Dec. 29, 1942. B. S. HARRINGTON 2,306,602

CHILLING APPARATUS

Filed July 26, 1941 3 Sheets-Sheet 1

Fig. 1

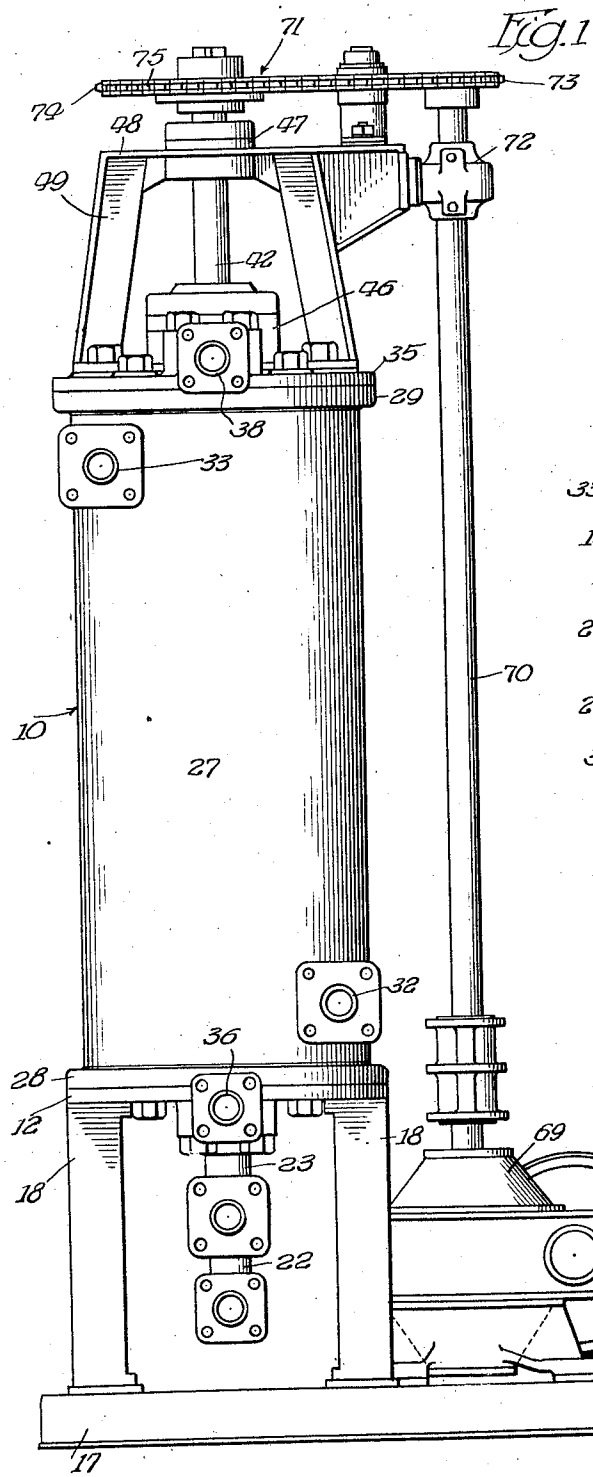
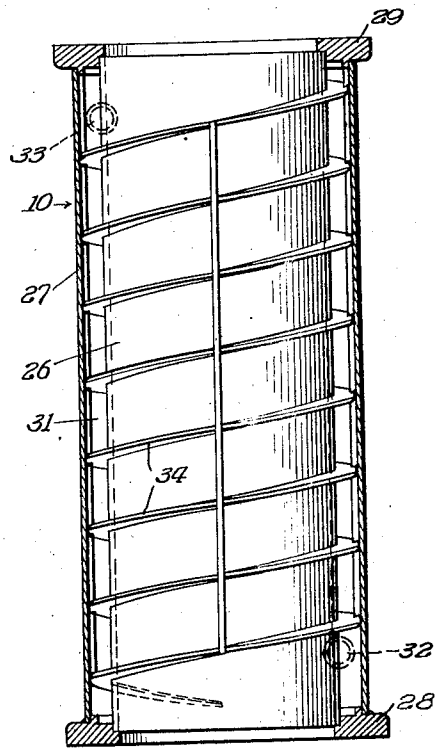


