

April 7, 1942.

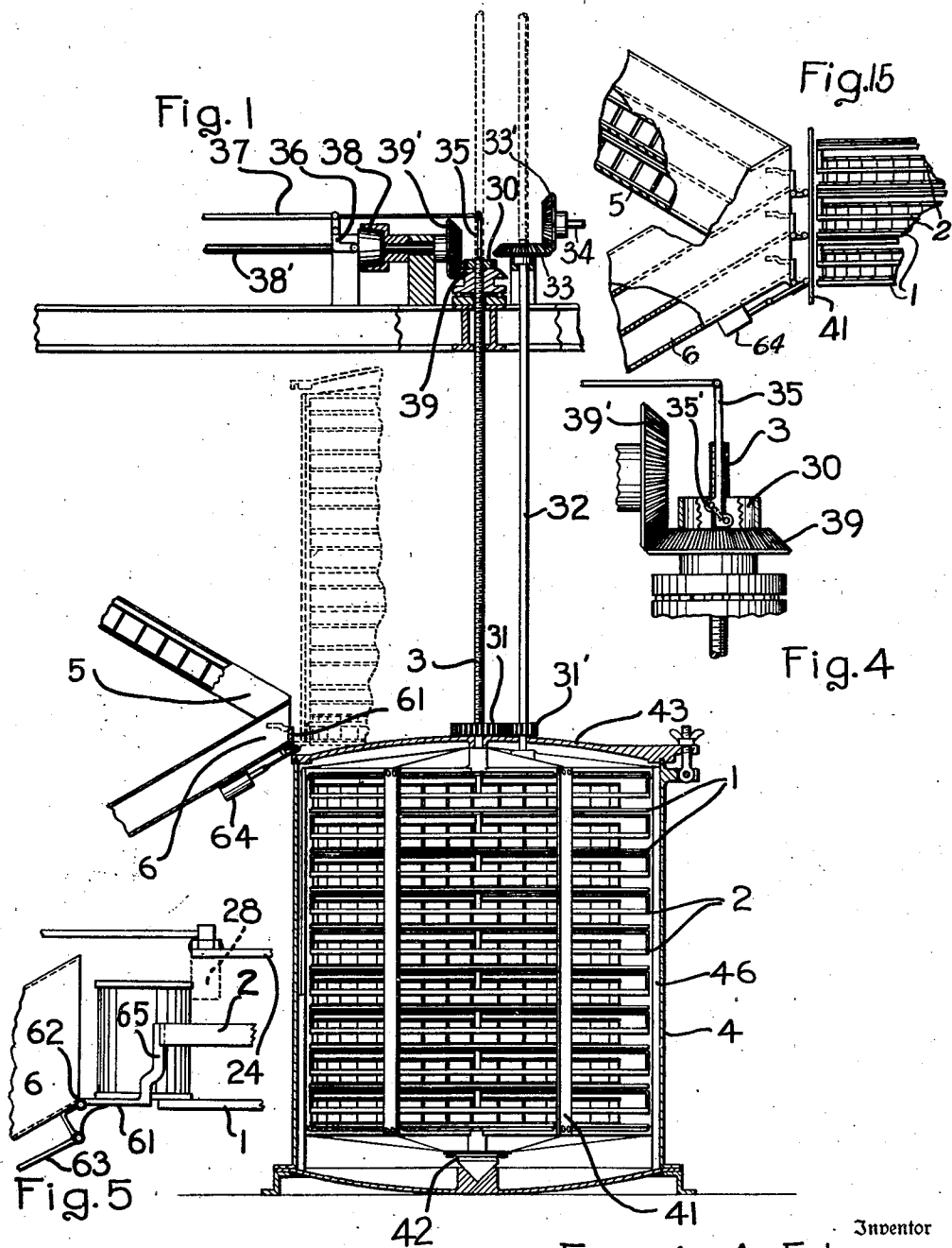
F. A. FAHEY

2,278,434

CAN HANDLING MECHANISM

Filed Sept. 25, 1939

4 Sheets-Sheet 1



Inventor

Francis A. Fahey

By

Charles L. Reynolds

Attorney

April 7, 1942.

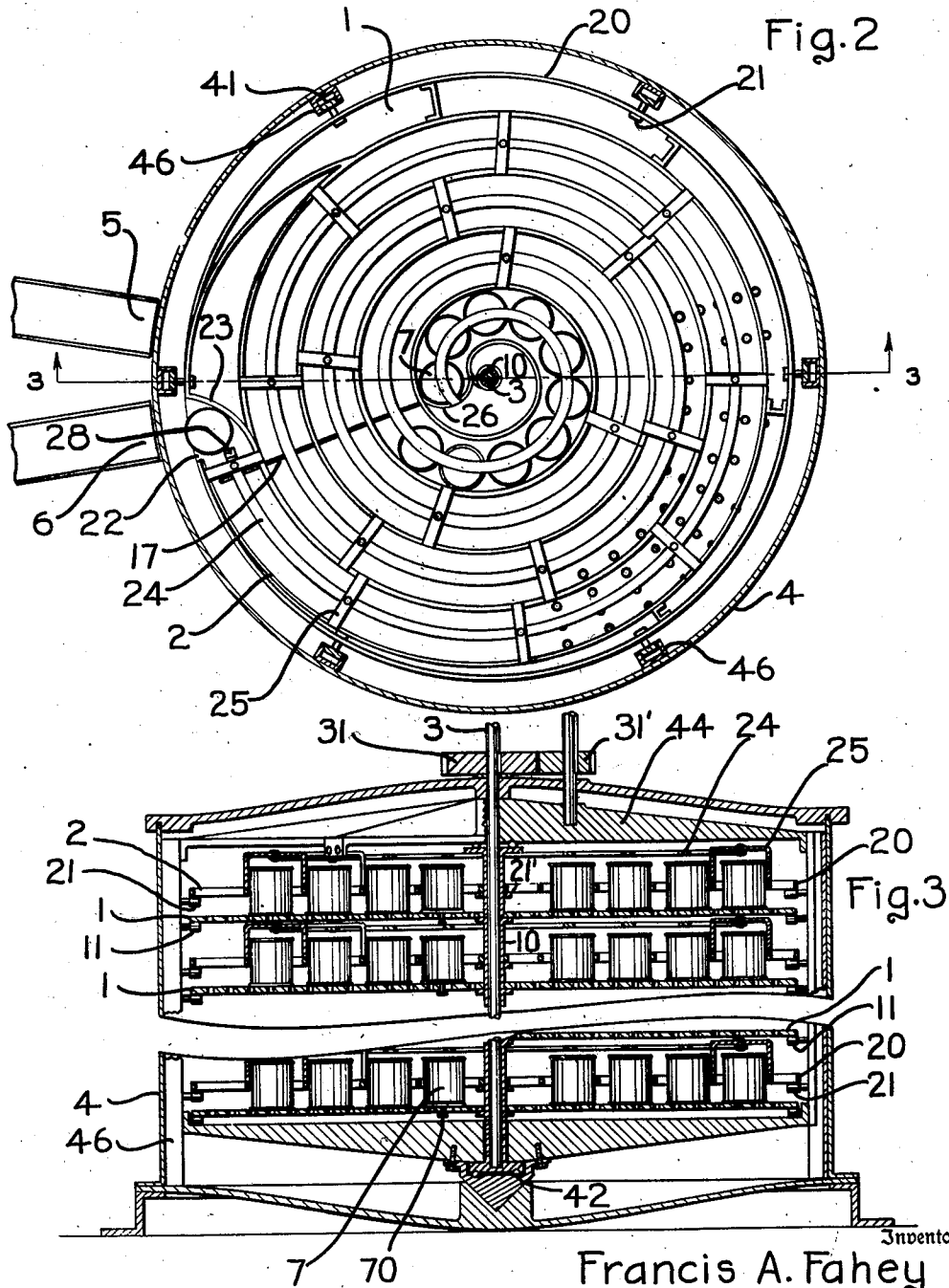
F. A. FAHEY

2,278,434

CAN HANDLING MECHANISM

Filed Sept. 25, 1939

4 Sheets-Sheet 2



Francis A. Fahey

Charles L. Reynolds
Attorney

April 7, 1942.

