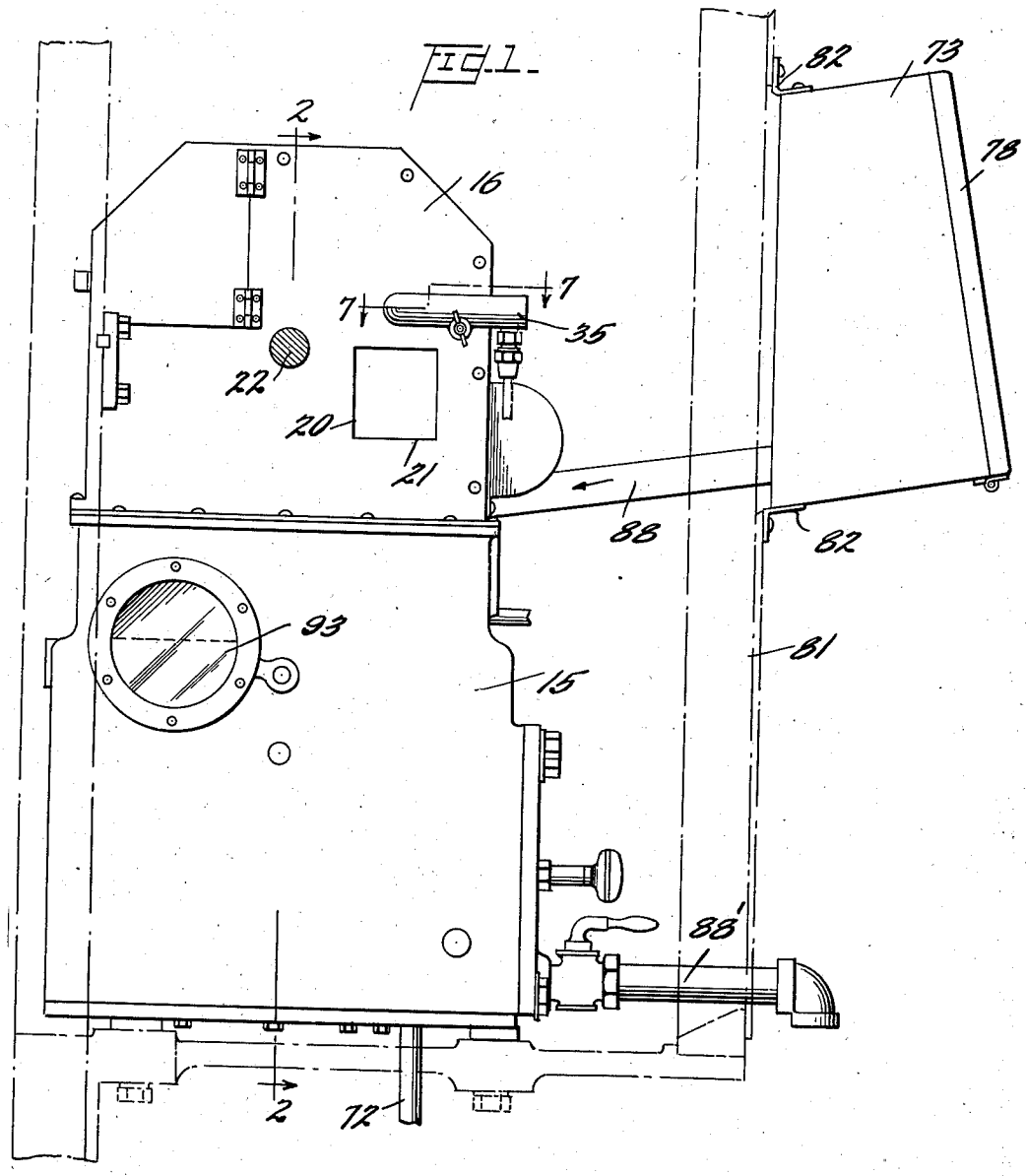
July 14, 1942. J. F. EARP 2,289,763

COATING APPARATUS

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FIG. 1.




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July 14, 1942. J. F. EARP 2,289,763