Fig. 2



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Fig. 3

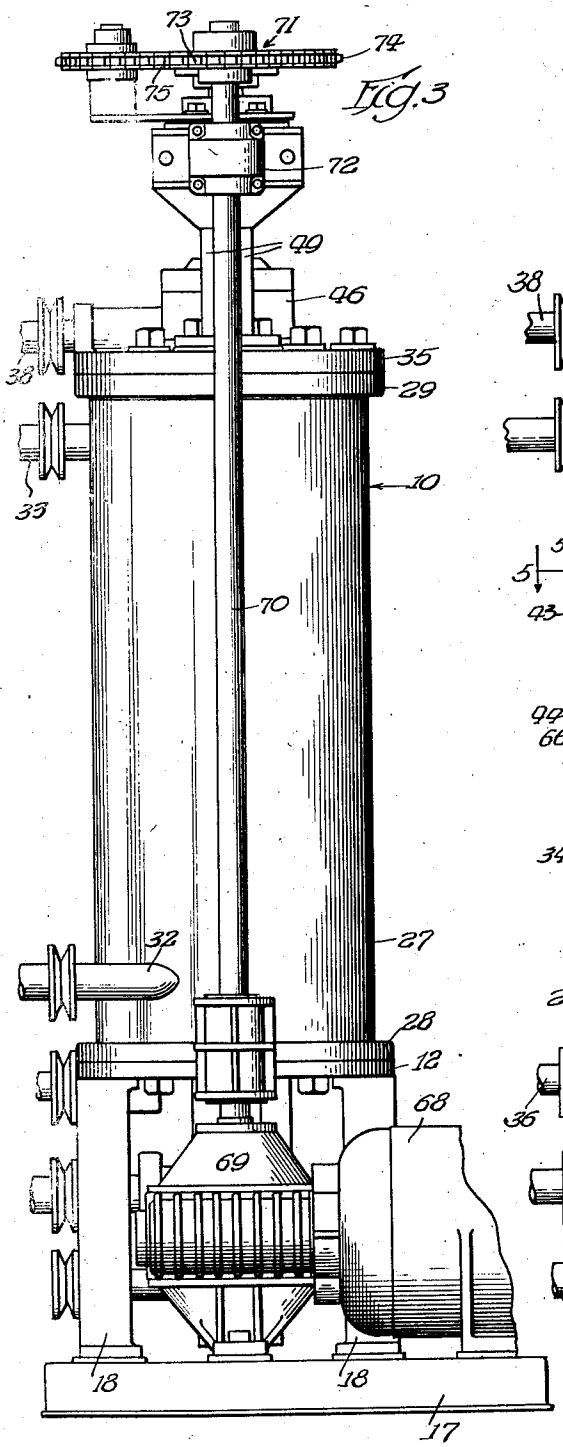
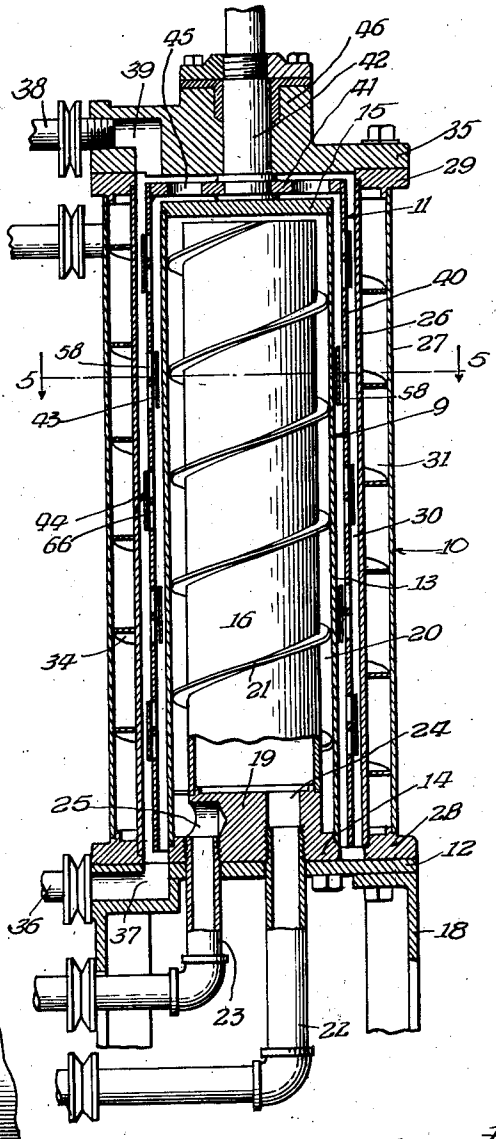


