Aug. 3, 1937. J. C. BERGNER 2,089,158

DOUGHNUT MACHINE

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FIG. I.

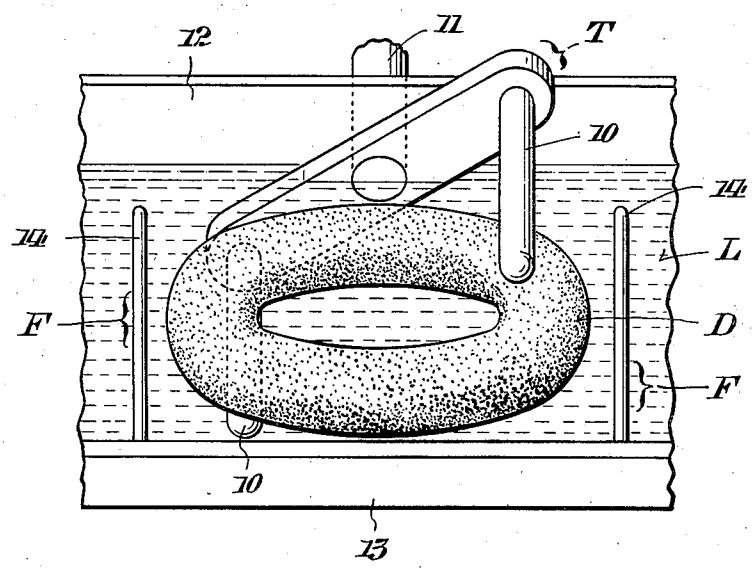


FIG. II.

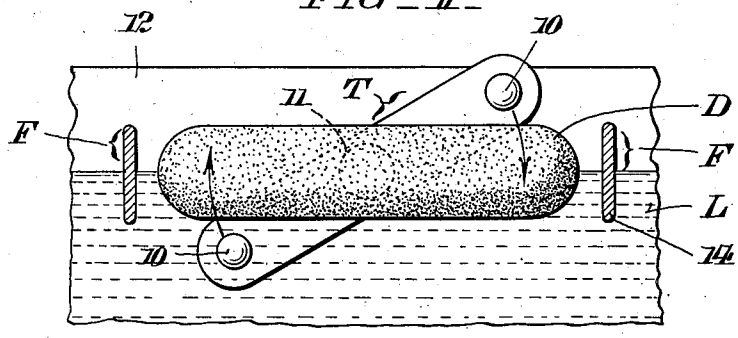
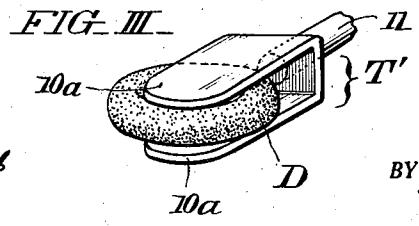


FIG. III.



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DOUGHNUT MACHINE

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FIG. IV.