COATING APPARATUS

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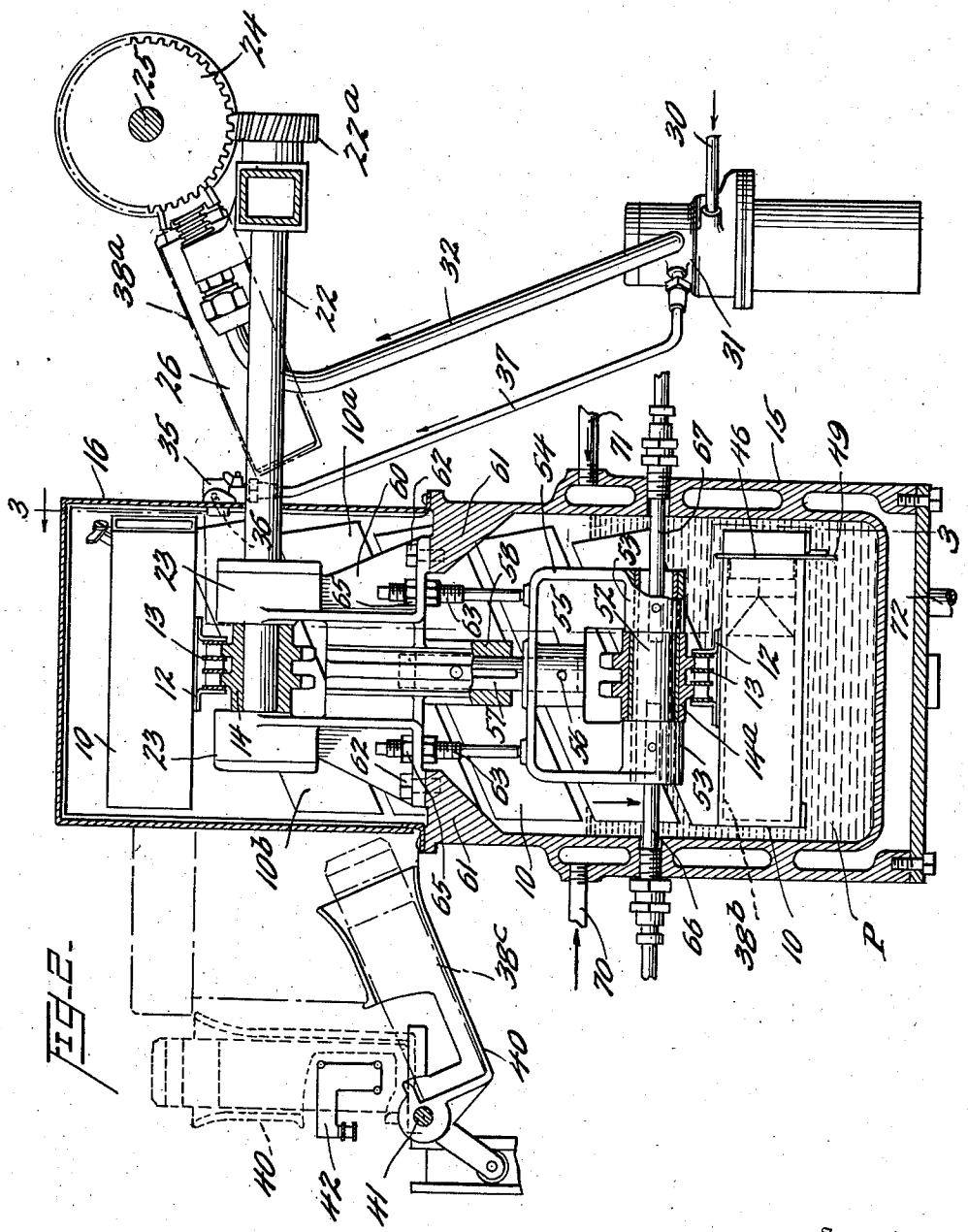


FIG. 2.

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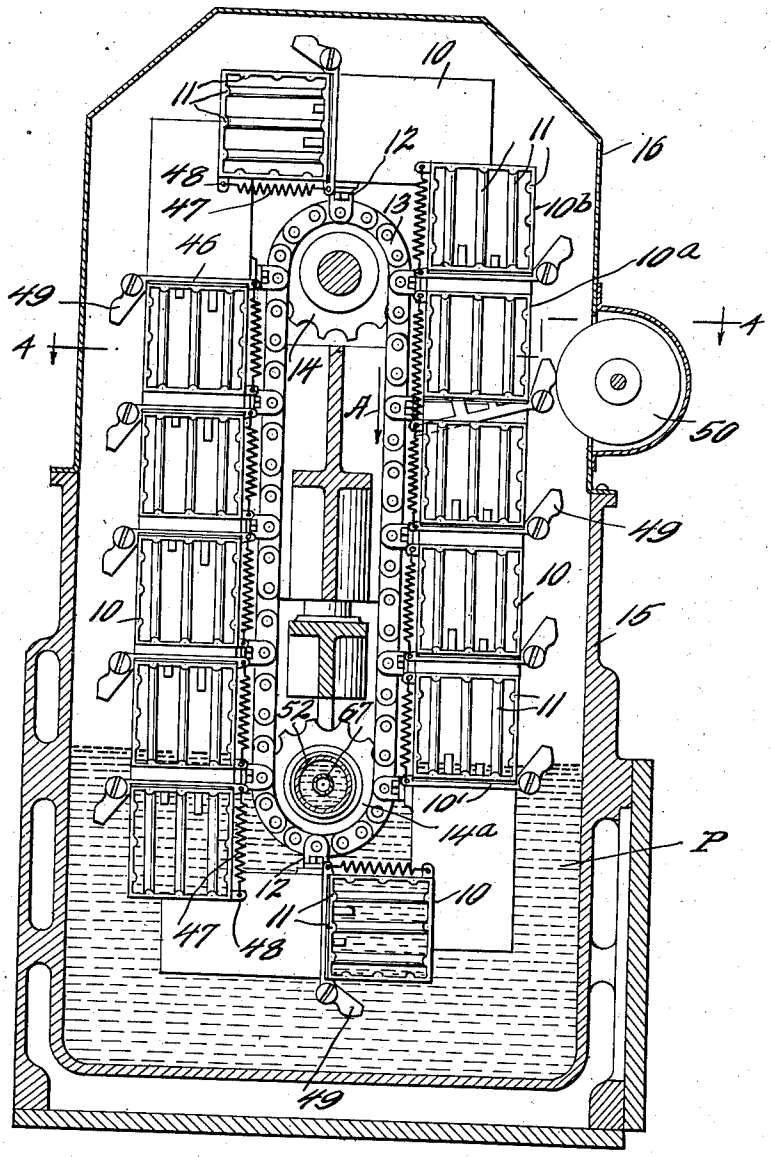
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COATING APPARATUS

Filed Aug. 15, 1940 5 Sheets-Sheet 3

FIG. 3.