Fig. 4



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CHILLING APPARATUS

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Fig. 5

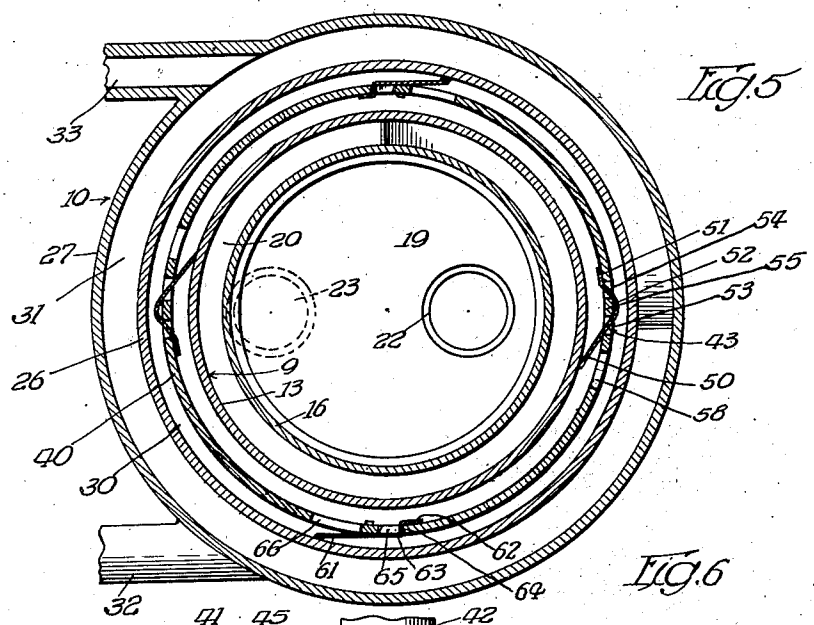


Fig. 6

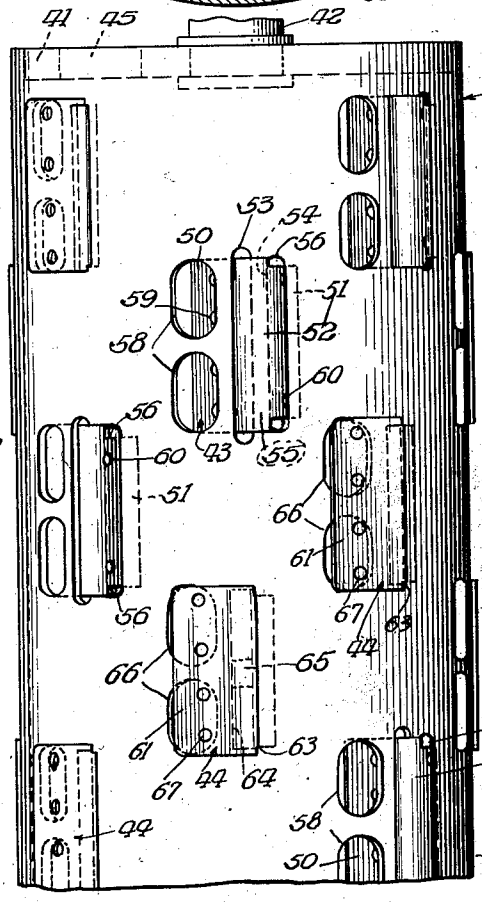


Fig. 8

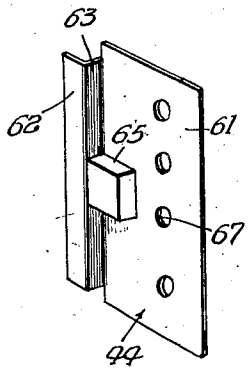
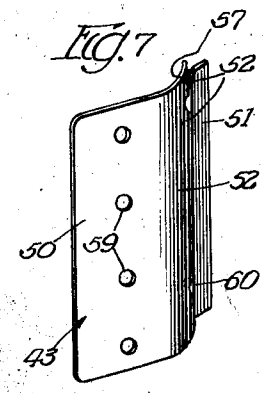


Fig. 7



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Patented Dec. 29, 1942 2,306,602

UNITED STATES PATENT OFFICE

2,306,602

CHILLING APPARATUS

Bertie S. Harrington, Chicago, Ill.

Application July 26, 1941, Serial No. 404,117

15 Claims. (Cl. 62—114)

The present invention relates generally to chilling apparatus. More particularly the invention relates to that type of apparatus which is especially designed to chill liquid material, such as lard, compound, or shortening and comprises a hollow cylindrical inner drum, a hollow ring-shaped outer drum around the inner drum and with an annular chilling space between it and the inner drum, means for circulating a liquid cooling medium through the two drums, means for causing the liquid material to be chilled to flow under pressure through the annular chilling space between the two drums, and a tubular rotor in the annular chilling space and with inner and outer scrapers for scraping the side wall of the inner drum and the inner side wall of the outer drum so as to prevent the material from congealing or freezing thereon during transit or flow through the annular chilling space between the two drums.

One object of the invention is to provide a chilling apparatus of this type which is an improvement upon, and has certain advantages over, previously designed chilling apparatus of the same general character.

Another object of the invention is to provide a chilling apparatus of the type under consideration which is characterized by simplicity of design and construction, durability or long life, and accessibility of the operating parts including the scraper equipped rotor.

Another object of the invention is to provide a chilling apparatus of the type and character under consideration in which the inner and outer scrapers for scraping the opposed walls of the two drums are of new and improved construction and are mounted on the rotor so that they may be readily removed therefrom.

A further object of the invention is to provide a chilling apparatus of the type and character last mentioned in which the tubular rotor has slots adjacent the scrapers for permitting the material to be chilled to flow back and forth between opposite sides of the rotor, and also has slots with which the scrapers are interlocked.

A still further object of the invention is to provide a chilling apparatus which is compact and includes a novel arrangement of the parts as well as simple and improved means for refrigerating or chilling the inner and outer drums.

Other objects of the invention and the various advantages and characteristics of the present chilling apparatus will be apparent from a consideration of the following detailed description.

The invention consists in the several novel features which are hereinafter set forth and are more particularly defined by claims at the conclusion hereof.

In the drawing which accompanies and forms a part of this specification or disclosure and in which like numerals of reference denote corresponding parts throughout the several views:

Figure 1 is a front view of a chilling apparatus embodying the invention;

Figure 2 is a vertical section of the hollow ring-shaped outer drum;

Figure 3 is a side view illustrating in detail the mechanism for driving the scraper equipped rotor;

Figure 4 is a vertical section of the apparatus showing the arrangement or position of the scraper equipped rotor with respect to the inner and outer drums and illustrating the design of the means for circulating a cooling medium through the two drums;

Figure 5 is an enlarged transverse section taken on the line 5—5 of Figure 4 and showing in detail the construction and design of the inner and outer scrapers and the manner in which they are held in assembled relation with the rotor;

Figure 6 is a fragmentary side view or elevation of the scraper equipped rotor;

Figure 7 is a perspective view of one of the inner scrapers; and

Figure 8 is a perspective view of one of the outer scrapers.

The apparatus which is shown in the drawing constitutes the preferred form or embodiment of the invention. It is primarily designed or adapted to chill for conditioning purposes liquid material, such as lard, compound, or shortening, and comprises an inner drum 9, an outer drum 10, and a rotor 11.