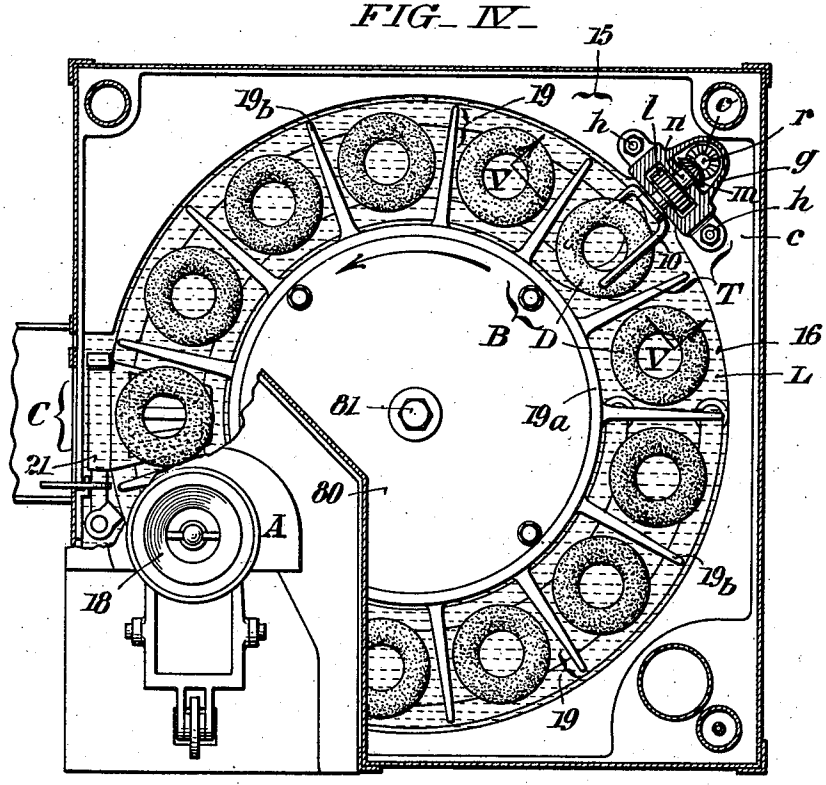


FIG. VI.

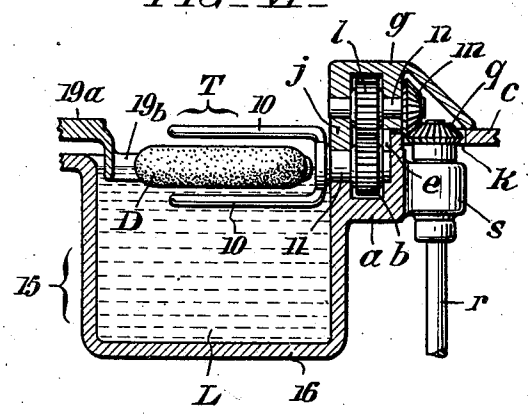
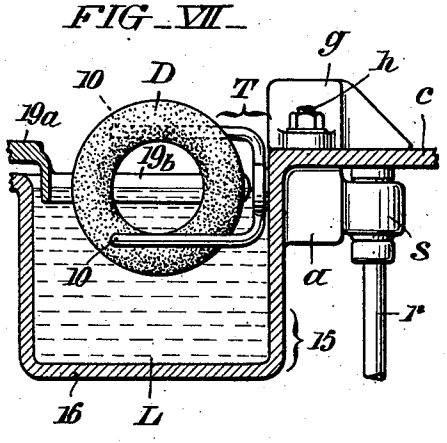


FIG. VII.



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DOUGHNUT MACHINE

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FIG. IX.

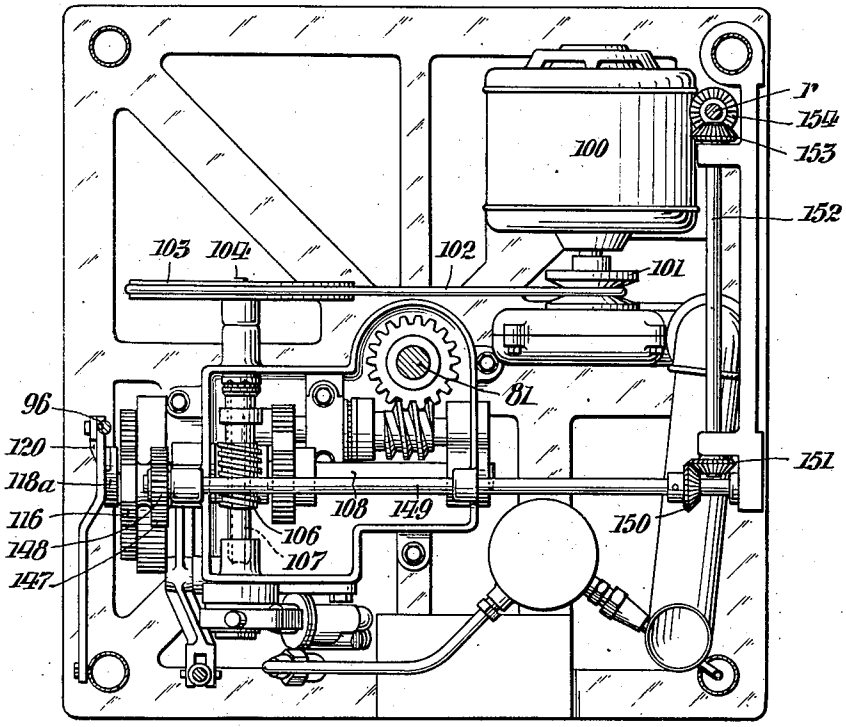
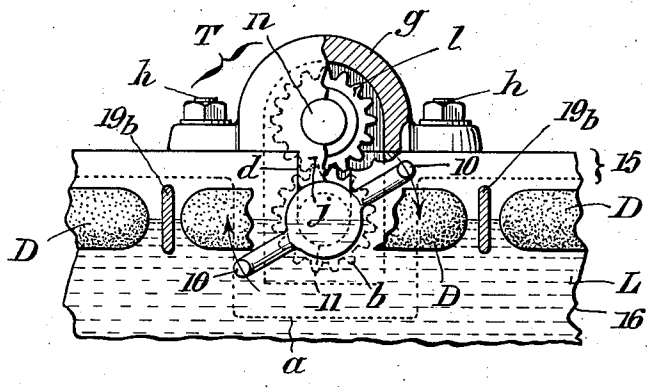