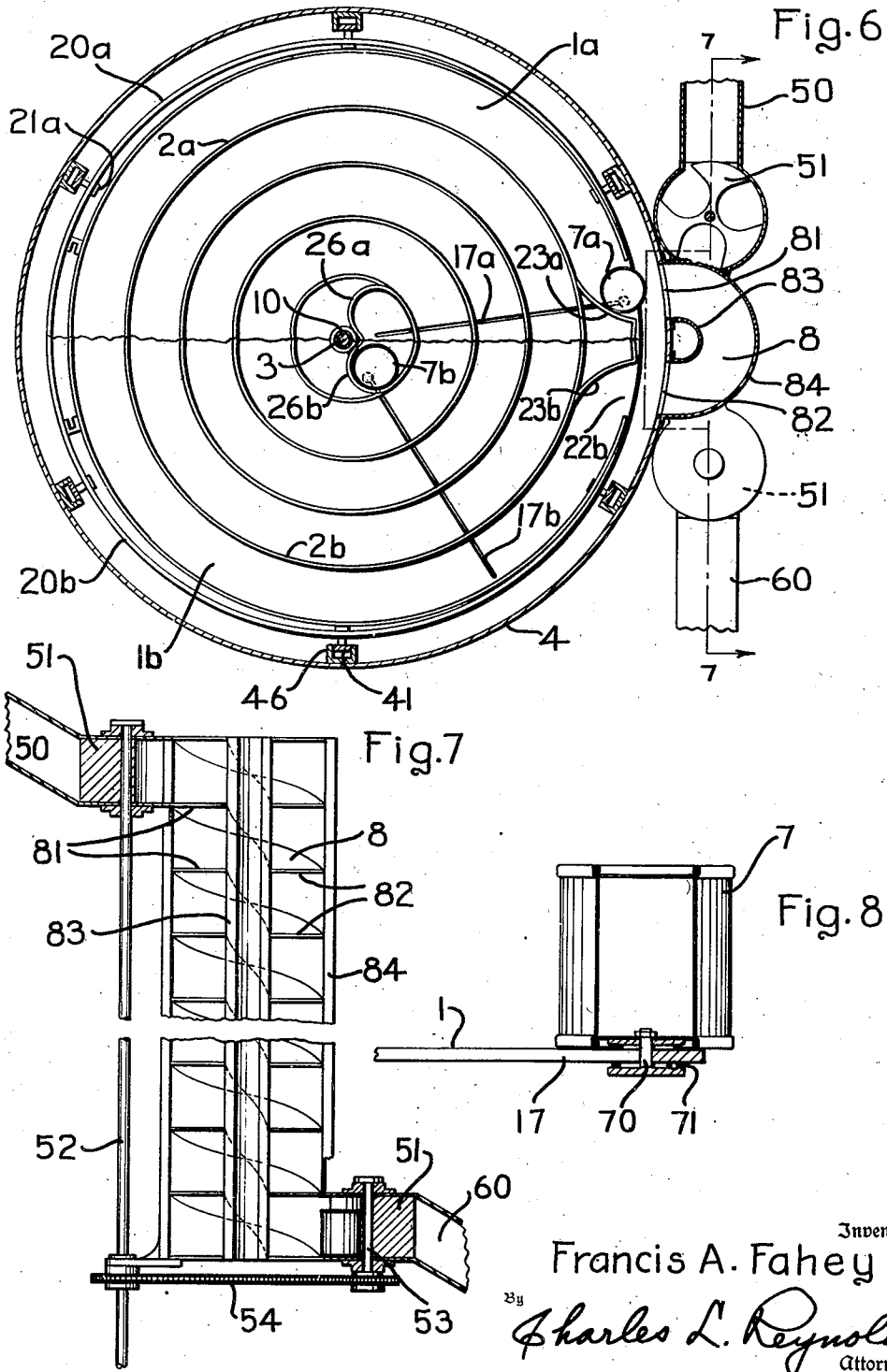
F. A. FAHEY

2,278,434

CAN HANDLING MECHANISM

Filed Sept. 25, 1939

4 Sheets--Sheet 3



Inventor

Francis A. Fahey

By *Charles L. Reynolds*
Attorney

April 7, 1942.

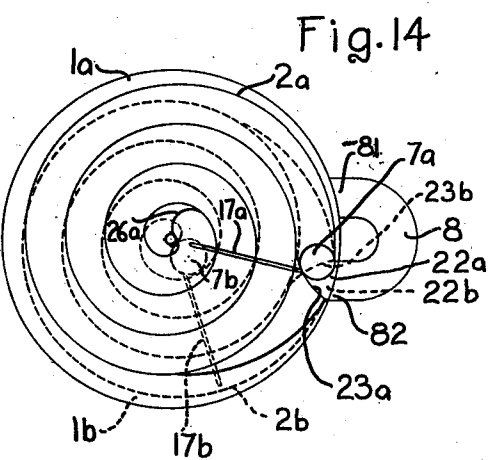
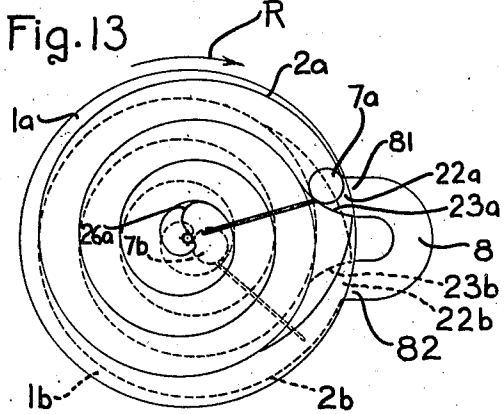
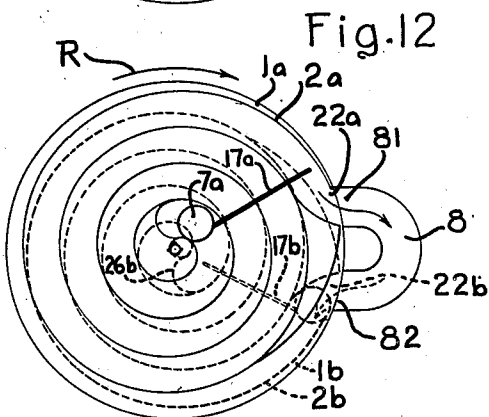
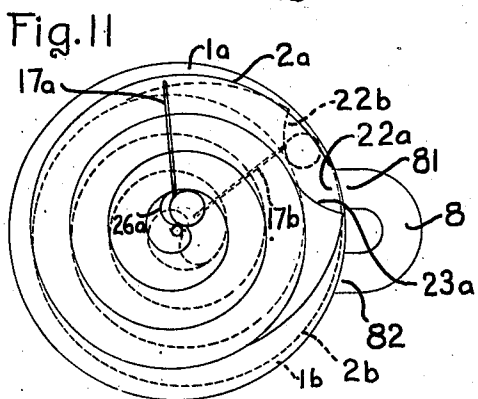
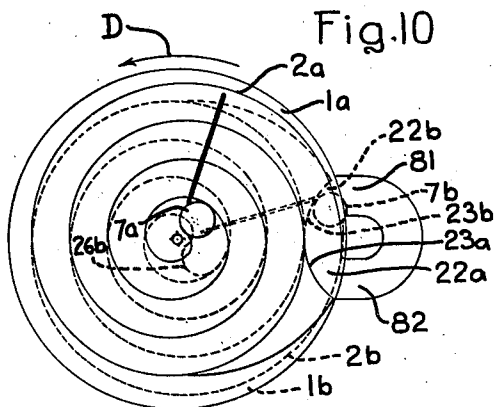
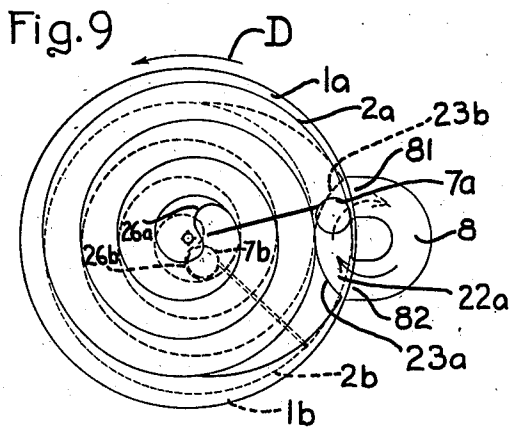
F. A. FAHEY

2,278,434

CAN HANDLING MECHANISM

Filed Sept. 25, 1939

4 Sheets-Sheet 4



Inventor

Francis A. Fahey

By Charles L. Reynolds
Attorney

Attorney

UNITED STATES PATENT OFFICE

2,278,434

CAN HANDLING MECHANISM

Francis A. Fahey, Seattle, Wash.

