April 1, 1941. B. G. NEWHALL 2,237,107

LIQUID COOLER

Filed Dec. 5, 1938 2 Sheets-Sheet 1

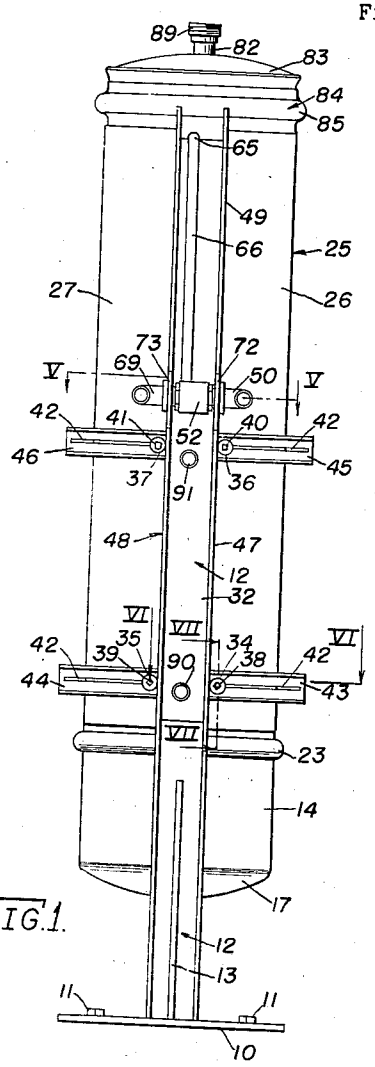


FIG. 1.

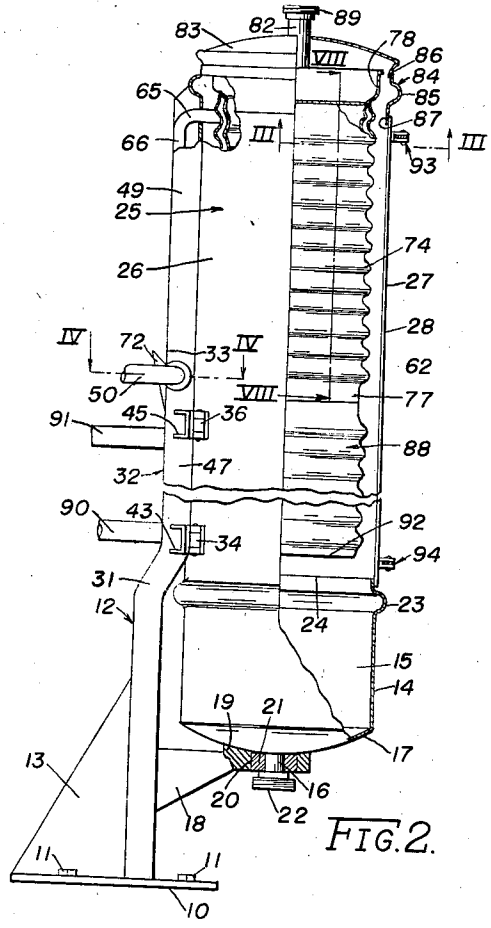


FIG. 2.

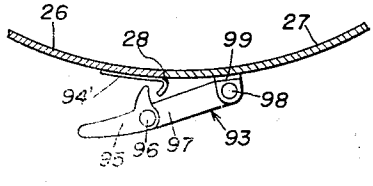


FIG. 3.

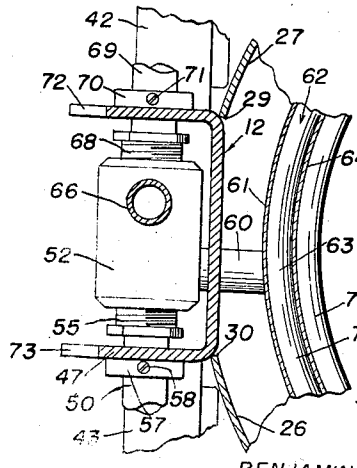


FIG. 4.

INVENTOR.
BENJAMIN G. NEWHALL.
BY Harry C. Schuster
ATTORNEY.