FIG. V.



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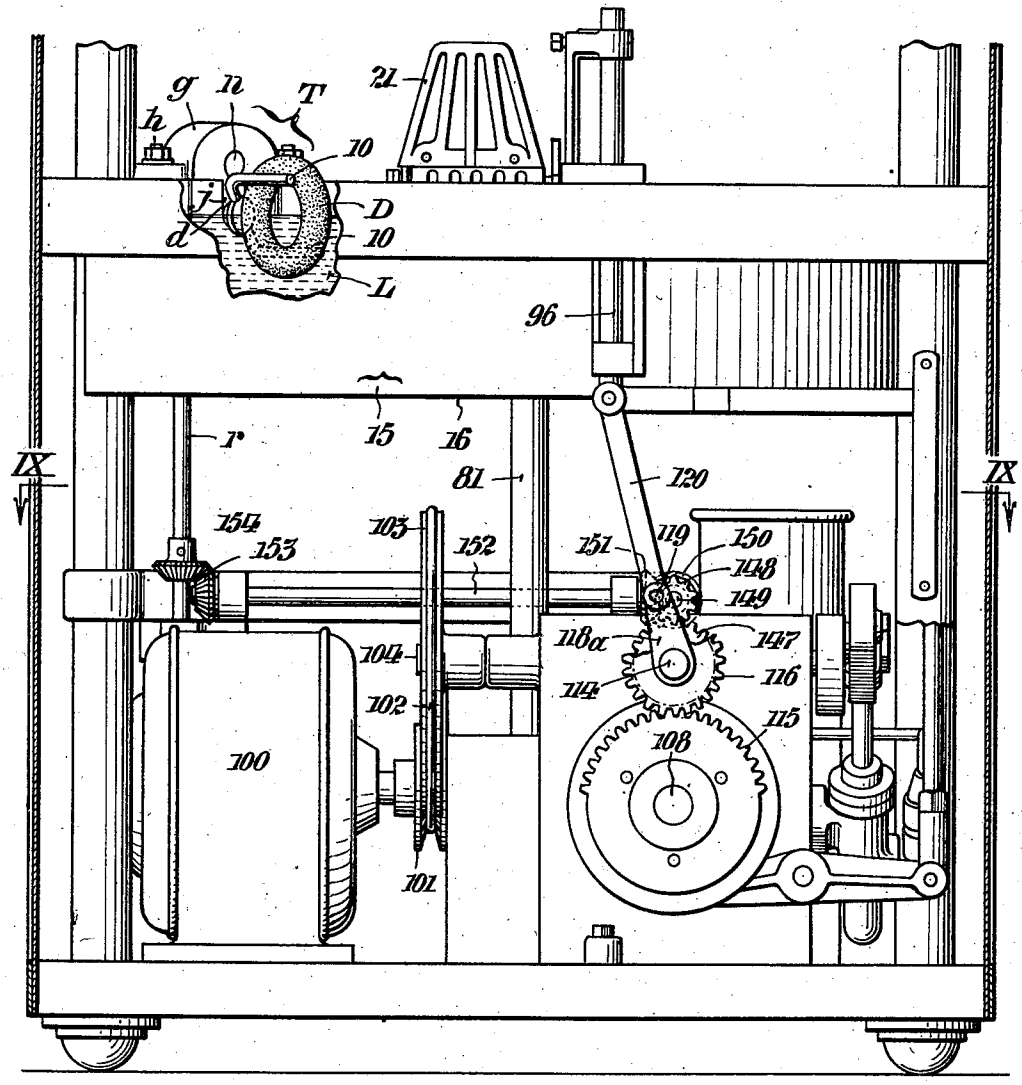
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DOUGHNUT MACHINE