Application September 25, 1939, Serial No. 296,441

25 Claims. (Cl. 198—209)

In handling cans, for instance in processing the contents, or in cooling, and in like operations, it is desirable to utilize to the fullest extent possible the available floor space, all with due regard, of course, to the other conditions surrounding such handling, as for instance the necessity of heating the cans or of subjecting them to pressure. The cooking of fish requires, in one instance, approximately ninety minutes. The cooker must handle a sufficient load, or sufficient cookers must be provided, to absorb the full capacity of the other machines acting upon the fish, and the more cans that can be loaded into or passed through a given cooker, the less total floor space is required for cooking. My invention is directed to the achievement of the general end indicated above. Specifically it is an object to provide can handling mechanism having one, or several superposed, spiral passages into the peripheries of which are loaded in upright position filled cans to be processed, such cans after processing being discharged from the machine by reversal of movement along the same spiral passages outward to their peripheries. A further object is to load the cans into and unload them from such a device automatically, thereby achieving economies in effort and in time. It is also an object to provide such can handling mechanism by which agitation of the cans is achieved, as may be desirable or necessary, for example to hasten cooling.

It is a further object to provide mechanism of the nature indicated which may be incorporated with slight structural changes, and without change in general principle, either in a batch loading and unloading device, or in a continuous handling device, in the latter of which the cans enter the cooking retort at one point and leave at another point.

In discharging the cans it is another object to insure positive outward movement thereof across the face of a rotative disc in a spiral path from its central portion toward its periphery.

It is a further object to employ a rotative disc and spiral can guide in combination, which may be relatively rotated to advance cans across the disc toward or away from its center along the spiral, or may be rotated in unison so that the cans will not progress along the spiral in either direction. Other objects, and particularly such as relate more purely to structural and mechanical details and arrangements, will be discovered as the study of this specification progresses.

The accompanying drawings illustrate the principles of the invention as embodied in two

somewhat differing forms, that is, one form arranged for a batch-loading operation, and the second form arranged for continuous loading and unloading. It will be understood that the drawings are for purposes of illustration only, and are not intended in any sense to limit the invention. Indeed, many conventional details have been purposely omitted for greater clarity of illustration and understanding.

I have referred above, and will refer hereafter, to spiral can guiding means, and it is to be understood that this term is intended to be used in the broad sense to include any generally spirally arranged can guide which will conduct cans from a receiving or feed point adjacent the periphery of the disc and towards the center of the disc, or vice versa, and it is not essential that the cans move throughout the entire distance, or that the spiral be geometrically accurate or continuous, nor that it be a tight spiral, although a tight, geometric spiral is the preferable arrangement, inasmuch as it best conserves and utilizes all available space, and in general enables satisfactory operation with the least resistance.

Figure 1 is in general a side elevation, with the casing and cover of a retort shown in section, illustrating my novel spiral can handling mechanism as embodied in a batch loading arrangement.

Figure 2 is a horizontal section through the device of Figure 1, viewing a rotative disc and cooperating can guide in plan view.

Figure 3 is an enlarged axial section on the line 3—3 of Figure 2.

Figure 4 is an enlarged detail of certain drive mechanism included in Figure 1, and Figure 5 is a side elevation of certain feed or discharge mechanism on an enlarged scale, likewise as shown in Figure 1.

Figure 6 is a horizontal section through a continuous process machine taken half through one spiral and half through the next spiral.

Figure 7 is a section, substantially on the broken line 7—7 of Figure 6, illustrating mechanism for transferring the cans from one level to the next, and the cooperating feed and discharge mechanism.

Figure 8 is a fragmentary elevation view of a structural detail with parts broken away, showing a rotative disc and dummy can mechanism cooperating therewith.

Figures 9 to 14 are diagrams, illustrating successive positions of parts, together completing the cycle of operation of the feeding arrange-

ment in a continuous process machine incorporating my spiral can handling mechanism.

Figure 15 is a fragmentary side elevation view, with parts broken away, showing a form of loading and unloading mechanism alternative to that shown in Figure 1.

My improved can discharge mechanism is applicable individually, as shown, to each platform and cooperating can guide. For production purposes multiple superposed platforms and corresponding can guides are employed, either in an arrangement for batch loading, or for continuous processing in which the cans progress from an upper tier to the next lower. Features common to both multiple layer types will be described primarily in connection with the batch embodiment since it is somewhat simpler than the continuous processing arrangement.

Each loading spiral, whether used in the batch loading arrangement or in the continuous processing arrangement, includes a rotative platform or disc, perforated for passage of steam or hot air, which is designated in general by the numeral 1, see Figure 2. In a multiple layer machine these discs are disposed all in axial alignment and all are connected together by shaft 3, as described hereafter, for conjoint rotation, such rotation being reversible. Cooperating with each such disc is a can guiding means which, as shown, preferably consists of a tight or close, true geometric spiral can guide 2 spaced somewhat above the disc with which it cooperates, mounted for rotation, or at least for angular shifting, with respect to its cooperating disc and about such disc's axis of rotation. When there is relative rotation between the disc and the cooperating spiral guide, preferably effected by holding the guide stationary and rotating the disc in the proper direction, cans delivered upon the disc at the peripheral entrance to the spiral will be moved inwardly towards the center of the disc by contact with the spiral guide, and preferably substantially to its center. Conversely, by relative rotation of the same disc and spiral guide in the opposite sense, such as by reversing rotation of the disc while still holding the guide stationary, cans which have been guided into the center of the disc are caused to move outwardly along the spiral guide through the same path to its peripheral entrance, there to be discharged from the disc.

So far as I am aware, it has never before been proposed to rotate such a can carrying disc reversely with respect to a stationary spiral for moving cans outwardly again along the same spiral path to be discharged through the same peripheral spiral end opening 22 into which they were loaded. Another way in which my invention is particularly distinguished from such prior art as is known to me, is that the spiral guide, or each such spiral guide, where the can handling device is made up of a plurality of superposed discs, is rotative with its disc, or at least is so mounted that for a limited part of the rotation of the disc it may shift angularly with the disc and without effecting any relative rotation between them by such angular movement.

As is best shown in Figure 3, the superposed discs 1 are connected for conjoint rotation by spacer sleeves 10 each fastened to both discs engaged and surrounding and secured to a shaft 3, and each disc, in the arrangement shown, is supported at its periphery by rollers 11 mounted upon frame elements or uprights 41 of the enclosing cage, slidable in vertical guides 46 within

the retort 4. In addition an axial thrust bearing 42 is provided at the lower end of the assembly. In similar fashion the spiral guides 2 are supported upon rollers 21 similarly mounted, engaging their periphery, or engaging an additional circular rim 20 which surrounds the spiral guides, and they may be provided with an additional bearing at 21' adjacent the axis of rotation. Thus it may be seen that each spiral guide is rotatable entirely independently of the disc, about a common axis.

The entrance 22 at the periphery of each spiral guide is formed by an outwardly directed deflector wall 23, and the spiral guide is of a width to closely embrace the opposite sides of a can which enters it at the entrance 22. A spiral hold-down bar 24, supported by brackets 25 from the guide 2, limits upward movement of the cans, so that they are retained always without cocking relative to the guide, and with just sufficient clearance that they may move without binding.