The inner drum 9 is cylindrical and is preferably disposed in an upstanding or vertical position. It is mounted on, and projects upwardly from, a disc-like supporting plate 12 and consists of a cylindrical side wall 13, a lower head 14, an upper head 15 and a tube 16. The plate 12 extends horizontally and is supported in an elevated position above a base structure 17 by way of a plurality of laterally spaced legs 18. The lower head 14 of the inner drum rests on the central portion of the top face of the supporting plate 12 and is bolted to such plate in order that the inner drum is in fixed relation with the plate 12. The side wall 13 of the inner drum is formed of thin metal for heat transfer purposes. The lower end of the side wall is welded or otherwise secured to the outer mar-

gin or peripheral portion of the lower head 14, as shown in Figure 4. The upper head 15 of the inner drum serves as a closure for the upper end of the side wall 13 and is welded to the upper end of the latter. The lower head 14 is provided with a central upstanding enlargement 19 and this serves as a supporting medium for the tube 16. The latter is positioned within the central portion of the side wall 13 and is spaced from the latter in order to form an annular space 20 between it and said side wall 13. The lower end of the tube rests on, and is welded or otherwise fixedly secured to, the upper end of the enlargement 19. The upper end of the tube 16 is open and terminates beneath the upper head 15 of the inner drum so that the interior of the tube is in communication with the upper end of the annular space 20. A spiral baffle 21 is disposed in the space 20 and suitably secured to the outer face of the tube 16 and the inner face of the side wall 13. A liquid cooling medium, such as brine or a refrigerant, is circulated through the inner drum by way of a vertically extending inlet pipe 22 and a vertically extending outlet pipe 23. The inlet pipe 22 is located between the plate 12 and the base structure 17 and is centrally positioned with respect to the plate supporting legs 18. The lower end of the pipe 22 is connected to a source of the cooling medium and is adapted to receive the cooling medium under pressure. The upper end of the inlet pipe 22 extends through a hole in the central portion of the plate 12, is connected to the lower head 14 of the inner drum by way of a screw thread connection, and communicates with the lower interior portion of the tube 16 by way of a vertical duct 24 in the central enlargement 19 of the lower head 14. When the apparatus is in operation and the cooling medium is delivered to the pipe 22 under pressure such medium flows upwards through the duct 24 into the lower end of the tube 16. Thereafter it flows upwards through the tube and thence downwards through the annular space 20 between the tube and cylindrical side wall 13. Due to the spiral baffle 21 the cooling medium is caused to flow in a helical or spiral course as it travels or passes through the annular space 20. The outlet pipe 23 serves as a return for the cooling medium. It is positioned in side by side relation with the inlet pipe 22, as shown in Figure 4. The upper end of the outlet pipe extends through a hole in the central portion of the supporting plate 12, is connected to the lower head 14 by a screw thread connection, and communicates with the lower end of the annular space 20 by way of an L-shaped duct 25 in the enlargement 19. The lower end of the outlet pipe is connected by any suitable piping to return the spent cooling medium to the source of the cooling medium. The cooling medium, as it flows spirally through the annular space 20 between the tube 16 and the cylindrical side wall 13, serves to refrigerate the side wall.

The outer drum 10 is ring-shaped and extends vertically. It is positioned around and in concentric relation with the inner drum 9 and consists of a cylindrical inner side wall 26, a cylindrical outer side wall 27, a ring-shaped lower head 28, and a ring-shaped upper head 29. The inner side wall 26 is of greater diameter than the cylindrical side wall 13 of the inner drum 9 and defines with the side wall an annular chilling space 30 through which the material to be chilled is caused to flow as hereinafter described. The cylindrical outer side wall 27 of the outer drum surrounds, and is spaced from, the cylindrical inner side wall 26 and defines with the latter an annular space 31. The lower ring-shaped head 28 serves as a bottom end closure for the space 31. It rests upon, and is bolted or otherwise fixedly secured to, the marginal portion of the supporting plate 12 and is welded to the lower ends of the inner and outer side walls 26 and 27 of the outer drum. The upper ring-shaped head 29 serves as a closure for the upper end of the annular space 31 and is welded, or otherwise suitably connected, to the upper ends of the inner and outer side walls 26 and 27. A liquid cooling medium, such as brine or a refrigerant, is circulated through the annular space 31 by way of a horizontally extending inlet pipe 32 and a horizontally extending outlet pipe 33. The inlet pipe 32 is adapted to receive the cooling medium under pressure in the same manner as the inlet pipe 22 for supplying the cooling medium into the lower end of the tube 16. It is joined to the lower portion of the cylindrical outer side wall 27 of the ring-shaped outer drum 10 and communicates with the lower end of the annular space 31 by way of a hole or aperture in the lower end of the wall 27. The outlet pipe 33 serves as a return for the spent cooling medium and is connected to the upper end of the outer side wall 27. It is positioned in parallel relation with the inlet pipe 32 and communicates with the upper end of the annular space 31 by way of a hole or aperture in the side wall 27. A spiral or helical baffle 34 is disposed in the space 31 between the side walls 26 and 27 and serves to cause the cooling medium to flow in a spiral course through said space 31. When the apparatus is in operation the cooling medium which is supplied to the ring-shaped outer drum 10 enters the lower end of the annular space 31 via the inlet pipe 32, then flows in a spiral course through the space 31 and is finally returned to the source of supply by way of the outlet pipe 33. The cooling medium during travel through the space 31 serves to refrigerate the cylindrical inner side wall 26 of the outer drum 10. If desired a jacket of asbestos or other insulating material may be applied to the outer side wall 27 of the outer drum 10 in order to insulate such side wall from the surrounding atmosphere. The lower end of the annular chilling space 30 is closed by the supporting plate 12, as best shown in Figure 4, and the upper end of such space is closed by a head 35. The latter rests upon, and is bolted to, the upper ring-shaped head 29 of the outer drum 10. The upper head 15 of the inner drum 9 is imperforate and positioned a short distance beneath the central portion of the head 35. The material to be chilled is introduced into the lower end of the annular space 30 by way of an inlet pipe 36. The latter is connected by a screw thread connection to a boss on the supporting plate 12 and communicates with the lower end of the space 30 by way of an L-shaped duct 37 in the boss and plate. It is contemplated that the material to be chilled will be delivered to the pipe 36 while it is under pressure. After entering the space 30 the material to be chilled flows upwards and is chilled or cooled as a result of contact with the cylindrical side wall 13 of the inner drum 9 and the cylindrical inner side wall 26 of the outer drum 10. The material, after being chilled or cooled to the desired extent due to transit or passage through the space 30, is discharged by way of a horizontally extending outlet pipe 38. This pipe