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FIG. VIII



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Patented Aug. 3, 1937 2,089,158

UNITED STATES PATENT OFFICE

2,089,158

DOUGHNUT MACHINE

John C. Bergner, Lansdowne, Pa., assignor to Doughnut Corporation of America, New York, N. Y., a corporation of New York

Application March 5, 1935, Serial No. 9,442

3 Claims. (Cl. 53—7)

This invention relates to the cooking and handling of doughnuts and the like, and especially to turning such articles which is generally done for the purpose of cooking them alike on both sides. It not only involves a new type of turning device, but also the correlation of the turning device with means for feeding along or progressing the doughnuts. In suitable forms of embodiment, the invention affords a simple and rugged mechanism, very certain in its action, not easily deranged, and very little liable to deform the doughnuts or other articles on which it acts. It can be easily adapted and applied to present commercial types of doughnut machines, and even to existing machines. Other features and advantages of the invention will appear from the following description of species thereof, and from the drawings.

In the drawings, Fig. I is a somewhat diagrammatic tilted or perspective side view of a turnover device conveniently embodying my invention, in association with a progressing means.

Fig. II is a corresponding elevation showing only the pushers of the progressing means, in section.

Fig. III is a diagrammatic perspective view of a somewhat different form of the turnover device.

Fig. IV is a plan view of one commercial form of doughnut machine with my turnover device applied thereto.

Fig. V shows a fragmentary arcuate section through the machine of Fig. IV, taken as indicated by the line and arrows V—V in Fig. IV, with one of the parts partially broken away.

Fig. VI shows a fragmentary radial section through the cooking trough of the machine shown in Fig. IV, at the turnover.

Fig. VII is a view similar to Fig. VI showing the device in the act of turning over a doughnut.

Fig. VIII is a side elevation of the machine shown in Fig. IV, with its external casing and other parts partly broken away and partly in vertical section.

Fig. IX is a plan view of the operating mechanism shown in Fig. VIII, with parts above a plane of section indicated by the line and arrows IX—IX in Fig. VIII removed.

Figs. I and II show cooking liquor L (such as hot grease or oil), and a doughnut D of ordinary annular form afloat at the surface of the liquor L, as during cooking. The doughnut-turning device T comprises substantially horizontal and parallel doughnut-engaging "finger" members or "prongs" 10, 10 projecting from a cross-bar on the end of a substantially horizontal shaft or axis 11 located substantially or approximately at the plane of the surface of the liquor L. Preferably, the fingers or prongs 10, 10 are both offset (oppositely) from the axis 11. With the distance apart of the fingers 10, 10 and their angular position about the axis 11 here shown, the finger 10 that is uppermost overlies and engages the doughnut D near its righthand edge, while the other finger 10 underlies and engages the doughnut D near its lefthand edge. Fingers 10, 10 such as shown in Figs. I and II may aptly be termed "tine fingers", to distinguish them from the wide, flat, closely spaced fingers illustrated in Fig. III, and described hereinafter. Clockwise rotation of the device T (as indicated by the arrow) will first swing the right-hand edge of the doughnut D down into the liquor L and its left-hand edge up into the air, and then turn the doughnut on completely over, about the axis of the shaft 11. Rotation of the device T 180° clockwise from the position shown will invert the doughnut D in this manner and positionally interchange the individual tine fingers 10, 10; a further 180° clockwise rotation of the device T will again invert the doughnut and restore the individual fingers 10, 10 to their very positions in Figs. I and II; and so on indefinitely.

The doughnut D may also be turned in a similar way by rotating the device D counter-clockwise. From the position shown, the first 100° or so of counter-clockwise rotation of the device T would merely reverse the relation of the fingers 10, 10 to the right and left-hand edges of the doughnut: thereafter, each 180° of counterclockwise rotation would invert the doughnut. Successive inversions of the doughnut D may also be produced by turning the device T counter-clockwise and clockwise alternately from the position shown,—each time through an angle of over 180°.