The entrance 22 of each spiral guide may be brought opposite a feed point, of any convenient or known nature, represented by the gravity feed chute 5, and when the entrance 22 is so located, and the disc 1 with which it cooperates is at the same level as the feed point of the chute 5, cans may be received upon the disc, and, assuming that the latter is rotating in the proper direction, and that the cooperating guide 2 is stationary, so that there is relative rotation between the disc and the guide, the cans will tend to travel or rotate with the disc and will be impelled and guided by the spiral guide 2 towards the center of rotation, until finally the first such can will bring up against the inner end of the spiral guide, represented by the stop wall 26. If cans have been loaded upon the disc and into the entrance 22 with sufficient rapidity behind the first such can, by the time the first such can reaches the stop wall 26 the spiral can guide is fully loaded, and since it occupies substantially all the space over the entire surface of the cooperating disc, the retort at this level is substantially solidly loaded, and may be similarly loaded at each level until it is fully loaded, with little or no loss of space.

In like manner there is provided a receiving or discharge point, of suitable or known nature, indicated by the gravity chute 6. Preferably this is located at the same level as the feed chute 5, but this discharge chute 6 is oppositely inclined, and is spaced angularly from the chute 5. If now it is desired to discharge or unload a disc which has been loaded in the manner previously described, this can be accomplished by shifting the entrance 22 of the spiral can guide into position to register with the discharge chute 6, fixing it in that position, and reversing the direction of rotation of the cooperating disc 1.

The shift from the position wherein the entrance 22 registers with the feed chute 5 to the position where the entrance registers with the discharge chute 6 may be accomplished automatically or manually upon engagement of the first can with the stop wall 26. Continued movement of the disc after the first such can engages the stop wall 26 may automatically effect the proper shift of the spiral can guide. A lock would ordinarily be employed to hold the spiral feed opening in registry with the chute 5, or with the discharge chute 6, as will be discussed in detail hereafter, and the spiral would be unlocked to permit such shift, preferably also automatically by such wall engagement of the can. The release may be

manually accomplished, if desired, and likewise the reversal of the direction of rotation of the disc 1 may be manually accomplished.

With the spiral can guide shifted, then, so that its entrance 22 is in registry with the discharge chute 6, reverse rotation of the cooperating disc 1 will tend to move the cans from their innermost position towards the periphery to discharge them. However, this tendency may not be of itself sufficient to accomplish the movement of the cans in sufficiently close succession or with sufficient positiveness, although the inclination of the spiral normally tends to move the cans outwardly, for that inclination is very slight. During the loading operation, spirally inward movement of the cans is assured by the inward pressure of cans behind, delivered by positive feed means or by gravity at the entrance 22 from the feed chute 5, downwardly inclined toward the level of the disc which is being loaded, whereas in unloading, individual cans that reach the entrance pass onto the discharge chute 6 inclined downwardly away from the level of the disc, but this produces no appreciable tendency to draw the remaining cans outwardly for discharge. Accordingly it is desirable, indeed practically necessary, to provide means to positively move the cans outwardly from their innermost position, and the provision of means to this end, and the particular pusher which will now be described, is a further distinctive feature of this invention.

This means conveniently takes the form of a dummy can 7, which is positively interengaged between the disc 1 and the cooperating spiral guide 2. The dummy can 7 is provided with a stud 70 projecting downwardly from its bottom. Its bottom rests upon the surface of the disc 1, and the stud 70, with suitable anti-friction means 71 interposed between its head and the bottom of disc 1, engages within a slot 17 which is disposed generally radially of the disc 1; see Figure 8. Preferably, as shown in Figure 6, the pivot stud is located somewhat eccentrically of the can center, so that its engagement with the disc slot will give a pulling action tending to lead the can and to allow it to swing along the spiral, since the resistance created by engagement of the can sides with the guide will ordinarily be behind this pulling point. The dummy can, upstanding within the can guide 2, has positive engagement with the walls of the guide, and in particular with the end stop walls 23 and 26, respectively, at opposite ends of its travel.

When a disc is ready to be loaded, the dummy can 7 is at the outermost end of the slot 17—that is, at the periphery of the disc and at the entrance 22 of the spiral guide—where it engages the stop wall 23. It is therefore the first can of the new load into the can guide, and all other cans fall in line behind it. The dummy can first reaches the inner end of the can guide, and therefore engages the end stop wall 26, when the disc is fully loaded. Since the disc 1, with which the stud 70 is engaged, can not rotate if the dummy can 7 does not rotate with it, any tendency for the disc to continue rotation in the loading sense forces the dummy can 7 against the stop wall 26 and thereby accomplishes angular shifting or rotation of the can guide jointly with and at the same rate as the disc. This shifting may be limited angular shifting only, from the feed chute 5 to the discharge chute 6, or it may continue indefinitely, the loaded disc and can guide rotating conjointly.

When the disc begins to rotate in the opposite

sense the dummy can 7 is impelled to rotate with it, and the dummy can thereby positively pushes the cans in advance of it, on ahead of it, causing them to move reversely in the spiral can guide. Eventually it pushes them, one by one, through the entrance 22, and since this entrance is in registry with the discharge chute 6, the cans are discharged one by one, until the dummy can eventually arrives at the entrance and engages the stop wall 23. When this occurs, providing the rotation of the disc in the same sense continues, and provided the can guide is not at that time locked in position, this engagement of the dummy can with the end wall initiates angular movement of the spiral again, in the sense corresponding to the sense of rotation of the disc. As before, this may be only a shift from registry with the chute 6 into registry with the chute 5, or it may be conjoint rotation of the disc and can guide continuing indefinitely.

Obviously it is desirable to load several discs at different levels simultaneously, by providing a multiple passage feed chute 5, and similarly to unload several levels simultaneously by means of a similar multiple passage discharge chute 6, as shown in Figure 15, but still, unless it is desired to provide a feed chute and a discharge chute for each individual level, it is necessary to effect relative movement axially between the feed and discharge chutes and the disc assembly. In the arrangement shown in Figure 1 the chutes are fixed, and the disc assembly is caused to elevate and lower to accomplish feeding upon and discharge from the several levels represented by the individual discs 1. It may be pointed out here that the retort 4 is stationary, though its cover 43 is removable, and held closed by the normal clamps, and the shaft 3 supports the entire disc assembly. The shaft 3 is threaded and is received within a nut 39, and may be engaged also at times by a split nut 30, all as shown in detail in Figure 4. Rotation of the nut 39 relative to the shaft 3 elevates the entire disc assembly, or lowers it, as may be required to bring about registry of successive level groups with the chutes 5 and 6.

The disc assembly includes the discs 1, the interposed can guides 2, and the supporting and rotating means for the same. Since the guides 2, and also the discs 1, are supported by rollers at their peripheries, the uprights 41 that support these rollers are part of a cage, and are supported from a spider 44, all of which moves vertically with the disc assembly. If the disc assembly does not move vertically, the spider 44 and uprights 41 may form part of a fixed retort.

In a multiple disc machine all the discs rotate together in the same direction, although at any given time some may be rotating in a loading sense, or in an unloading sense, with respect to their respective spirals if such spirals are stationary, while others are rotating with their spirals in fully loaded or in unloaded condition. If different sets of spirals are oppositely directed and are held from rotating at the same time, those discs corresponding to one set of spirals may be rotating in the loading sense while the discs corresponding to the oppositely directed set will be rotating in an unloading sense, although all the discs will be rotating conjointly in the same absolute direction. When unloaded the dummy can of each disc has reached the peripheral end of its slot 17 and has engaged the end wall 23, hence, though rotation of the disc in the same direction continues, the dummy can of each disc can go no farther, and remains at

the peripheral end of its slot, constraining its spiral guide 2 and its disc to rotate alike. If, therefore, such rotation continues as successive discs are unloaded, no harm results; when the last disc is unloaded every dummy can 7 is at the peripheral end of its slot. But now, when the direction of disc rotation is reversed, unless all the discs are loaded simultaneously—that is, if some one or more spirals, as well as their discs, must rotate in the loading direction because such discs are not being loaded, when other spirals are held stationary while their discs are being loaded—the dummy cans of the non-loading discs, unless restrained, may, and probably will, tend to travel inwardly owing to relative rotative creep between the respective rotating spirals and discs. Their rate of inward travel would not ordinarily coincide with the rate of inward travel of the dummy can of a loading disc, simply because there is nothing to hold the spiral guide of a non-loading disc stationary, but the result is a more or less irregular and uncontrolled inward travel of each dummy can of a non-loading disc, and complete failure of coordination between each such disc and its spiral guide, and between the guides of the several non-loading discs.