is connected to a boss in the head 35 and communicates with the upper end of the annular chilling space 30 by way of an L-shaped duct 39.

The rotor 11 is adapted to be driven continuously at a comparatively low speed during operation of the apparatus. It comprises a thin tubular body 40, an end wall 41 and a drive shaft 42 and, as hereinafter described, has inner scrapers 43 and outer scapers 44 for scraping the cylindrical side wall 13 of the inner drum and the cylindrical inner side wall 26 of the outer drum in order to prevent the material to be chilled from congealing or freezing on such walls during passage or flow through the annular chilling space 30 between the two drums. The tubular body 40 of the rotor extends vertically and is concentrically arranged with respect to the inner and outer drums 9 and 10. It is disposed in the annular chilling space 30 and spaced equidistantly from the side walls 13 and 26. The lower end of the rotor body 40 is open, as shown in Figure 4, in order that a portion of the material to be chilled flows upwards between the inner face or periphery of the body 40 and the outer face of the side wall 13 while the remainder flows upwards between the rotor body and the inner side wall 26 of the outer drum 10. The end wall 41 of the rotor overlies and is spaced above the upper head 15 of the inner drum 9. It extends across and is welded or otherwise fixedly secured to the upper end of the rotor body and has an annular series of holes 45 therein for permitting the material in the upper end of the rotor to flow into the duct 39 and thence to the outlet pipe 38. The upper face of the end wall 41 is positioned beneath the lower bottom face of the head 35 so that the portion of the material which flows through the holes 45 is permitted to flow into the duct 39. The shaft 42 extends vertically and is driven, as hereinafter described, so as to effect rotation of the rotor and the desired scraping of the opposed or opposite side walls of the two drums. The lower end of the shaft is fixedly secured to the central portion of the end wall 41 and is journalled in a bearing 46 on the central portion of the head 35. The upper end of the drive shaft is journalled in a bearing 47 which, as shown in Figure 1, is carried by a plate 48. The latter is held in an elevated position above the head 35 by way of a plurality of upstanding legs 49. If it is desired to remove the rotor from its operative position for repair or inspection purposes it is only necessary to remove the bolts for the head 35. Proper loosening of such bolts results in loosening of the head so that it makes it possible to remove the rotor from its operative position by raising the head with respect to the two drums. So far as the chilling apparatus which is illustrated in the drawing is concerned the rotor is driven in a clockwise direction as shown in Figure 5.

The inner and outer scrapers are mounted on the tubular body 40 of the rotor 11 and are arranged so that they are in superposed annular series. Preferably there are two inner scrapers and two outer scrapers in each annular series and the two inner scrapers are arranged one diametrically opposite the other and the two outer scrapers are arranged one diametrically opposite the other and at right angles to the inner scrapers. As shown in Figure 6, the scrapers of each annular series are laterally offset with respect to the scrapers of the adjoining series. The inner scrapers are in the form of sheet metal stampings and consist of substantially flat leading margins 50, flat trailing margins 51, and outwardly bulged or arched central portions 52. The body of the rotor is provided with a vertically extending front slot 53 and a vertically extending rear slot 54 for each of the inner scrapers 43. The front slots are disposed directly in front of the rear slots 54 and are separated from the latter by bar-like elements 55. As best shown in Figure 5, the outwardly bulged central portions 52 of the inner scrapers extend around or are in straddled relation with the outer faces of the bar-like elements 55. The flat trailing margins 51 abut against the inner faces of the portions of the rotor body which define the rear edges of the slots 54 and the substantially flat leading margins 50 of the inner scrapers extend inwardly and also forwards with respect to the direction of rotation of the rotor and abut against the inner corners of the portions of the rotor body that define the front edges of the front slots 53. The front or leading edges of the scrapers 43 are straight and engage the outer periphery or surface of the cylindrical side wall 13 of the inner drum 9 with inward pressure. The inward presure to which the leading edges of the inner scrapers 43 are subjected is attributable to the fact that the bulge of the central portions of the scrapers is of less magnitude than the thickness of the bar-like elements 55 and as a result when the scrapers are in place, i. e., in assembled relation with the body of the rotor, the elements 55 exert such outward pressure on the outwardly bulged central portions 53 of the scrapers that the front or leading margins of the scrapers are caused to swing inwards into spring contact with the side wall 13 of the inner drum. The inner corners of the portions of the rotor body that define the front portions of the edges of the slots 53 serve as fulcrums for the leading margins 50 of the inner scrapers and hence outward bowing of the central portions of the scrapers due to the action of the bar-like elements 55 places the leading margins of the inner scrapers under the desired inward pressure. In addition the outward bowing of the central portions of the inner scrapers resulting from the action of the elements 55 results in the flat trailing margins of the inner scrapers engaging the adjacent face portions of the rotor body with outward pressure. The ends of the rear slots 54 terminate inwardly of the ends of the front slots 53 and are defined by shoulder-like parts 56 which are integral with the rotor body. These shoulder-like parts fit within cutouts or notches 57 in the rear or trailing corners of the inner scrapers and prevent rearward displacement of the inner scrapers with respect to the rotor during drive of the rotor. In assembling the rotor the inner scrapers 43 are first placed inside the rotor. Thereafter the trailing margins 51 of the scrapers are inserted through the slots 53. The scrapers are then manipulated so as to bring the trailing margins into place and the outwardly bulged central portions 52 into straddled relation with the bar-like elements 55. Two vertically spaced comparatively wide slots 58 are formed in the rotor body 40 directly in front of each front slot 53. These slots 58 are positioned in opposed relation with the leading margins of the inner scrapers and permit the portion of the material to be chilled that is on the inside of the rotor to flow to the outside of the rotor after scraping thereof by the scrapers 43. The leading margin 50 of each of the inner scrapers is