April 1, 1941. B. G. NEWHALL 2,237,107

LIQUID COOLER

Filed Dec. 5, 1938 2 Sheets-Sheet 2

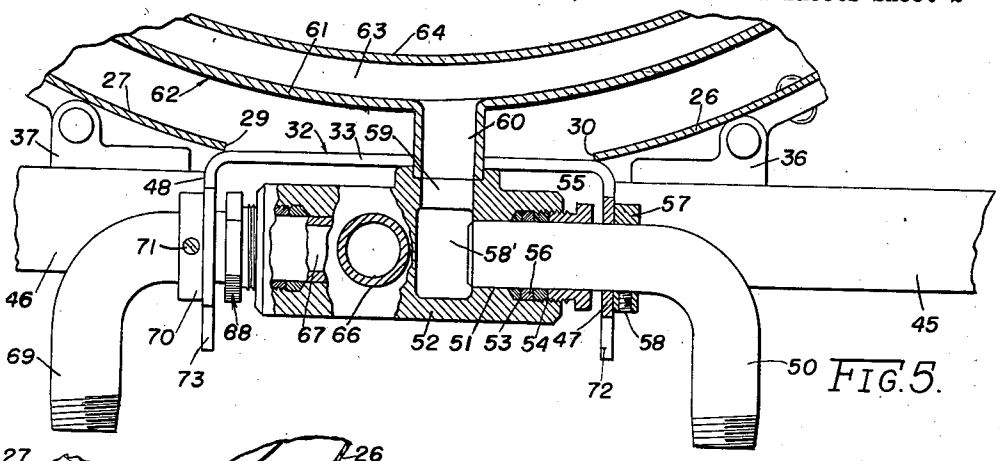


FIG. 5.

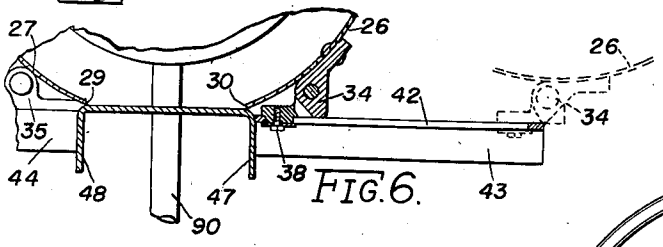


FIG. 6.

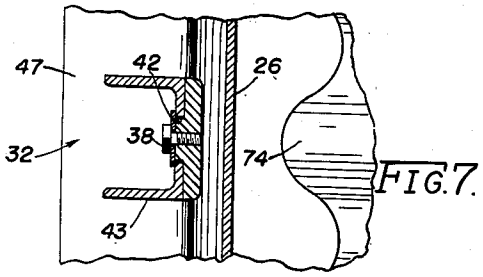


FIG. 7.

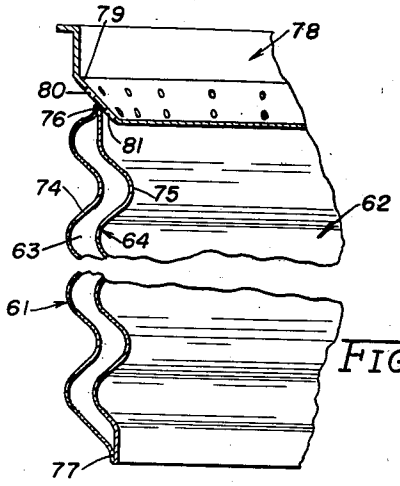


FIG. 8.

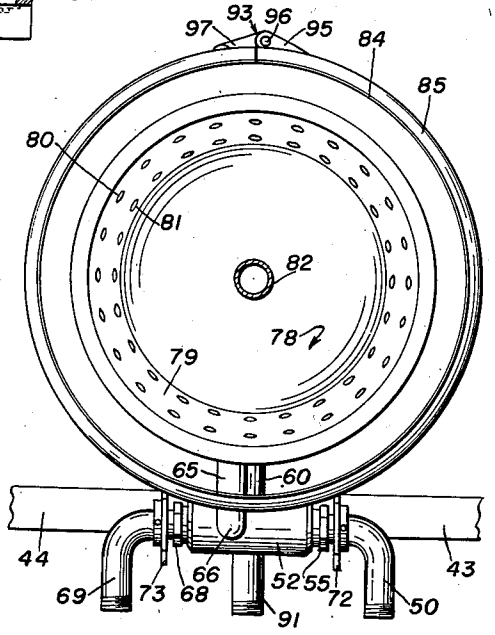


FIG. 9.

INVENTOR,
BENJAMIN G. NEWHALL.
BY Harry C. Lewis
ATTORNEY

Patented Apr. 1, 1941 2,237,107

UNITED STATES PATENT OFFICE

2,237,107

LIQUID COOLER

Benjamin G. Newhall, Forest Park, Ill.