It is preferred to keep the dummy can of each non-loading disc at the peripheral end of its slot, while rotating in the loading direction without being actually loaded, in order to have it ready to control and to lead the cans into the spiral guide, and in order to maintain proper coordination of each disc with its spiral guide, as its turn to load arrives. Suitable means to this end are shown, including a stop 28 hinged upon the top guide 24 (see Figures 2 and 5) in position to drop down behind the dummy can which is within the entrance 22, but which can be raised by any suitable means (not shown) when the spiral guide is stopped, as in Figure 5, to commence loading of its disc. The stop 28 is shown raised in Figure 5, in which position it offers no obstruction to loading cans, and it can readily be moved into and held in this non-obstructing position so long as the spiral guide 2 is stationary, as it must be during actual loading or unloading. When the last can is unloaded, and the dummy can passes beyond the stop 28, the latter is released, if still held upraised, and drops down behind the dump can into the broken line position, obstructing the latter's inward movement until the stop is raised again.

To elevate or to lower the disc assembly the elevating drive shaft 38' is caused to drive the gear 39', through the engaged clutch 38, and this rotates the combination bevel gear and nut 29; the shaft 3 of the disc assembly being held from rotating at such times, the disc assembly is thereby moved vertically. However, since it is necessary to rotate the discs whenever loading or unloading, and since vertical movement can not be permitted at such times, arrangements must then be made to prevent relative rotation between the nut 39 and shaft 3. This is accomplished by locking the nut 39 against vertical movement, and hence rotation, relative to the shaft 3 through a split lock-nut 30, simultaneously disengaging the clutch 38, so that the shaft 3 may be turned freely with the nut 39 and will not rotate relatively thereto. The lock-nut 30 is spring-urged open, out of engagement with the threads on the shaft 3, but may be opened and held open by the lever 35. If the upper end of the lever 35, fulcrumed at 35', is swung to the

left, by appropriate movement of the control rod 37, the lock nut 30 is permitted to open and to disengage the threads, by the action of its spring. By the same movement of the control rod 37 to the left, the clutch lever 36, connected to the rod 37, is swung in such manner as to engage—that is, to close—the clutch 38. With the lock nut 30 open and the clutch 38 closed, ensuring rotation of the nut 39 effects vertical movement of the disc assembly. With the clutch 38 open and the lock nut 30 closed into thread clamping position, the nut 39 is locked to the shaft through the lock nut 30, and no downward vertical movement can occur because of the positive positioning of the lock nut supporting the shaft, through gear 39, from the bearing shown beneath the gear; rotation of the discs can occur, however, through suitable means which are now to be described. During such rotation in either direction the shaft 3 would not tend to be threaded up through the nut of gear 39 when it is free to rotate, of course, because the weight of the disc and spiral mechanism acts against any such movement.

A gear 31, fast upon the shaft 3, and hence connected to turn the discs 1 which are fast to the shaft, is driven by a gear 31' upon a countershaft 32, feather-keyed to slide through the gear 33. The latter is driven from the gear 33' upon the rotative drive shaft 34. As the shaft 34 rotates, the shaft 3 and the discs 1 are rotated, but it is to prevent simultaneous vertical movement due to relative movement of the shaft 3 and nut 39 that the nut 39 is locked to the shaft 3, as explained above. When vertical movement is desired, it is preferred that the shaft 32 be held against rotation, which may be accomplished by declutching and holding stationary the shaft 34. By preventing rotation of the shaft 32, the shaft 3, interengaged therewith through gears 31 and 31', is likewise held against rotation, and that is the desired status when vertical movement is desired.

As has been indicated, it is desirable to provide means to prevent rotation of the spiral can guide 2 at times, and it is also desirable to provide bridge means to permit cans to pass from or to a chute, or between such a chute and the disc 1. Such a combined bridge and stop means is illustrated in Figure 5, consisting of a bridge element 61 pivoted at 62 and operated by a control rod 63 and cylinder 64 (see Figure 1). The bridge piece 61 also has an upright finger 65 which is operatively positioned, by the location of the bridge piece 61 in operative position, for engagement with the can guide 2, thus to stop it in registry with the chute 6. Similar means would be employed in conjunction with the chute 5. The cylinder 64 may be actuated to raise bridge 61 into the position shown in Figure 1, thus to release finger 65 from engagement with guide 2, which holds the spiral stationary, by suitable control mechanism (not shown) operating in response to movement of the dummy can 7 into a limiting position. With the opening 22 held in registry with feed chute 5 by its stop finger 65, engagement of the dummy can with wall 26 would operate such control mechanism to retract such stop finger so that the spiral guide can rotate with the disc 1 toward chute 6 as seen in Figure 2. When the disc 1 is rotating in the opposite direction and the stop finger of chute 6 holds the spiral end opening 22 in registry with such chute, engagement of dummy can 7 with wall 23 after pushing out all the cans through

opening 22 would operate such control mechanism to retract the stop finger 65 of chute 6 so that the spiral guide would be released to turn with disc 1 toward feed chute 5. Upon movement of the spiral end opening 22 out of registry with one of these chutes the finger 65 associated with such chute may be returned, either immediately or at some later time, into position for again engaging a spiral 2, and its bridge will be restored simultaneously to can carrying position.

The batch machine preferably, though not necessarily, has all the spiral guides directed in the same direction, that is, if one is a clockwise spiral as viewed from above, all are clockwise spirals as so viewed, or vice versa. The discs are loaded in successive stages, either singly, or preferably several discs as a group at one time, as indicated above, and while any given disc is being loaded its spiral guide is fixed, for instance by the finger 65 or an equivalent finger, but other discs are rotating, and their spiral guides are rotating in synchronism with them, and while any given spiral guide is rotating with its disc, there can be no feed of cans either into or from such a rotating spiral guide. It is only when there is relative rotation between the spiral guide and its disc, such as when the spiral is held stationary while its disc is rotated that there can be any feed. If, then, a spiral guide is prevented from rotating only when its disc is loading or unloading, and if the spiral guide is free to rotate with its disc at all other times, then clearly a disc which has been loaded is not affected by the fact that it continues to rotate, since its spiral guide is then free to rotate with it. Similarly with the unloading operation. Only the disc or discs which are being unloaded have their spiral guides fixed so that they will not rotate, and all other spiral guides rotate with their discs and therefore produce no effect upon the cans loaded upon their discs.

When the dummy can mechanism is incorporated in a continuous operation machine, however, the arrangement must be somewhat different. The difference lies chiefly in the elimination of the normal functions of the elevating mechanism and the mechanism required by reason thereof (though the elevating mechanism may be retained so that the discs can be raised to clear jams, or may be eliminated entirely, if desired), and the substitution for the feed means, previously described, of different feed means and discharge means. In this arrangement cans are fed upon the uppermost disc of the assembly, and are discharged eventually from the lowermost disc of the assembly. To accommodate movement of the cans from one level to the level next below there is provided transfer mechanism, which preferably takes the form of gravity chutes. The spiral can guides are alternately convoluted in opposite directions. For instance, the spirals at the first, third, and fifth levels, etc., the odd numbered levels, may progress clockwise, let us say, and the intervening even numbered levels, the second, fourth, sixth, etc., counterclockwise. For continuous feed-through, means are provided for locating the spiral can guides first in position to receive cans from the level above, and next in position to discharge cans to the level below, and then to shift the spirals back again to the first position. All the odd numbered spirals may be connected for conjoint movement, and all the even numbered spirals may be connected for conjoint movement, but the two sets of spirals are independently movable. The move-

ment of each such set of spirals is not a complete rotary movement, but rather an angular shifting to and fro with respect to the feed and discharge points of the chutes.