provided with a vertical series of equi-distantly spaced holes 59 and these holes permit a portion of the material on the inside of the rotor body to flow through the inner scrapers. In addition these holes prevent the material to be chilled from accumulating between the inner portions of the leading margins of the inner scrapers and the adjacent parts of the rotor body, i. e., the parts between the slots 59 and the front slots 53. The outwardly bulged central portions of the inner scrapers 43 are provided with holes 60 so as to permit passage of the material to be chilled through the slots 54. The inner scrapers of each series are of such length and are so arranged that their ends lap the ends of the inner scrapers of the adjacent or adjoining series. As a result of this arrangement the inner scrapers serve during drive of the rotor 11 to scrape the entire outer periphery of the cylindrical side wall 13 of the inner drum 9.

The outer scrapers 44 serve to scrape the entire inner face or periphery of the inner side wall 26 of the ring-shaped outer drum 10. They are in the form of one-piece sheet metal stampings and consist of flat leading margins 61, inwardly offset flat trailing margins 62 and flat central portions 63. The central portions 63 serve to cross connect and extend at substantially right angles to the leading and trailing margins 61 and 62. As a mounting means for each of the outer scrapers 44 the body 40 of the rotor is provided with a vertically extending slot 64. The outer scrapers are arranged so that the leading margins thereof extend outwardly and forwardly in that portion of the annular chilling space 30 which is between the rotor body and the inner side wall of the outer drum 10. The flat central portions 63 are positioned in abutment with the rear portions of the slots 64 and the flat trailing margins 62 are in lapped relation with the inner faces of the portions of the rotor body that define the rear portions of the slots 64, as shown in Figure 5. The front edges of the leading margins of the outer scrapers are straight and engage the inner periphery or surface of the inner side wall of the drum 10. The leading margins 61 abut against and are urged outwards by the portions of the rotor body that define the front portions of the slots 64 with the result that the leading edges of the outer scrapers engage the inner side wall of the outer drum with outward pressure. In order to prevent sidewise displacement of the outer scrapers with respect to the slots 64, block-like lugs 65 are provided. These blocks are disposed in front of, and are welded or otherwise fixedly secured to, the central portions 63 of the scrapers 44. They fit snugly within the central portions of the slots 64, as shown in Figure 5. Two vertically spaced elongated slots 66 are formed in the rotor body 40 directly in front of each of the slots 64. These slots 66 permit the material which is scraped by the outer scrapers to flow to the inside of the rotor body for contact with the cylindrical side wall 13 of the inner drum 9. Holes 67 are formed in the leading margins 61 of the outer scrapers so as to permit a portion of the material to flow past the scrapers and to prevent the accumulation of material between the inner portions of the leading margins of the scrapers and the adjacent portions of the rotor body. The outer scrapers of each annular series are of such length and are so positioned that the ends thereof are in lapped relation with the ends of the outer scrapers in the adjoining series. Because of this the entire inner periphery of the inner side wall of the ring-shaped outer drum is scraped during rotation of the rotor 9. When the apparatus is in use the inner scrapers in connection with drive of the rotor 9 operate to scrape the material from the side wall 13 and such material, due to the deflecting action of the leading margins of the inner scrapers, is caused for the most part to flow to the outside of the rotor body via the slots 58. The outer scrapers 44 operate, as hereinbefore described, to scrape the inner surface of the inner side wall of the outer drum 10 and cause the scraped material to flow to the inside of the rotor body via the slots 66. During drive of the rotor the material, due to the action of the scrapers, is caused as it travels upwards through the annular chilling space 20, to flow back and forth between the inside and outside of the rotor body. Due to the fact that the material is caused to travel back and forth via the slots 58 and 66 effective agitation of the material is effected.