Application December 5, 1938, Serial No. 243,984

8 Claims. (Cl. 257—180)

This invention relates to liquid coolers and more particularly to an improved cooler construction, although certain features thereof may be employed with equal advantages for other purposes.

It contemplates more especially the provision of a cylindrical sectional type cooler which is simple in construction, comparatively inexpensive to manufacture, and more efficient in operation.

One object of the present invention is to simplify the construction and improve the operation of devices of the character mentioned.

Another object is to provide an improved cylindrical sectional type of liquid cooler that is simple in construction and more efficient in operation from the standpoint of possessing increased capacity per unit area of space requirement therefor.

Still another object is to provide improved combined mounting and circulating means for a sectional type of liquid cooler.

A further object is to provide a cylindrical cooler having spaced corrugated cooling surfaces without requiring the cooling medium to follow a circuitous path so as to permit the use of the heavy refrigerants.

A still further object is to provide a cylindrical sectional type cooling device with improved circulating and mounting means therefor.

Still a further object is to provide a cylindrical type of cooling unit provided with improved refrigerant circulating liquid cooling means to render such more compact, less expensive to manufacture, and more efficient in operation.

Other objects and advantages will appear from the following description of an illustrative embodiment of the present invention.

In the drawings:

Figure 1 is a rear view in elevation of a liquid cooler embodying features of the present invention.

Figure 2 is a side view in elevation of a liquid cooler shown in Figure 1, parts of the casing being broken away and other parts being shown in section to clarify the illustration.

Figure 3 is a fragmentary sectional view of the casing section taken substantially along line III—III of Figure 2.

Figure 4 is a fragmentary sectional view taken substantially along line IV—IV of Figure 2.

Figure 5 is a fragmentary sectional plan view of the combined mounting and circulating means shown in Figure 4 as viewed substantially from line V—V of Figure 1.

Figure 6 is a fragmentary sectional plan view taken substantially along line VI—VI of Figure 1.

Figure 7 is a fragmentary sectional view of a casing section mount taken substantially along line VII—VII of Figure 1.

Figure 8 is a fragmentary sectional view in elevation taken substantially along line VIII—VIII of Figure 2.

Figure 9 is a plan view of the liquid cooler shown in Figure 1 with the top cover removed.

The structure selected for illustration comprises a base constituting, in this instance, a steel plate 10 of any suitable shape and configuration anchored to a supporting surface such as a floor by means of bolts 11. A standard comprising, in this instance, a substantially U-shaped steel beam 12 extends vertically upward from the base 10 to serve as a support for the cooling unit which may be elevated from the floor or other suitable surface at the desired heighth. The standard 12 is welded or otherwise attached to the base 10, and these parts are laterally supported by an angle brace 13 which is welded or otherwise joined therebetween to rigidify the frame structure.

A cylindrical liquid catch basin 14 is preferably though not essentially shaped or cast from heavy non-corroding metallic material to present a chambered interior 15 for the collection of the cooled liquid that is discharged through the pipe 16 communicating with the convexly curved bottom 17 thereof. The catch basin 14 with its axial discharge pipe 16 is supported by a laterally extending bracket 18 welded or otherwise joined to the standard 12 to extend oppositely of the angle bracket 13. The basin supporting bracket 18 is preferably provided with a concavely shaped boss 19 on the upper surface thereof to conform with and serve as a complement of the convexly curved basin bottom 17 to support the catch basin 14 in operative position to serve as a collector of the cooled liquid as will appear more fully hereinafter.

As shown, a vertical aperture 20 is provided in the catch basin supporting bracket 18 in axial relation with the concavely shaped boss 19 so as to completely and freely receive the discharge pipe 16 therethrough. A circular bushing 21 is fitted around the pipe 16 so as to conform in size with the bracket aperture 20 to preclude lateral displacement thereof and still provide the aperture 20 sufficiently large to permit a threaded flange 22 on the lower extremity of the pipe 16 to pass therethrough in permitting the removal of the catch basin 15 for cleansing purposes.

It is worthy of note that the threaded flange 22 serves to preclude the removal of the bushing 21 from the pipe 16 and with this arrangement the catch basin 15 can be readily removed and replaced without entailing much time, labor, or expense. The liquid collecting housing 14 terminates upwardly, in this instance, in a convexly curved peripheral ridge or flange 23 which defines an inwardly extending open peripheral orifice 24 through which the liquid enters the basin 15 from cooling instrumentalities disposed thereabove.