Doughnuts D may be fed along or progressed in the liquor L, into and out of the turning device T, by any suitable means,—many of which are well known in the art,—as by flow of the liquor L, or by air-jets above the liquor arranged to blow the floating doughnuts along. As shown, a definite guideway or channel is provided for the travel of doughnuts, being formed by a guide or wall 12 at the rear of Fig. I and another member 13 in front. I have found that positive mechanical means F may be used with the turner T for feeding along or progressing the doughnuts, such as a plurality of pusher arms or vanes 14 pro-

jecting across the channel just mentioned from the member 13, which may move as a travelling carrier or support for the arms 14. This travelling support 13 may have the character of a (flexible) band or belt travelling horizontally in a vertical plane, either from left to right or from right to left in the drawings. Two pusher vanes 14, 14 are here shown, with a sufficient interval or space between them to accommodate the doughnut D comfortably. These vanes 14, 14 coact with the members 12, 13 to form a confining cell for the doughnut. In the present instance, the doughnut-progressing means F with its projecting pushers 14, 14 and the fork-like turning device T with its fingers 10, 10 "face" toward each other, and the turnover shaft 11 is associated with and extends through the guide or wall 12,—although these relations may be reversed, if desired, in some cases. Preferably, both the progressing means F and the turnover T have intermittent motions, in alternation with one another.

The spacing apart of the tine fingers or prongs 10, 10 shown in Figs. I and II affords space between them for passage of the pushers 14, 14 (as well as of the doughnut D) in the travel of the progressing means,—even with the tine fingers 10, 10 in positions considerably to right and left of the axis 11 as shown. Such positions of engagement of the tine fingers 10, 10 with the doughnut D give them, perhaps, a better hold on the doughnut for turning it than would obtain with a spacing of these fingers just sufficient to pass the pushers 14, 14 with the fingers in the vertical plane of the axis 11; but it is not essential. Accordingly, Fig. III illustrates a fork-like turner T' in which the fingers or prongs 10*a*, 10*a* are spaced so closely as just to accommodate the doughnut D between them—with reasonable clearance to allow for variations in doughnut thickness and to allow passage of pushers (not shown) between the fingers when the latter are in the vertical plane of the axis 11. These fingers 10*a*, 10*a* are wide and flat, like plates,—as distinguished from a tine-like form such as the round rods of Figs. I and II,—to afford a greater area of contact with the doughnut D, although such wide, flat form of the fingers 10*a*, 10*a* is not essential.

Figs. IV–IX illustrate the combination of my tine-type doughnut-turning device shown in Figs. I and II in a commercial doughnut machine such as shown in U. S. Patent No. 1,817,887, granted August 4, 1931, to H. T. Hunter as inventor. Except as otherwise hereinafter indicated, the construction and operation of the doughnut machine may correspond exactly with said Hunter Patent No. 1,817,887, and hence need not be here described in detail, but may be briefly explained as follows:

The cooking receptacle 15 shown affords an annular channel or trough 16 for the liquor L and the doughnuts D, which are successively dropped into the liquor by a former 18 at a station A. The doughnuts D are carried around in the receptacle 15 by a rotary spider-like progressing device 19, comprising an annular rim 19*a* with radiating vanes 19*b*. The rim 19*a* is attached to a disc 80 fast to an upright drive shaft 81 that turns intermittently in steps corresponding to the spaces or cells between the successive pusher vanes 19*b*. On its way, each doughnut D is inverted at a station B, nearly opposite the introduction station A, to assure the cooking on both sides. By the time each doughnut D has made the circuit of the trough 16 and reached a station C adjacent the introduction station A, it is fully cooked, and is ejected from the apparatus by an ejector 21.

Fig. IV (which corresponds to Fig. III of the Hunter patent) shows my turner T substituted for the manipulating device 20 of that patent. The intermittently rotating spider 19 of the patent is retained for progressing the doughnuts; but its pusher vanes 19*b* radiating from the annulus 19*a* (which correspond to the vanes 14, 14 in Figs. I and II) are made somewhat narrower in order to pass the turner T as above explained. Unlike the turnover device 20 of said Hunter patent, my turning device T inverts each doughnut in the same cell of the spider 19 in which the doughnut reaches the station B,—instead of transferring the doughnut to the next cell ahead, as described in said Hunter patent.