The rotor 11 of the apparatus is driven by means of an electric motor 68, a speed reducing unit 69, a vertically extending shaft 70 and a chain and sprocket connection 71. The electric motor 68 is mounted on the base structure 17 and is positioned to one side of the outer drum 10. The speed reducing unit 69 is also mounted on the base structure 17. It is connected for drive by the armature shaft of the electric motor 68 and serves to drive the vertically extending shaft 70. The latter is disposed in parallel relation with the outer drum 10 and has its upper end journalled in a bearing 72 which is carried by the plate 48 on the legs 49. The connection 71 comprises a sprocket 73 on the upper end of the shaft 70, a sprocket wheel 74 on the upper end of the rotor driven shaft 42 and an endless chain 75 around the sprocket and sprocket wheel.

When the apparatus is in operation the cylindrical side wall 13 of the inner drum 9 is refrigerated due to the downward passage of the cooling medium through the annular space 20 and the inner side wall of the outer ring-shaped drum 10 and is refrigerated due to the upward flow of the cooling medium through the annular space 31. As the material to be chilled flows upwards through the annular chilling space 30 it contacts with, and is chilled by, such walls. The material during upflow thereof through said annular space 30 is subjected to the action of the inner and outer scrapers and is caused to flow back and forth between the inside and outside of the rotor body 40. When the material reaches the upper end of the chilling space 30 it is forced through the L-shaped duct 39 and thence into the outlet pipe 38. Due to the fact that the liquid cooling medium flows downwards through the annular space 20 in the inner drum and upwards through the annular space 31 in the outer drum 10 the material is subjected to a substantially uniform chilling temperature as it flows upwards from one end of the annular chilling space 30 to the other.

The herein described chilling apparatus is both rugged and durable and effectively and efficiently fulfills its intended purpose. It is in the form of a compact unit and is characterized by the fact that the various operating parts, such, for example, as the scraper equipped rotor and the head 35, are readily removable for repair or inspection purposes. Because of the interlocking connections between the scrapers and the rotor body the scrapers may be readily removed when the rotor is withdrawn from the chilling space 30.

Whereas the apparatus has been described as being particularly designed for use in connection with chilling lard, compound, or shortening it is to be understood that it may be used to chill other kinds of liquid materials. It is also to be understood that the invention is not to be restricted to the details set forth since these may be modified within the scope of the appended claims without departing from the spirit and scope of the invention.

Having thus described the invention what I claim as new and desire to secure by Letters Patent is:

1. A chilling apparatus comprising a cylindrical refrigerated wall adapted to have the material to be chilled flow past one face thereof, and a rotor embodying a tubular body positioned in spaced and concentric relation with said one face of the wall and having slots therein, and removable scrapers for scraping the wall in connection with drive of the rotor embodying free leading portions with scraping edges in contact with said one face of the wall and trailing portions in interlocked relation with the slots.

2. A chilling apparatus comprising a cylindrical refrigerated wall adapted to have the material to be chilled flow past one face thereof, and a rotor embodying a tubular body positioned in spaced and concentric relation with said one face of the wall and having openings therein and longitudinal slots behind the openings, and removable scrapers for scraping the wall in connection with drive of the rotor embodying free leading portions in opposed relation with the openings and with scraping edges in contact with said one face of the wall and trailing portions in interlocked relation with the slots.

3. A chilling apparatus comprising in combination, a cylindrical refrigerated wall adapted to have the material to be chilled flow past the inner face thereof, and a rotor embodying a tubular body of less diameter than the wall within said wall positioned in spaced and concentric relation with the inner face thereof and having longitudinal slots therein, and removable scrapers for scraping the wall in connection with drive of the rotor embodying free leading portions extending outwards from the body and provided with straight scraping edges in contact with said inner face of the wall, and in addition embodying trailing portions in interlocked relation with the slots.

4. A chilling apparatus comprising in combination, a cylindrical refrigerated wall adapted to have the material to be chilled flow past the outer face thereof, and a rotor embodying a tubular body of greater diameter than the wall around and positioned in spaced and concentric relation with the wall and having longitudinal slots therein, and removable scrapers for scraping the wall in connection with drive of the rotor embodying free leading portions extending inwards from the body and provided with straight scraping edges in contact with said outer face of the wall, and also embodying trailing portions in interlocked relation with the slots.

5. A chilling apparatus comprising in combination, a pair of cylindrical concentric refrigerated walls with an annular chilling space therebetween through which the material to be chilled is adapted to flow, and a rotor embodying a tubular body positioned in said space in spaced and concentric relation with the walls and having openings therein and longitudinal slots behind the openings, inner scrapers for scraping the inner wall embodying free leading portions positioned inwardly of the body and adjacent certain of the openings and trailing portions in interlocked relation with the slots behind said certain openings, and outer scrapers for scraping the outer wall embodying free leading portions positioned outwardly of the body and adjacent the other openings and trailing portions in interlocked relation with the slots behind said other openings.

6. A chilling apparatus comprising a cylindrical refrigerated wall adapted to have the material to be chilled flow past one face thereof, and a rotor embodying a tubular body positioned in spaced and concentric relation with said one face of the wall and having a pair of side-by-side longitudinal slots therein, and a removable scraper for scraping the wall in connection with drive of the rotor embodying a free leading portion extending away from the rotor body in the direction of the wall and with a straight wall-engaging scraping edge and also embodying a bowed trailing portion threaded through the two slots and in straddled relation with the portion of the body that is disposed between said slots.

7. A chilling apparatus comprising a cylindrical refrigerated wall adapted to have the material to be chilled flow past one face thereof, and a rotor embodying a tubular body positioned in spaced and concentric relation with said one face of the wall and having a pair of side by side longitudinal slots therein, and a removable scraper for scraping the wall in connection with drive of the rotor embodying a substantially flat leading margin extending away from one face of the rotor body in the direction of the wall, a bowed intermediate portion extending through the two slots and in straddled relation with the portion of the body between the slots, and a substantially flat trailing margin in lapped relation with the portion of the body that is rearwards of the rearmost slot.