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2,289,763

COATING APPARATUS

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FIG. 4.

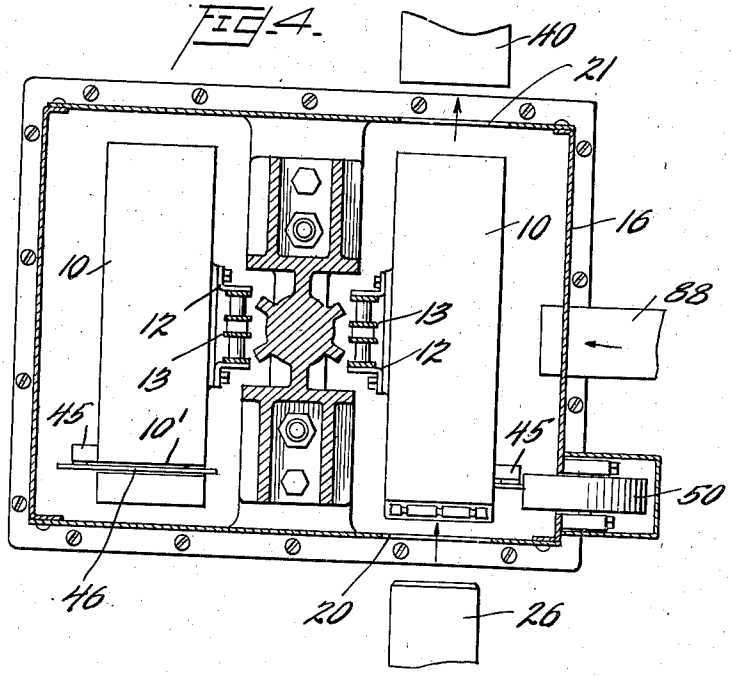



FIG. 6.

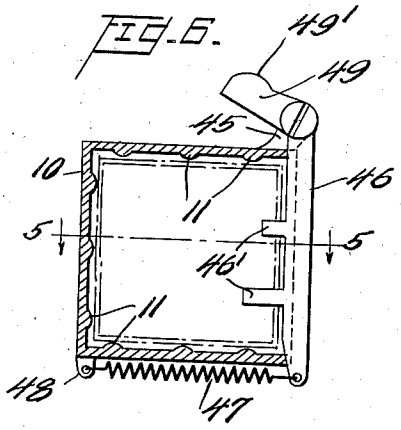
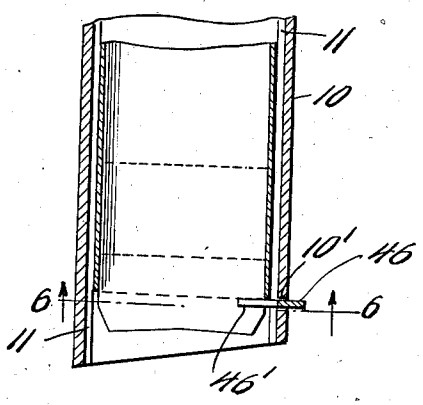



FIG. 5.



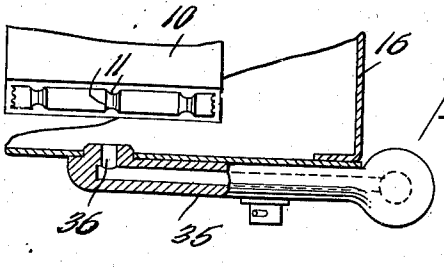




FIG. 7.

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COATING APPARATUS

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FIG. 8.