In Figure 6, which is a transverse section through the retort, looking down in plan upon two discs and their corresponding spiral can guides, at levels one just above the other, it will be observed that the one spiral is directed oppositely to the other. To distinguish the elements at different levels, such as the discs and corresponding spiral guides, the one which is uppermost in Figures 6 and 9 to 14 may be distinguished by the suffix *a* and the lower one by the suffix *b*. In Figure 6 the disc 1*a* has a cooperating clockwise spiral can guide 2*a*, as viewed in plan view, and the lower disc 1*b* has a counterclockwise spiral can guide 2*b*. Each such disc has a slot 17*a* or 17*b* and the dummy cans 7*a* and 7*b*, respectively, which engage the one the stop walls 23*a* and 26*a*, and the other the stop walls 23*b* and 26*b*, respectively.

Situated at one side of the disc assembly, and extending vertically, is the feed, discharge, and transfer mechanism. The initial feed chute 50 in this instance, and the discharge chute 60, are disposed the one leading to the uppermost level of the cans, and the other leading from the lowermost level, and for the preservation of pressure and conservation of steam within a closed retort the cans may be fed through plug valves 51, which are well-known in the art, and these two plug valves may be connected for timed operation simultaneously by means of the shafts 52 and 53, connected by the chain drive 54. Intermediate these two levels there are superposed inclined half-helical can guides 8. Each of these may be considered as leading from a receiving point 81, about a semi-circle to a delivery point 82 at the next level below. Each is of sufficient linear extent that the can may slide down it, rather closely embraced by the inner wall 83 and the outer wall 84, without cocking or sticking, and yet without any opportunity to upset. A top hold-down rail may be employed if desired, but has not been illustrated.

It is to be particularly observed that the respective receiving points 81 are all at one side of the transfer device, and the delivery points 82 are all at the opposite side, all the openings of each set being in vertical alignment. The receiving point 81 at each level is the point where cans are received for transfer to the next lower level by gravity from an unloading or discharging disc, and the point 82 at any level is the feed or delivery point, where cans sliding down the half-helical chute by gravity are fed to or delivered upon a loading disc at this level.

While it is intended that the cans move normally down the chute 8 by gravity alone, it must be remembered that cans are discharged into this chute by the positive action of the dummy can 7, and this follow-up action may be relied upon entirely to push cans along the chute 8, or may serve to supplement gravity, especially in clearing jams resulting, usually, from defective or deformed cans.

This arrangement of the parts constituting the can handling device contemplates that each alternate disc, let us say all the odd-numbered discs 1*a*, will be loading at one time, and at that time all the even-numbered discs 1*b* will be unloading, so that as disc 1*b* unloads, its load is received immediately and directly upon the disc 1*a* below. However, as soon as all the discs 1*a* are loaded,

the sense of rotation of the discs is reversed, and now all the discs 1a are unloading, and each disc 1a unloads directly and immediately upon the disc 1b below it, and all the discs 1b are loading at this time. Immediately the discs 1b are loaded the sense of rotation of the discs is again reversed, and the cycle recommences.

Since it has been pointed out that all the receiving points 81 are in vertical alignment at one side of the center of the transfer chutes, and all the delivery points 82 are vertically aligned and at the opposite side of the center of the chutes, it becomes evident that a given disc can not both load and unload without a shift in the position of the entrance 22 of its cooperating spiral can guide. The position of these entrances 22 must be shifted with the completion of each phase of the cycle, and the complete cycle is shown diagrammatically in Figures 9 to 14.

Referring to those figures, Figure 9 shows the position of parts at the commencement of loading operations upon disc 1a, and at the commencement of unloading operations from disc 1b, which is below disc 1a. Disc 1a being ready to commence loading, the entrance 22a of its spiral can guide 2a is in registry with the delivery point 82 of the chute 8, and rotation of the discs 1a and of the discs 1b has just commenced in the sense indicated by the arrow D. Since the disc 1b is to unload, the entrance 22b is in registry with the receiving point 81 of the chute 8. The dummy cans 7a and 7b are in the respective positions as shown. Continued rotation of the discs in the sense of the arrow D causes the cans to load upon the disc 1a from the chute 8, and to unload uninterruptedly from the disc 1b into the chute 8, until such time as the disc 1a is fully loaded and the disc 1b is fully unloaded, at which time parts will be in the position of Figure 10 which shows the relative position of parts at the completion of loading of the disc 1a, and at the completion of unloading of the disc 1b. In this position of Figure 10 the dummy can 7b has just reached the entrance 22b, and has expelled the last can from the now unloaded disc 1b, and the dummy can 7a has just reached the inner end of the spiral can guide 2a, and the latter spiral can guide is completely filled with cans which have followed in line behind the can 7a. It should be remembered that in the position shown in Figure 10 the respective dummy cans have just reached but have not applied any pressure to the respective end walls 25a and 23b, and consequently no shift of the spiral can guides from the position of Figure 9 has as yet occurred.

If we consider now that the discs have a continued tendency to rotate in the sense of the arrow D, beyond the position of Figure 10, then it will follow that the dummy cans 7a and 7b, pressing upon the respective end walls 25a and 23b, will each shift its spiral can guide 2a or 2b from the position of Figure 10 to the position of Figure 11. Such shifting may be controlled automatically by reason of pressure of the dummy cans against the end walls of the corresponding can guides, or it may be controlled manually. Since both can guides are simultaneously and equally shifted in the same sense, there is no shift in their positions relative to each other, although both shift relative to the points 81 and 82.

As may be seen in Figure 11, this shift shifts the entrance 22a from the delivery point 82 to the receiving point 81. The entrance 22b, however, is shifted beyond the point 81, and now is

in registry with no point of the chute 8. In consequence, while the disc 1a and its can guide 2a are in readiness for discharging the loaded cans into the chute 8, the disc 1b and its guide 2b, immediately below, are not yet in position to receive such cans. Before they can be placed in such position the can guide 2b must be shifted from the position of Figure 11, without corresponding shifting of the position of the can guide 2a, into the position of Figure 12. This can be accomplished by engaging and holding the can guide 2a in its new position, that of Figure 11, and then reversing the direction of rotation of all the discs. This presses the dummy can 7b against the stop 28 lodged behind it to interlock the disc and spiral, and consequently the can guide 2b is also reversely rotated until it has been shifted to and is held in the new position of Figure 12. This change in the sense of rotation is indicated in Figure 12 by the arrow R, indicating a reversal of the sense indicated by the arrow D.

Assuming that parts have reached the position of Figure 12, the disc 1a has by now begun to discharge at 81 into the chute 8, and the discharged cans, passing down the chute 8 to the point 82, are delivered thence into the entrance 22b for movement onto the disc 1b. Stop 28 is raised and the dummy can 7b moves inward, followed by the cans descending from the tier above. Ejection of the cans from the guide 2a is assured by reason of the dummy can 7a, and the cans loading upon the disc 1b fall in line behind the can 7b. Eventually the parts reach the position of Figure 13, which illustrates their relative position at completion of the unloading of disc 1a, and the completion of loading of the disc 1b.

Again, however, it is necessary to accomplish shifting back to the position of Figure 9. This can be done, as before, by continued rotation in the sense of the arrow R, from the position of Figure 13 to the position of Figure 14, the latter of which is an intermediate position between the positions of Figure 13 and Figure 9. Such continued rotation in the sense of the arrow R, when the dummy can 7a is in engagement with the end wall 23a, but before the can 7b has quite come into engagement with the end wall 25b, produces a shift of the spiral guide 2a, so that its entrance moves from the point 81 to the point 82. The guide 2a is locked and held in this position by a finger 65, as shown in Figure 5, and then the direction of rotation of the discs is reversed to the original sense D. The full load of cans on disc 1b affords sufficient friction to entrain spiral 2b with the disc despite outward pressure of dummy can 7b, and consequently the commencement of this movement effects an angular shift of the guide 2b so that its entrance 22b moves from registry with the point 82 into registry with the point 81, and parts are back again in the position illustrated in Figure 9.