It is worthy of note that the peripheral flange 23 together with the inwardly extending circular orifice edge 24 presents a shoulder for fitted engagement of the cylindrical casing 25. The cylindrical casing 25 comprises, in this instance, a pair of complemental and substantially circular casing sections 26 and 27 that have a common vertical front meeting edge 28 and rearward edges 29 and 30 that extend along the substantially U-shaped standard 12. The standard 12 is, as shown, offset forwardly as at 31 just above the catch basin 15 so as to accommodate the increased diameter of its curved peripheral flange 23 which serves as a complemental meeting shoulder for the casing sections 26—27.

Beyond the offset 31, the standard 12 has a vertically extending portion 32 disposed in parallel spaced relation with the standard 12 to terminate in a straight edge 33 above the pipe joint 52. The casing sections 26—27 are mounted on oppositely disposed hinges 34—35 and 36—37 that have one of their swinging elements terminating in pintles 38—39 and 40—41, respectively, mounted for slidable displacement in horizontal slots 42 provided in oppositely disposed channel plates 43—44 and 45—46 that are welded or otherwise joined to the side walls 47—48 of the substantially U-shaped beam or standard 12—32.

In consequence thereof, the casing sections 26—27 are capable of being separated and then pivoted outwardly to render the interior accessible for cleansing purposes and vary the pivotal mounting of the upper standard 49 that is superposed and vertically aligned with the lower standard extension 32 for pivotal joinder thereto and angular displacement as will appear more fully hereinafter. To this end, a cooling medium intake or pipe 50 extends laterally through the side wall 47 of the lower standard extension 32 (Figure 5) for sealed communicating joinder with an axial opening 51 provided in a cylindrical housing mount 52.

The housing opening 51 in the pipe housing mount 52 is provided with a concentric counter-bore 53 which is threaded as at 54 to threadedly receive an axial aperture packing retaining nut 55. Suitable packing discs 56 are disposed in the counter-bore 53 for retention by the retaining nut 55 that serves to provide a relatively seal-tight rotating connection between the pipe 50 and the housing mount 52. The intake pipe 50 is held stationary by a disc ring 57 having a set screw 58 extending radially therethrough to engage the pipe 50.

As shown, the housing aperture 51 in the housing mount 52 communicates with a central chamber 58' that has a radial port 59 extending therefrom to communicate with an intake pipe 60 constituting a part of an exterior cylindrical wall 61 of a cooling unit 62. The cooling unit intake 60 is welded or otherwise joined to a counter-bore provided concentrically of the port 59 so as to effect a permanent connection therebetween to direct the cooling fluid through the pipe 50 and into the cylindrical chamber 63 defined by the inner cylindrical wall 64 spaced from and joined at their upper and lower ends to the outer cylindrical walls 61 to comprise the upper cooling section 62.

In this manner, a cooling medium such as cold water is directed into the pipe 50 and received by the cylindrical chamber 62 disposed between and defined by the spaced cylindrical walls 61—64 of the upper cooling unit 62. This cooling medium is discharged from the upper end of the cylindrical chamber 63 by means of a discharge pipe 65 that is welded or otherwise joined in communicating relation therewith (Figure 2). The pipe 65 passes above the upper standard 49 and is bent downwardly to provide a vertical pipe portion 66 disposed between the side walls of the standard 49.

The vertical pipe 66 is welded for joinder and communication with the interior of the pipe housing mount 52 (Figure 5) that has a housing discharge chamber 67 separate and apart from the central chamber 58' in the housing mount 52 to communicate with a threaded packing retainer nut 68 similar in construction to the retainer nut 55. The packing retainer nut 68 establishes seal-tight communicating joinder with a discharge pipe 69 that extends through the other side wall 48 of the lower standard extension 32.

A disc ring 70 similar in construction to the ring 57 is secured to the discharge pipe 69 by means of a set screw 71 so that the cooling medium can be circulated in the cylindrical chamber 63 of the cooling unit 62 and the latter may be tilted backwardly about the intake and discharge pipe 50—69 relative to the housing mount 52. It will be apparent, therefore, that the upper cooling unit 62 is rigidly mounted to the upper standard or beam 49 through the intake and exhaust pipes 60—65, respectively, and that the entire upper cylindrical chamber 62 may be tilted backwardly with the pipe housing or fitting 52 which rotates relative to the cooling liquid intake and outlet pipes 50 and 69, respectively, until limited by angular plates 72 and 73 fixed to the side walls 47—48 of the lower standard or beam extension 32. This is rendered possible by separating the casing sections 26—27 along the channel guide plates 43—44 and 45—46 which are provided with the slots 42 for slidingly mounting the casing sections 26—27. When fully separated, the space between the casing sections 26—27 permits the tilted displacement of the upper cooling chamber 62 therebetween for cleansing access to both the upper and lower cooling units 62 and 88, respectively.