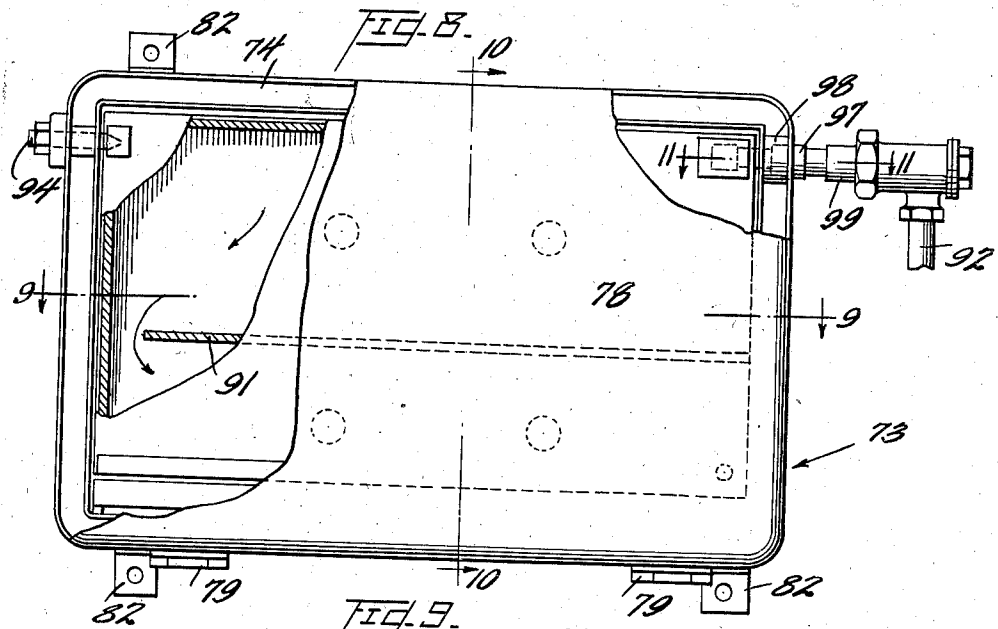



FIG. 9.

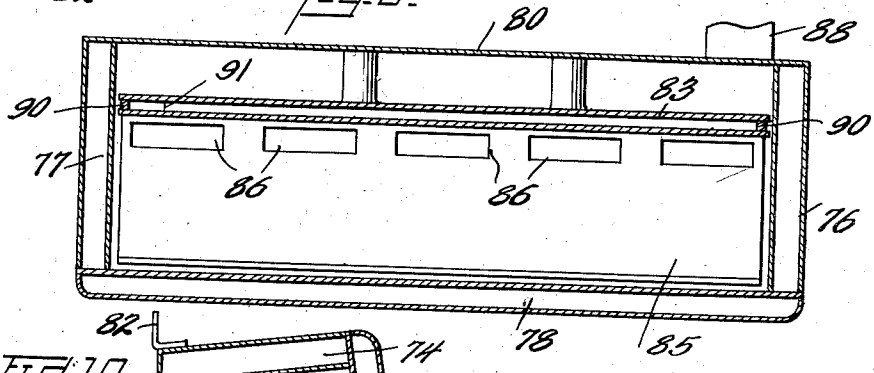



FIG. 10.

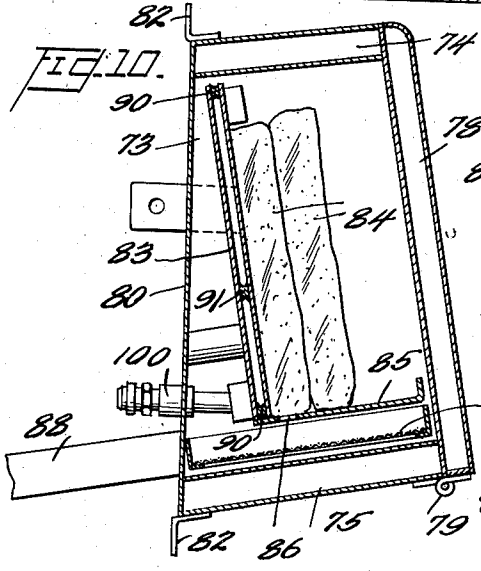
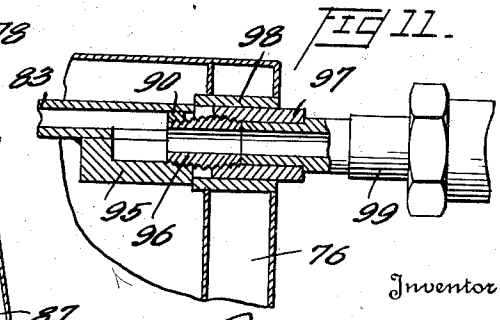



FIG. 11.




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2,289,763

# UNITED STATES PATENT OFFICE

2,289,763

## COATING APPARATUS

James F. Earp, Detroit, Mich., assignor to The American Paper Bottle Company, Toledo, Ohio, a corporation of Ohio

Application August 15, 1940, Serial No. 352,794

16 Claims. (Cl. 91—46)

This invention relates to mechanisms for applying coatings to articles of various kinds but more particularly to mechanisms for coating partially completed paper containers. Paper bottles and containers are customarily coated interiorly and exteriorly with a protecting substance such as paraffin prior to being charged with a commodity to be dispensed, especially when the commodity is a liquid such as milk.

A container which has been proven to be eminently successful for the packaging and dispensing of milk is described and claimed in Patent 2,047,891, issued July 14, 1936, in the name of Henry T. Scott. That container is tubular, rectangular in cross-section, and is of a type which may be readily fabricated, charged and sealed on a complete automatic machine designed for that purpose. The paper used in the fabrication of the container, while of best quality, must nevertheless be coated with a substance which will prevent contact of the fibers of the paper wall with its liquid contents, whether such contents be milk, oil, or other liquid, in order that the wall of the container may keep its original strength and the container its shape and durability.