As a result of this cycle of operation cans may be entered continuously at the plug valve 51 from the feed chute 50, whence they pass by way of the uppermost chute 8 to the delivery point 82, and are then delivered upon the uppermost disc 1a. This disc is loaded short, however, by the number of cans required to fill a chute 8. This is required because there is some slight lag occasioned by the reversal of the sense of rotation of the discs and the shifting of the can guides. Upon reversal of the sense of rotation of the uppermost disc 1a the feed of cans ceases for the time being, and the cans are unloaded from the uppermost disc 1a to the next lower disc 1b. The

sense of rotation is again reversed to the original sense, the feed of cans is resumed, and now simultaneously cans are loaded upon the uppermost disc 1a, and are unloaded from the next lower disc 1b upon the next lower disc 1a. The spiral can guide of this latter disc (the third) extends in the same direction as the spiral can guide of the uppermost (the first) spiral disc 1a, but reversely to the can guide 2b of the intermediate (the second) disc 1b. The operation described continues, the cans advancing from one level to the next below, until the entire retort is fully loaded. The time required to pass through the retort governs the time of processing.

The statement that the retort is fully loaded does not mean that all possible space within it is occupied, for half the discs will be loaded and half will be unloaded, so that it is never more than half filled, and indeed, because of short loading, there is some space not occupied at each level. Nevertheless a large part of the space is loaded, and considerably more cans may be loaded into the cubic capacity of the retort as a whole than is possible with continuous loading retorts of the types heretofore used, thereby effecting greater economy in floor space. The greatest economy of floor space is, of course, accomplished by the use of the batch loading arrangement of Figure 1, yet on the whole the continuous loading process effects important economies in space, and has the advantage of the continuous passage of cans through the retort, without appreciable interruption, and, of course, without loss of steam, of heat, or of pressure.

By reason of the support of the spiral can guides in such manner that they are movable angularly in conjunction with the associated discs, and further by reason of the employment of the dummy cans, the present mechanism is susceptible of employment either in a batch processing machine or in a continuous loading, as has been made apparent above, and in either arrangement is different from and produces important economies of space over arrangements heretofore employed.

It is particularly desired to point out with relation to the chutes 8 that these require no timing, no operative mechanism, and yet positively guide the cans from one level to the next, without the possibility of overturning or jamming, and since the walls 83 and 84 of this transfer device may be incorporated in effect as part of the walls 4 of the retort, there is no possibility of loss of steam, temperature or pressure by reason of the inclusion of such transfer mechanism in the retort.

What I claim as my invention is:

1. Can handling mechanism including a rotative disc, can feeding and can receiving means spaced angularly adjacent the disc's periphery, means disposed adjacent the disc, and supported for angular shifting about the disc's axis, independently of rotation of the disc, to register selectively with the can feeding means or with the can receiving means, said shiftable means being formed and arranged to define a continuous can-guiding path terminating at one end at the disc's periphery and at its other end inwardly thereof, and means to effect relative rotation between the disc and the guiding means, selective as to sense of rotation, whereby to feed cans into or to discharge them from such path.

2. Can handling mechanism as in claim 1, characterized in that the can-guiding means is spirally arranged, with its inner end adjacent

the common axis, and is formed to occupy substantially all the space on the disc's surface.

3. Can handling mechanism comprising a rotative disc, a can chute inclined downwardly to and terminating at the disc's periphery, to deliver successive single cans to the disc, a second can chute inclined downwardly from a terminus at the disc's periphery, but spaced angularly from the first chute, to receive successive cans from the disc, angularly shiftable can guiding means opening at the disc's periphery, and cooperating with the disc to guide cans supported upon the disc inwardly towards the disc's center of rotation or outwardly towards its periphery, depending upon the sense of the disc's rotation, means to rotate the disc in opposite senses, and relative to the can guide, to determine the direction of movement of the cans, and means to fix the can guide selectively in registry with the first chute, to receive cans therefrom, or in registry with the second chute, to discharge cans thereto.

4. Can handling mechanism comprising a rotative disc, a spiral can guide adjacent and cooperating with the disc, when the guide is stationary, to effect movement of cans resting upon the disc inwardly towards the center of the disc or outwardly towards its periphery, depending upon the sense of rotation of the disc, and means supporting the spiral guide for rotation with the disc, in either sense, when desired, thereby avoiding movement of cans relative to the disc.

5. Can handling mechanism comprising a plurality of discs rotative about a common axis in either sense, and spaced along such axis, spiral can guides disposed each adjacent a cooperating disc, and supported for rotary movement about the discs' axis, but independently of the discs, and means operable to secure each spiral guide against rotation, thereby to effect movement of cans inwardly towards the center of the disc or outwardly towards its periphery, depending upon the sense of rotation of the disc, relative to the direction of the spiral.

6. Can handling mechanism including a rotative disc, means disposed adjacent the disc, formed and arranged to define a continuous can guiding path terminating at one end at the disc's periphery, and at its other end inwardly thereof, means to effect relative rotation between the disc and the guiding means, selective as to sense of rotation, whereby to feed cans into or to discharge them from such path, and positively acting means operable to move cans outwardly along such path.

7. Can handling mechanism comprising a rotative disc, a spiral can guide adjacent and cooperating with the disc, when the guide is stationary, to effect movement of cans resting upon the disc inwardly towards the center of the disc or outwardly towards its periphery, depending upon the sense of rotation of the disc, means supporting the spiral guide for rotation with the disc, in either sense, when desired, thereby avoiding movement of cans relative to the disc, and means interengaged between the disc and spiral guide, and movable in accordance with their relative rotary movement, to push cans outwardly towards the periphery of the disc.

8. Can handling mechanism comprising a rotative disc, a spiral can guide adjacent and cooperating with the disc, when the guide is stationary, to effect movement of cans resting upon the disc inwardly towards the center of the disc or outwardly towards its periphery, depending upon the sense of rotation of the disc, means

supporting the spiral guide for rotation with the disc, in either sense, when desired, thereby avoiding movement of cans relative to the disc, and means engaged with the can nearest the disc's center, and positively operable in accordance with relative movement of the disc and spiral guide to push that can, and others ahead of it, outwardly towards the periphery of the disc.

9. Can handling mechanism comprising a rotative disc, a spiral can guide adjacent and cooperating with the disc, when the guide is stationary, to effect movement of cans resting upon the disc inwardly towards the center of the disc or outwardly towards its periphery, depending upon the sense of rotation of the disc, means supporting the spiral guide for rotation with the disc, in either sense, when desired, thereby avoiding movement of cans relative to the disc, radial guide means formed in the disc, a dummy can engaged by the spiral guide, and a follower carried by the dummy can and engaged in the radial guide means, to shift the dummy can positively outwardly by appropriate relative rotary movement of the disc and spiral guide.

10. A can handling mechanism comprising a plurality of rotative and coaxial discs spaced one above another, spiral can guides interposed between adjoining discs, to guide cans upon the cooperating disc, as the latter rotates, inwardly towards its center, or outwardly towards its periphery, depending upon the sense of the disc's rotation, means supporting the spiral guides for rotary movement about the disc's axis of rotation, and means operable to secure each spiral guide against rotation whenever movement of the cans inwardly or outwardly of the disc is desired.

11. Can handling mechanism comprising an upright shaft, a plurality of discs assembled in spaced apart relationship along said shaft and secured thereto for conjoint rotation, a spiral can guide supported above each disc for rotation, independently of the discs, and each adapted to cooperate with its disc to guide cans inwardly from a feed point adjacent the disc's periphery towards its center, can delivering means disposed at a selected level, to deliver cans upon a disc at the feed point at such level, means to shift the disc assembly vertically to bring successive discs to the feed level for filling, and to remove them when filled, means for rotating the disc assembly, and means to hold the cooperating spiral guide against rotation during filling of the disc, the spiral guide being otherwise free to rotate with the disc to prevent filling.