As shown in Figs. IV–VII, the cooking-liquor receptacle 15 has a gear compartment or pocket *a* (Figs. V–VII) which may be cast integral therewith, to accommodate a toothed gear *b* fast on the turner shaft 11. This compartment *a*, which opens upward through the top apron *c* of the receptacle 15, has a notch *d* with semi-circular bottom in its wall next the receptacle 15, and also has a shallow vertical groove *e* in its opposite wall, likewise semi-circular at its lower end. Notch *d* and groove *e* accommodate and journal the turnover shaft 11. Compartment *a* is closed at the top by a cover *g*, removably secured to the apron *c* by bolts *h*. Cover *g* has at its lower side a projection *j* (Figs. V and VIII) that extends down into the notch *d* and has its lower end semi-circularly hollowed to fit the shaft 11, which is thus properly journaled and held in alignment. Cover *g* (Figs. VI and VII) extends over a gear opening *k* in the apron *c*, beyond the opening to pocket *a*, and itself has gear compartments or pockets for a toothed gear *l* and a (bevel) gear *m*, both fast on a shaft *n* journaled in the walls of the cover compartment containing gear *l*. Gear *l* overlies and meshes with gear *b* on turner shaft 11, and (bevel) gear *m* meshes at opening *k* with a (bevel) gear 9 fast on the upper end of an upright turner-drive shaft *r*. Shaft *r* is shown journaled in a bearing lug *s* that may be cast integral with gear compartment *a*.

Figs. VIII and IX (corresponding to Figs. V and IV of the Hunter patent) illustrate the actuating mechanism of the Hunter patent, with certain modifications entailed by substitution of an intermittently rotating turner T for Hunter's oscillatory turnover 20. As here shown, an (electric) motor 100 beneath the receptacle 15 has belt and pulley connections 101, 102, 103 to a shaft 104 which in turn has worm connections 106, 107 to a "master" shaft 108, and this master shaft 108 gives intermittent motion, through a mutilated gear couple 115, 116, to a shaft 114,—all as shown and described in said Hunter patent. Instead, however of the rather complicated combination of eccentrics (117 and 118) shown and described in the Hunter patent, shaft 114 carries a simple crank 118*a*, whose crank pin 119 is connected by a link 120 to the ejector-actuating slide rod 96 of the Hunter patent. Besides crank 118*a*, shaft 114 drives (through gears 147, 148) a shaft 149 which in turn drives (through bevel gears 150, 151) a shaft 152 that is connected (by bevel gears 153, 154) to the above-mentioned upright drive shaft *r* of the turner T.

The general operation of the doughnut machine and its various mechanisms remains as described in the Hunter patent,—excepting only as to the turner T, which operates as described in connec-

tion with Figs. I and II. Figs. V and VI make plain how the vanes 18b push doughnuts D into the turner T and themselves pass the turner; and Figs. VII and VIII show the turner T in the act of turning over a doughnut D, which appears in the vertical mid-position of its turning-over movement.

In Figs. IV–IX, various parts and features are marked with the same reference characters as in Figs. I and II or as in the Hunter Patent No. 1,817,887 (with an added letter, where such distinction appears necessary), as a means of dispensing with repetitive detailed description.

Having thus described my invention, I claim:

1. In apparatus for handling doughnuts afloat at the surface of cooking liquor, the combination with a cooking vessel for the liquor, of a turnover device comprising upper and lower engagement members adapted and arranged to engage a doughnut floating on the liquor on top and underneath and having a shaft or axis extending out through the side of the vessel, a gear on said shaft outside the vessel, and means for actuating said turnover device from beneath the vessel including a gear mounted above and meshing with said first-mentioned gear.

2. In apparatus for handling doughnuts afloat at the surface of cooking liquor, the combination with a cooking vessel for the liquor having a top apron with a gear opening therein, and also provided with an external gear compartment open upward through said apron between said gear opening and the wall of the vessel, of a turnover device comprising upper and lower engagement members adapted and arranged to engage a doughnut floating on the liquor on top and underneath and having a shaft or axis extending out through the side of the vessel, a gear on said shaft in said compartment, and means for actuating said turnover device from beneath the vessel including an upright shaft with a gear thereon at said gear opening, a gear box secured to said apron over said gear opening and said gear compartment, and gear means in said gear box meshing with said turning device gear and with said gear on said upright shaft.

3. A turnover device, for doughnuts afloat on the cooking liquor, arranged to turn about a substantially horizontal axis approximately at the surface of the cooking liquor, and comprising upper and lower tine fingers extending in the general direction of said axis, but spaced apart and oppositely offset from said axis so as to engage over and under a floating doughnut near its edges at opposite sides of the axis, and thus turn it over about said axis when the device is correspondingly turned thereabout.

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