In Patent 2,133,214, issued October 11, 1938, to Henry T. Scott is disclosed and claimed a coating apparatus primarily designed for use in applying a coating to all surfaces, both exterior and interior, of a paper container of the type disclosed in Patent 2,047,891, just prior to the charging, closing, and sealing of the container, the apparatus including means for successively introducing containers into the carriers of an endless series of container carriers moving along a closed path, a portion of which path lies below the level of the surface of a bath of coating material, and means for successively removing containers from the carrier series as they reach a predetermined point, after having been coated. Each successive carrier after having received a container to be coated moves downwardly toward and into the bath of coating material in liquid form, then passes through the bath in such manner that all surfaces of the container are exposed to the liquid of the bath in a desired manner and thereafter removed from the bath bottom end foremost and drained, each container after being drained being ejected from the coating apparatus by an ejector device and passing onto further mechanism for chilling and solidifying the coating, charging the container with liquid and closing and sealing the same.

The present invention comprises an improvement upon the coating apparatus just above briefly described and its primary purpose is to simplify, speed up, and render more effective in operation the previously patented apparatus. It is likewise intended that the improved apparatus shall occupy less space for a given capacity than the earlier one, and that a simpler means for liquifying solid coating material, and supplying it to the bath, be provided. Other features of improvement are incorporated into the coating apparatus which comprises the subject matter of the present invention, the number of operating parts being, for example, considerably reduced and thus the cost of construction and maintenance being minimized.

By way of example one form of the invention is illustrated in the accompanying drawings in which:

Figure 1 is a side elevation of the coating apparatus and the associated means for liquifying solid coating material;

Figure 2 is a section on line 2—2 of Figure 1 certain parts of adjacent mechanisms being also included;

Figure 3 is a section on line 3—3 of Figure 2;

Figure 4 is a section on line 4—4 of Figure 3;

Figure 5 is a partial longitudinal section, taken on the line 5—5 of Figure 6, through one of the carrier elements;

Figure 6 is a section on line 6—6 of Figure 5;

Figure 7 is a section on line 7—7 of Figure 1, portion of the air nozzle there illustrated being partly broken away to show more clearly an interior air passage;

Figure 8 is a front elevation, partially broken away, of the coating material liquifying device shown in side elevation in Figure 1;

Figure 9 is a section on line 9—9 of Figure 8;

Figure 10 is a section on line 10—10 of Figure 8; and

Figure 11 is a section on line 11—11 of Figure 8.

The coating apparatus selected for illustration includes a container or kettle for a bath of molten coating material, a series of carriers each designed and intended to receive an article to be coated, to move the article into and through the bath, and to then lift the article above the surface of the bath to a position adjacent a discharging mechanism by means of which it is removed from the carrier. Heretofore mechanical means has been employed to place a container to be charged within one of the carriers, and a second mechanical device utilized to effect removal of the coated container from the carrier. The

present invention contemplates the elimination of these mechanical container charging and discharging devices and the substitution therefor of simple and inexpensive pneumatic means. Thus, the container to be coated is actually blown by an air blast into the container carrier or container receptacle and, after having been coated, is blown by another air blast out of the carrier and into a mechanism especially designed to receive it and to effect its transfer to some further mechanism for acting upon the same.

The carrier elements or receptacles are indicated in the drawings by the numerals 10, 10 and from an inspection of Figures 2 and 3 it will be observed that these carriers are elongated tubular members, rectangular in cross section, and open at both ends, the inner walls being provided with ribs 11 which function to prevent the outer surface of any container placed within the carrier from having contact with the inner wall surface of the carrier over any substantial area, thus insuring that all outside surfaces of the articles to be coated may be reached by the coating material. There are a number of carriers 10 and each is provided with a bracket 12 by means of which it is mounted on a chain 13, the chain 13 passing around sprockets 14 and 14*a* mounted for rotation about parallel axes, respectively, the arrangement being such that, when the chain is moved in the direction of the arrow A (Figure 3) the carriers 10 will pass downwardly in succession, pass under the surface of the bath of coating material such as molten paraffin which is indicated at P, through the bath, and thence upwardly to a point of discharge. The series of carriers 10 together with the means upon which these carriers are mounted are housed within a casing the lower part 15 of which is in the nature of a steam kettle and the upper part 16 of which may be of relatively light sheet metal, this upper portion 16 functioning principally as a means to retain heat and vapor and to prevent contamination of the coating substance.

As shown, the several containers 10 are angularly disposed with respect to the horizontal when moving vertically and this is primarily for the purpose of insuring that, when the apparatus is being used to coat containers of the tubular type, with one closed end, each successive container is introduced into the bath bottom end foremost. The mechanism is so designed that the container is then moved in such manner through the bath that all wall surfaces thereof are exposed to the liquid in the most effective manner, and is removed from the bath bottom end foremost, all for purposes set forth at greater length in Patent 2,133,214, previously referred to and likewise in Patent 2,133,213, in which the method of coating which is carried out by the present machine is fully described and claimed.

Formed in the opposite parallel walls of casing 16 are apertures 20 and 21 for the introduction into the casing of containers to be coated, and the discharge from the casing of containers which have been coated, respectively, the inlet opening 20 being approximately horizontally opposite the outlet opening 21. The openings are so located that, when the right-hand open end (Figure 2) of a carrier 10 is disposed in register with the inlet opening 20 in the casing, the left-hand open end of the carrier 10 immediately above is in register with the discharge opening 21, the arrangement thus being such that both charging and discharging operations may be simultaneously effected, a carrier located at position 10*a* (Figure 2) being so positioned that it will receive a container introduced through opening 20 and the carrier next immediately above, and occupying the position 10*b*, being aligned with opening 21.