8. A chilling apparatus comprising in combination a cylindrical refrigerated wall adapted to have the material to be chilled flow past one face thereof, and a rotor embodying a tubular body positioned in concentric and spaced relation with said one face of the wall and having a pair of longitudinally extending side by side slots therein, and a removable scraper for scraping the wall during rotation of the rotor having a free leading portion extending away from the rotor body in the direction of the wall and with a straight wall-engaging scraping edge and also having a bowed trailing portion threaded through the two slots and in straddled relation with the portion of the body that is between said slots and arranged so that it serves to urge the leading portions into spring contact with said wall.

9. A chilling apparatus comprising in combination a pair of cylindrical concentric refrigerated walls with an annular chilling space therebetween through which the material to be chilled is adapted to flow, and a rotor comprising a tubular body fitting within said space and in spaced relation with the two walls and provided with an opening therein and a pair of side by side longitudinally extending slots behind the opening, a removable scraper for scraping one of the walls during rotation of the rotor having a free leading portion adjacent the opening and extending away from the rotor body in the direction of the one wall, and also having a bowed trailing portion threaded through the two slots and in straddled relation with the portion of the body that is

between said slots and arranged and positioned so that it serves to urge said leading portion into spring contact with said one wall.

10. A chilling apparatus comprising a cylindrical refrigerated wall adapted to have the material to be chilled flow past one face thereof, and a rotor embodying a tubular body positioned in spaced and concentric relation with said one face of the wall and having a longitudinal slot therein, and a removable scraper for scraping the wall in connection with rotation of the rotor embodying a free leading margin extending away from the body portion in the direction of the wall and provided with a straight scraping edge in contact with said one face of the wall, a central portion extending at right angles to the leading margin and loosely through the slot, and a trailing margin in lapped relation with the portion of the rotor body that defines the rear portion of the slot, said scraper also having means associated with the central portion for preventing sidewise displacement of the scraper with respect to the rotor body.

11. A chilling apparatus comprising a cylindrical refrigerated wall adapted to have the material to be chilled flow past one face thereof, and a rotor embodying a tubular body positioned in spaced and concentric relation with said one face of the wall and having a longitudinal slot therein, and a removable scraper for scraping the wall in connection with rotation of the rotor embodying a free leading margin extending away from the body portion in the direction of the wall and provided with a straight scraping edge in contact with said one face of the wall, a central portion extending at right angles to the leading margin and loosely through the slot, and a trailing margin in lapped relation with the portion of the rotor body that defines the rear portion of the slot, said scraper also having a lug associated with its central portion and fitting in the slot for holding the scraper against sidewise displacement with respect to the rotor body.

12. A chilling apparatus comprising in combination a cylindrical refrigerated wall adapted to have the material to be chilled flow past one face thereof, and a rotor embodying a tubular body positioned in concentric and spaced relation with said one face of the wall and having a longitudinally extending slot therein, a removable scraper for scraping the wall during rotation of the rotor having a trailing margin in lapped relation with that portion of the rotor body that defines the rear part of the slot, a central portion extending at substantially right angles to the trailing margin and loosely through the slot and a comparatively wide substantially flat free leading margin extending away from the rotor body in the direction of the wall and engaging the wall with spring pressure, said scraper also having means associated with the central portion and fitting within the slot for holding the scraper against sidewise displacement with respect to the body of the rotor.

13. A chilling apparatus comprising in combination a pair of cylindrical concentric refrigerated walls with an annular chilling space therebetween through which the material to be chilled is adapted to flow, and a rotor comprising a tubular body fitting within said space in spaced relation with the two walls and provided with an opening therein and a pair of side by side longitudinally extending slots behind the opening and also provided with a second opening and a single longitudinally extending slot behind the last mentioned opening, a removable scraper for scraping one of the walls during rotation of the rotor having a free leading portion adjacent the first mentioned opening and extending away from the rotor body in the direction of said one wall and also having a bowed trailing margin threaded through the two slots and in straddled relation with the portion of the body that is between said slots, and a second scraper for scraping the other wall having a free leading portion adjacent the second opening and extending away from the rotor body in the direction of said other wall and a trailing portion in interlocked relation with the single slot.

14. A chilling apparatus of the character described including an inner drum embodying a cylindrical side wall, heads at the ends of said side wall and a tube within the side wall spaced from the latter so as to form therebetween an annular space and having one end thereof fitting against, and secured to, the head and its other end open and terminating inwardly of the other head, and means for circulating a liquid cooling medium through the inner drum in order to refrigerate the side wall including a pipe in communication with the interior of said one end of the tube, and a pipe communicating with the end of the annular space that is adjacent said one head, a hollow ring-shaped outer drum around the inner drum and with an annular space therebetween for the passage of the material to be chilled.

15. A chilling apparatus of the character described including an inner drum embodying a cylindrical side wall, heads at the ends of said side wall, a tube within the side wall spaced from the latter so as to form therebetween an annular space and having one end thereof fitting against and secured to, the head and its other end open and terminating inwardly of the other head, and a spiral baffle in said annular space; and means for circulating a liquid cooling medium through the drum including an inlet pipe communicating with the interior of said one end of the tube and an outlet pipe in communication with the end of the annular space that is adjacent said one head.

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