a turn at one end, means to drop dough batches into the hot grease, means to advance the dough batches along the channel, and means to sweep the dough batches around the turn, comprising a sweep arm, means to raise and lower said sweep arm, and means to sweep the arm back and forth at intervals between the raising and lowering movements.

17. In a machine of the class described, the combination of a channel along which dough batches are to be advanced, said channel accommodating a plurality of lines of the dough batches, means for swinging the lines of dough batches around a corner, and means for thereafter turning over one dough batch of each line simultaneously.

18. Apparatus for advancing doughnuts along a channel of an automatic doughnut forming and cooking machine containing hot liquid for frying the doughnuts and adapted to have uncooked doughnuts periodically introduced into one end thereof, including: a set of spaced elements extending transversely of the channel and vertically movable together; a second set of similarly spaced elements extending transversely of the channel above the first set, the second set being vertically movable from a position in the liquid to a position completely out of the liquid and reciprocable longitudinally of the channel a distance equal to the spacing between elements; means for moving the upper set longitudinally of the channel while both sets are in lowered position to cause doughnuts floating between the elements of the upper set to be advanced a desired distance in a predetermined time; means for raising both sets to remove the upper set from the liquid and cause the lower set to retain the doughnuts in the advanced position; and means for moving the upper set of elements, while out of the liquid, back to their initial position longitudinal of the tank and for then lowering both sets to repeat the cycle of operation.

19. Apparatus of the character claimed in claim 18, wherein said channel is one of two channels with means therebetween for overturning the doughnuts.

CHARLES E. CARPENTER.

CERTIFICATE OF CORRECTION.

Patent No. 2,201,364. May 21, 1940.

CHARLES E. CARPENTER.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 1, second column, line 22, for "complement" read --supplement--; page 4, first column, line 14, for the reference numeral "25" read --35--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 9th day of July, A. D. 1940.

(Seal)

Henry Van Arsdale,
Acting Commissioner of Patents.