The carrier actuating means is intermittently operated by a suitable mechanism so that, for charging and discharging purposes, carriers are momentarily halted in positions such as 10*a* and 10*b* (Figure 2), to permit a container to be coated to be placed in one carrier and a container which has been coated to be discharged from the carrier immediately above it. Means for effecting the intermittent movement of the carriers may be of any desired type. In Figure 2 the sprocket 14 is shown to be fixed upon a shaft 22 supported in bearings 23 and extending outwardly through an aperture formed in the casing wall, the shaft having a gear 22*a* fixed on its outer end the teeth of which mesh with those of a gear 24 fixed upon a shaft 25 which may conveniently be the supporting shaft of the mandrel carrying spider of a container squaring-out and bottom closing mechanism of the type disclosed and claimed in copending application, Serial No. 340,358, filed June 13, 1940, Charles Z. Monroe.

The squaring out and bottom closing mechanism which comprises the subject matter of the application just above referred to includes a plurality of mandrels, of which one is indicated at 26 in Figure 2, all of these mandrels being disposed radially of shaft 25 and being adapted to be successively brought into alignment with the charging opening 20 of the coating apparatus casing and into alignment with that container carrier 10 which happens to have its receiving aperture in register with opening 20 at that time. Pneumatic means, more particularly described in the copending application mentioned, may effect the transfer of a container from mandrel 26, the position of a container, the bottom of which has been closed, mounted on this mandrel, being indicated in chain lines, to the aligned carrier 10 and in the preferred form of pneumatic means employed compressed air is passed from a suitable source through a conduit 30 to a valve 31 and, when the valve is opened, is allowed to flow through duct 32 into compressed air ducts formed in mandrel 26 so that jets of compressed air will issue from the free end of the mandrel and against the bottom of the container mounted thereon, thus blowing the container into the registering carrier 10, bottom end foremost.

After having been coated and drained, and after the carrier in which the container is held reaches the position 10*b*, (Figure 2) further pneumatic means becomes active to blow the container from the carrier and this means includes the nozzle member 35 attached to the casing wall and having a downwardly and inwardly inclined discharge port 36 whereby a jet of air may be directed axially through a carrier in position 10*b* to strike the inside surface of the bottom of a container lying within such carrier. The nozzle device 35 may be conveniently supplied with air under pressure through a duct diagrammatically illustrated at 37 leading to valve 31, so that when valve 31 is opened, both the container charging and the container discharging mechanisms are called into action, both operations occurring simultaneously. The container 38*a*, with its bottom end closed, indicated in chain lines on the mandrel 26 is in position to be discharged into the coating apparatus, a container within one of the carriers 10 is indicated

at 38b, and a container which has just been ejected from the coating apparatus is indicated in chain lines at 38c. This container 38c is shown to be retained within an uprighting element 40 pivotally mounted at 41 and movable from the full line position in which it is shown in Figure 2 to the position in which it is shown in dotted lines in that figure, for the purpose of erecting the container and placing it in position to be engaged by a pusher member 42 of a container cooling mechanism more fully described in my copending application Serial No. 359,440, filed October 2, 1940.

During the time that a container is retained within a carrier member 10, and is moving downwardly toward or into the molten bath of coating material, it must be positively prevented from floating upwardly out of the upper or charging opening of such carrier. Naturally, when the bottom of the empty container comes into contact with the coating liquid, the container will tend to float and, unless confined, its upper end will be projected against the inner wall of the housing and will be injured. Latching means is associated with each carrier member, therefore, for preventing the escape of the container within it under such circumstances, this latching means being most clearly shown in Figures 3, 5 and 6. Thus upon the outer wall of each carrier, at one corner and adjacent that end opening through which containers are charged there is formed a bracket 45 upon which bracket is pivotally mounted a latch member or gate 46. Gate 46 comprises an elongated element which is normally retained in a slot 10' of the carrier by means of a spring 47 one end of which is connected to the free end of the gate and one end to a lug 48 integral with the carrier 10. The gate or latch includes an actuating arm 49 having a rounded edge 49' which is adapted to contact with the cylindrical surface of a revolubly mounted disc or roller 50 supported in bearings upon the casing 16.

The arrangement is such that, as each successive carrier 10 reaches the position of that carrier which is indicated at 10a in Figures 2 and 3, or just before this position is reached, the arm 49 of the associated latch or gate member strikes the stationary roller 50 so that the gate is moved to the position indicated in Figure 3 against the tension of the associated spring. When this movement occurs, the two projections 46' of the gate are withdrawn from the interior of the carrier, which carrier is then wholly unobstructed and may receive a container blown off of the mandrel 26. Shortly after, the motion of the carrier is resumed, the arm 49 of the gate member disengages the roller 50 and the gate closes, the projections 46' occupying the positions in which they are shown in Figures 5 and 6, in advance of the forward edge of the container, which container is shown in full lines in Figure 5 and in chain lines in Figure 6, thus preventing escape of the container upwardly when its bottom strikes the bath P. Escape of the container from the opposite end of its carrier, of course, is not prevented by the gate member 46 but there is little tendency for this to happen and, should a container tend to slide from the discharge end of a carrier as position 10b is approached, it will be prevented from doing so by contact with the inner surface of the side wall of casing 16, which is immediately adjacent.