12. Can handling mechanism comprising an upright shaft, a plurality of discs assembled in spaced apart relationship along said shaft and secured thereto for conjoint rotation in either sense, a plurality of spiral can guides, all similarly directed, each supported above a disc for rotation, independently of the discs, and each adapted to cooperate with its disc to guide cans inwardly from a feed point at the disc's periphery towards its center, or reversely to a discharge point at the disc's periphery, depending upon the sense of relative rotation between the cooperating disc and spiral guide, can feeding means and can receiving means each disposed at a selected level, the first to deliver cans at the feed point upon a disc which is at that level, and the second to receive cans at the discharge point from a disc which is at that level, means to shift the disc assembly vertically to bring successive discs to the feed level for filling, or to the discharge level for discharging, means to rotate the

disc assembly in one sense to load it, and in the opposite sense to unload it, and means at the level of any loading or unloading disc to hold the cooperating spiral guide of such disc against rotation, the spiral guides being otherwise free to rotate with the discs at all times.

13. Can handling mechanism including a rotative disc, can feeding and can receiving means spaced angularly adjacent the disc's periphery, means disposed adjacent the disc, and supported for angular shifting about the disc's axis, independently of rotation of the disc, to register selectively with the can feeding means or with the can receiving means, said shiftable means being formed and arranged to define a continuous can guiding path terminating at one end at the disc's periphery and at its other end inwardly thereof, means to effect relative rotation between the disc and the guiding means, selective as to sense of rotation, whereby to feed cans into or to discharge them from such path, and means operable upon discharge of the final can from the guiding means, or upon reception of the final can by the guiding means, to shift the peripheral terminus of the guiding means positively from discharge position to feed position, or vice versa.

14. Can handling mechanism including a rotative disc, can feeding and can receiving means spaced angularly adjacent the disc's periphery, means disposed adjacent the disc, and supported for angular shifting about the disc's axis, independently of rotation of the disc, to register selectively with the can feeding means or with the can receiving means, said shiftable means being formed and arranged to define a continuous can guiding path terminating at one end at the disc's periphery and at its other end inwardly thereof, means to effect relative rotation between the disc and the guiding means, selective as to sense of rotation, whereby to feed cans into or to discharge them from such path, and means positively interengageable between the disc and the guiding means, upon discharge of the final can from the guiding means, or upon reception of the final can by the guiding means, thereby to shift the peripheral terminus of the guiding means from discharge position to feed position, or vice versa.

15. Can handling mechanism comprising a plurality of superposed discs, means interconnecting all said discs for conjoint rotation, reversible drive means for rotating said discs selectively in either direction, a spiral can guide supported above each disc and rotatable therewith, chute means for loading said disc with cans and unloading them, locking means associated with said chute means for holding stationary the spirals while their discs are being loaded or unloaded with their outer ends in registry with such chute means, a dummy can carried by each disc and movable from the inner end of its spiral to its periphery, interengageable in each such limiting position between its disc and spiral to constitute a driving connection for rotating such spiral in conjunction with its disc, and means interconnecting each dummy can with its disc for moving said can, by rotation of its disc with respect to its spiral, positively along the path of its spiral can guide from its inner end to its outer end for effecting positive outward movement of cans on each disc along the same spiral path traversed during loading, to be discharged from the periphery of the disc through the same end of the spiral can guide into which they were loaded.

16. Can handling mechanism comprising a spiral can guide, a can supporting disc closely underlying said guide, means for rotating said disc relative to said spiral guide in a direction to move cans placed on the periphery of said disc inward along the spiral path defined by said can guide, and reversible for effecting relative rotation between said can guide and disc in the opposite direction, and means driven in synchronism with said disc for positively pushing cans on said disc outwardly along the same spiral path over which they moved inwardly, for discharge from the periphery of said disc.

17. Can handling mechanism comprising a spiral can guide, a can supporting disc underlying said guide, means for rotating said disc relative to said spiral guide in a direction to move cans on said disc outwardly along said guide, and a pusher member driven in synchronism with said disc to move outwardly along said spiral guide path, following up the outwardly moving cans.

18. In can handling mechanism having a can guide for guiding the movement of cans along a tortuous path, a dummy can disposed behind such cans in such path, and drive means for said dummy can connected thereto eccentrically of its center for effecting a pulling action on said can always forward of its center, and operable to move it along the path defined by such can guide, the dummy can thus moved pushing cans ahead of it along such path.

19. Can handling mechanism including a rotative disc, can feeding and can receiving means spaced angularly adjacent the disc's periphery, means disposed adjacent the disc, and supported for angular shifting about the disc's axis, independently of rotation of the disc, to register selectively with the can feeding means or with the can receiving means, holding means operable to retain said shiftable means in registry with either said receiving means or said holding means, said shiftable means being formed and arranged to define a continuous can guiding path terminating at one end at the disc's periphery and at its other end inwardly thereof, and means to effect relative rotation between the disc and the guiding means, selective as to sense of rotation, whereby to feed cans into or to discharge them from such path, said holding means being releasable, whereby such means may be released upon discharge of the final can from the guiding means, or upon reception of the final can by the guiding means, for shifting of the peripheral terminus of the shiftable guiding means from discharge position to feed position, or vice versa.

20. Can handling mechanism comprising a spiral can guide having a can receiving opening at its outer end, means closing the inner end of the spiral for blocking further movement of inwardly moving cans at such end other than reversely outward along the same spiral path over which they moved inwardly, a can supporting disc closely underlying said guide, and means for rotating said disc relative to said spiral guide in a direction to move cans placed on the periphery of said disc inward along the spiral path defined by said can guide, and reversible for effecting relative rotation between said can guide and disc in the opposite direction for moving cans on said disc outwardly along said spiral, for discharge from the periphery of the disc.

21. Can handling mechanism comprising a spiral can guide, a can supporting disc closely underlying said guide, means for rotating said disc relative to said spiral guide in a direction to move cans placed on the periphery of said disc inward along the spiral path defined by said can guide, and means supporting said spiral can guide for conjoint rotation with said disc when said disc has been loaded with cans.

22. Can handling mechanism comprising a spiral can guide, a can supporting disc closely underlying said guide, means for rotating said disc relative to said spiral guide to move cans along the spiral path defined by said can guide, and means interengageable between said guide and said disc for driving said guide from said disc for conjoint rotation of said guide with said disc.

23. Can handling mechanism, comprising a retort, a can carrying plate for reception within said retort, means supporting said plate for rotation about an upright axis, said means being movable vertically for raising said plate from and lowering it into said retort, a spiral can guide immediately above said plate and movable vertically therewith, locking means always above the rim of the wall of said retort engageable with said spiral can guide for restraining rotation thereof, means for effecting rotation of said first means, in turn to rotate said plate, and means above the rim of the retort wall for feeding cans onto said plate thus rotated to be moved by said rotating plate along said spiral guide restrained from rotating by said locking means.

24. Can handling mechanism, comprising a retort, a can carrying plate for reception within said retort, an upright shaft secured to said plate, a spiral can guide immediately above said plate, can loading means above the upper rim of the wall of said retort, control means cooperating with said shaft, alternatively operable for raising said plate and said spiral guide from said retort into a position adjacent to said loading means, or for rotating said plate in such raised position, and means operable to hold said spiral guide against rotation during such rotation of said plate for movement by said rotating plate of cans, loaded thereon from said loading means, along said spiral guide thus held against rotation.

25. Can handling mechanism, comprising a retort, a plurality of can carrying plates movable vertically upwardly out of said retort and back down into it, spiral can guides, one immediately above each plate and movable vertically therewith, a plurality of chutes above the upper rim of the wall of said retort for handling cans, a plurality of bridges, one for each chute, extending between the chutes and their respective plates when moved upward into registry with said respective chutes, operating means for said bridges, operable to lower said bridges into operative position, or to raise them into retracted position, means operable to rotate all said plates conjointly while in registry with their respective chutes, and means operable to hold all said spiral can guides from rotating with their respective plates while in registry with their respective chutes, for movement by said rotating plates of cans, loaded thereon from said chutes, along said spiral guides thus held against rotation.

FRANCIS A. FAHEY.