The lower sprocket 14a previously referred to is mounted for rotation upon a short hollow shaft 52 the ends of which are supported in bearings 53 preferably formed as integral portions of the depending brackets 54 the upper ends of which are carried by a hollow sleeve 55. Sleeve 55 is pinned as by a dowel pin 56 to the lower end of a rod 57 slidably received within and splined to a boss 58 integral with the main bracket 60. Bracket 60 bridges the inwardly extending lugs 61 integral with the lower portion 15 of the casing and is secured thereto by bolts 62. Adjustment screws are indicated at 63 respectively, each screw extending downwardly through an aperture formed in a horizontal flange of bracket 60 and being provided with nuts 65 which permit adjustment and hold it in any desired position of adjustment. The lower ends of the adjusting screws 63 bear against the bracket members 54 and it is by means of screws 63 that the proper tension may be maintained in the endless chain 13 since the sprocket 14a may be moved downwardly by the action of the screws, whenever necessary, to tension the chain and take up wear, the telescopic connection including rod 57 and boss 58 permitting downward movement of the lower sprocket supporting shaft. The splined connection between rod 57 and boss 58 ensures that the axes of the lower and upper sprockets shall remain in parallelism at all times.

Projecting through an aperture formed in a side wall of the lower or kettle portion 14a of the casing is a steam temperature control bulb 66 the inner end of this bulb lying within the interior of the sprocket supporting shaft 52. Projecting inwardly through an aligned aperture in the lower portion of the casing is a paraffin temperature gauge bulb 67, both bulbs 66 and 67 being positioned as shown so as to be exposed to the action of the molten coating material at a point where temperature fluctuation due to flow of the molten material is least likely to occur, whereby the automatic means for supplying the steam to the kettle at the temperature and in the quantity desired may be most accurately regulated. Likewise the means for indicating the temperature of the bath of molten material will function most reliably.

As shown in Figure 2, the lower wall of the kettle portion 15 of the casing is provided with tortuous passages for the reception of steam and conduits for bringing steam from a suitable source and introducing it into these cavities are indicated at 70 and 71, a steam return and drainage line being indicated at 72. By suitable control valves, not illustrated, the flow of steam may be so regulated that the temperature of the molten coating material may be maintained at the desired point in an entirely automatic manner. Naturally a small amount of coating material passes from the apparatus with each container which is immersed and withdrawn and the bath must be replenished from time to time.

The replenishment of the bath is effected by means indicated most clearly in Figures 8 to 11 inclusive. This means comprises the melting chamber generally indicated at 73, having double top and bottom walls 74 and 75, double side walls 76 and 77, and a double walled door 78 hinged to the bottom wall 75 at 79. The hollow walls of the chamber may be filled with insulating material to prevent the escape of heat. The back of the heating chamber may comprise a single plate 80 which may rest against a supporting frame member such as indicated at 81 and be secured thereto by brackets 82. The top and bottom, as well as the door 78 of the heated cham-

ber, are inclined, as shown, and likewise the steam heated material melting member 83 is disposed at an angle to the vertical, as indicated in Figure 10, so that flat blocks of material such as solid paraffin, which blocks are indicated at 84, may rest against the melting plate 83 and be gradually reduced to liquid form while in this position, the lower edges of the paraffin blocks being supported upon a shelf 85 rigid with the melting plate 83. The shelf 85 is perforated as at 86 to permit melted paraffin to pass downwardly, through the screening member 87, to the bottom of the chamber from where it passes through an inclined conduit 88 downwardly toward the coating apparatus, to be discharged into the bath.

The melting plate 83 is maintained in heated condition by steam which is passed through its hollow interior, the plate comprising parallel walls the margins of which are welded to the spacing and sealing strips 90, a baffle strip 91 being likewise interposed between these walls. Steam is led to the melting member from a main 92 through a connection such as shown in Figure 11, which permits swinging motion of plate 83 about a horizontal axis, the plate being supported at its other upper corner upon a hinge pin 94. To the inner face of the melting member 83, at its upper corner, is welded the hollow block 95 and threaded into an aperture in the end of the block is a short tube 96 upon the outer end of which is threaded a sleeve 97 which rather closely fits within a cylinder 98 supported in the side wall of the melting chamber but at the same time is free to revolve in this cylinder. Sleeve 97 also receives with a close fit the reduced end of the stationary steam conduit 99, which is connected to main 92, so that it may be said that steam is supplied to the melting member 83 through a hinge. This permits an operator to swing the member 83 upwardly about an axis adjacent its upper edge to facilitate cleaning of the compartment, the drain pipe 100 at its lower edge swinging with this member.

The paraffin or other bath may be drained from the kettle 15, whenever desired, through the valve controlled drain conduit 88', thus emptying the kettle and permitting it to be cleaned. The level of the coating bath may be ascertained by means of the liquid level 93.

It will be appreciated that the novel coating apparatus may be modified, in both the design and arrangement of its component elements, in adapting the invention to the coating of articles of various kinds, without relinquishing its benefits. Such minor variations are within its scope.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. In an apparatus for coating containers or the like, in combination, an endless chain or belt, guide means therefor whereby the chain is supported for movement longitudinally in a closed path, a plurality of open-ended container carriers mounted on the chain for movement therewith, means associated with each carrier and normally closing one end thereof to prevent emergence of a container therefrom, and stationary means for successively actuating said carrier closing means as the carriers pass a predetermined point to permit discharge of containers therefrom.

2. In an apparatus for coating containers or the like, in combination, an endless chain or belt, guide means therefor whereby the chain is supported for movement longitudinally in a closed path, a plurality of open-ended container carriers mounted on the chain for movement therewith, a member movably mounted on each carrier and normally closing one end thereof, and a stationary device for successively actuating said members as they pass a predetermined point to effect opening of the carriers successively to permit successive discharge of containers.

3. In a coating apparatus, a series of article carriers each inclined to the horizontal and having a chamber for the reception of an article to be coated, said chamber having an opening in its upper end through which an uncoated article may be introduced and an opening at its lower end through which such article may be discharged, means for moving said carriers along an endless path, a gate device normally closing the discharge opening at the lower end of said chamber, and stationary means for opening said gate device at a predetermined point in the travel of each carrier to permit discharge of its contents.

4. In a coating apparatus, in combination, a series of article carriers each having a chamber for the reception of an article to be coated and an opening through which such article may be discharged, means for moving said carriers along an endless path, a device movably supported on each carrier and normally closing the discharge opening thereof, and means positioned adjacent the path of movement of the carriers for successively actuating said devices as the carriers upon which they are mounted pass a predetermined point, to permit successive discharge of articles at that point.

5. The combination set forth in claim 4 in which each such device comprises a member pivotally mounted on the associated carrier and a spring normally holding said member in carrier closing position.

6. The combination set forth in claim 4 in which each such device includes a member pivotally mounted on the associated carrier and having an operating arm, the said operating arms successively contacting the means positioned adjacent the path of movement of the carriers whereby each member is moved to uncover the discharge opening of the carrier upon which it is mounted as said carrier reaches a predetermined position.

7. In a coating apparatus, in combination, a plurality of carrier receptacles each having a discharge opening and a member pivotally supported thereon which normally closes said opening, means for moving said carriers along a predetermined path, and a member mounted for revolution about a fixed axis adjacent said path for successively engaging and actuating said pivoted members as they pass and thus releasing articles within the associated receptacles.

8. The combination set forth in claim 7 in which each pivoted member has a projecting arm and the revolubly mounted member is positioned so that each such projecting arm will engage it at a predetermined point in the travel of the associated receptacle.

9. In a coating apparatus, in combination, a series of carrier receptacles each having spaced openings through which articles may be introduced and discharged, respectively, means for moving said receptacles in a closed path, and receptacle loading and unloading mechanism positioned adjacent said path, said mechanism including pneumatic means for simultaneously

loading one receptacle and unloading an adjacent receptacle.

10. In a coating apparatus, in combination, a series of carrier receptacles each having spaced openings through which articles may be introduced and discharged, respectively, means for moving said receptacles in a closed path, and receptacle loading and unloading mechanism positioned adjacent said path, said mechanism including pneumatic means for blowing an article into a carrier receptacle, and a second means for subsequently removing said article from said carrier receptacle.

11. In a coating apparatus, in combination, a series of carrier receptacles each having spaced openings through which articles may be introduced and discharged, respectively, means for moving said receptacles in a closed path, and receptacle loading and unloading mechanism positioned adjacent said path, said mechanism including means for directing blasts of air into successive receptacles to effect unloading of each such receptacle when it reaches a predetermined point.

12. In a coating apparatus, in combination, a series of carrier receptacles each having spaced openings through which articles may be introduced and discharged, respectively, means for moving said receptacles in a closed path, and receptacle loading and unloading mechanism positioned adjacent said path, said mechanism including pneumatic means for blowing an article into a carrier receptacle, and stationary means for preventing passage of such article through the discharge opening of said receptacle until said receptacle reaches a predetermined point of discharge.

13. In a coating apparatus, in combination, a casing the lower portion of which is adapted to retain a bath of liquid coating material, said casing having ports for the introduction and discharge of articles, an article carrier within the casing and having ports for the introduction and discharge of an article to be coated, and mechanism for bringing the article introduction port of the carrier into register with the article introduction port of the casing and thereafter bringing the article discharge port of the carrier into register with the article discharge port of the casing.

14. In a coating apparatus, in combination, a receptacle for a bath of molten material, mechanism including an endless chain, sprockets over which the chain passes, and article carriers mounted on the chain, for submerging articles in the bath and withdrawing them therefrom, one chain supporting sprocket being carried upon a hollow shaft supported below the level of the bath surface, and means for automatically maintaining the temperature of the bath constant, said means including a temperature indicating bulb positioned within the said hollow shaft but out of contact therewith.

15. In a coating apparatus, in combination, a receptacle for a bath of molten coating material, means for introducing articles to be coated into said bath and withdrawing them therefrom, and means for melting solid coating material and leading the molten material to the bath, said means including a device for supporting a block of such solid material with a major surface resting against an inclined heated plate, for the purpose set forth.

16. The combination set forth in claim 15 in which the said plate is disposed in a closed chamber and is supported for swinging movement so as to be displaceable to permit access to all interior surfaces of the chamber.

JAMES F. EARP.