It is to be noted that the exterior and interior walls 61—64 of the upper cooling unit 62, are provided with corrugations comprising convolutes 74 and 75, respectively (Figure 8) which are spaced in non-contacting relation for welded joinder at their upper and lower peripheral edges 76 and 77 so as to define the enclosed cylindrical chamber 63 that permits the cooling medium to flow in any direction therebetween without presenting any appreciable flow resistance and permitting the use of the flood system through which the cooling medium is circulated by resort to intake and exhaust pipes 50—60 that may be connected to a suitable cooling medium source such as cold water to constitute the initial stage of

cooling to be imparted to the liquid flowing over the exterior surface of both the outer and inner cooling walls 61 and 64.

The liquid is caused to flow thereover in a thin expansive film by providing an open circular vessel 78 at the upper peripheral common edge 76 (Figure 8). To this end, the vessel 78 is provided with an inclined lower wall portion 79 that has two circumferential series of apertures 80 and 81 spaced to communicate with the exterior and interior surfaces 61 and 64, respectively. To this end, the common meeting peripheral edges 76 of the exterior and interior walls 61 and 64 of the cooling unit 62 is welded to a solid circular line of the inclined portions 79 so as to definitely separate the spaced series of apertures 80—81 and insure that the liquid with which the vessel 78 is charged will flow by gravity down the exterior surface of the walls 61—64 of the upper cooling unit 62.

In order to charge the vessel 78 with the liquid to be cooled, an intake supply pipe 82 is axially joined by welding or other suitable expedients to a circular cover 83 that serves as a complement of a cylindrical band 84 which is outwardly extending bead 85 to present inwardly spaced peripheral edges 86 and 87 that serve as a complement of the cover 83 and the casing sections 26—27. Consequently, the casing sections 26—27 completely enclose the upper cooling unit 62 that is in superposed and axial relation with the lower cylindrical cooling unit 88. It is to be noted that the liquid to be cooled is conveyed from any suitable source such as a pasteurizing machine through a pipe that is detachably connected through a threaded flange 89 provided on the upper intake pipe 82, thereby establishing the flow of liquid such as milk from the pasteurizing machine or other source through the pipe 82 and into the open vessel 78 for gravity flow outwardly in thin films over both corrugated surfaces 61—64 of the upper cooling unit 62.

The lower cooling section 88 is constructed similarly to the upper cooling section 62, but can be of shorter length owing to the fact that a heavy refrigerant such as Freon can be circulated therethrough. The lower cooling section 88 is of the similar construction as the upper cooling section 62 and has a lower intake pipe 90 extending through the lower standard extension 32 for welded joinder with the interior chamber of the lower cooling unit 88, thereby serving to conduct a refrigerant therethrough and serve as a support therefor in conjunction with the discharge pipe 91 that is similarly attached to the upper portion of the lower cooling unit 88.

Consequently, a comparatively heavy refrigerant such as Freon can be utilized to step-up the refrigeration or cooling effect of the liquid as it passes downwardly in a thin film over both surfaces of the cooling section 62 to the lower cooling section 88 for eventual discharge to the collector or basin 15. It is to be noted that the lower cooling section terminates in a peripheral or circular edge 92 above the open upper end 24 of the collecting vessel 15 so as to permit an attendant's hand to be inserted therebetween for cleansing or other purposes. The distance between the lower edge 92 of the cooling section 88 and the open upper end 24 of the basin 15 and their comparative diameters are sufficient to permit the basin 15 to be telescoped thereover so that its lower discharge pipe 16 will clear the supporting bracket boss 19 and permit the basin 15 to be removed.

In order to retain the casing sections 26—27 properly closed to confine the superposed and vertically aligned sections 62—88, a pair of latches 93 and 94 (Figure 3) are provided adjacent the front meeting edges 28 of the sections 26—27 to retain them in closed contacting engagement. The latches 93 and 94 each consist of, in this instance, a stationery clip 94' for cooperation with a lever 95 pivotally mounted as at 96 to a link 97. The link 97 is pivotally mounted as at 98 to a bracket 99 welded or otherwise joined to the casing section 27 proximate to the meeting edge 28, thereby effecting the detachable closure thereof to preclude the entrance of foreign substances during the passing of liquid over the spaced surfaces of the cooling units 62—88.

It is to be noted that the spacing of the exterior and interior walls 61—64 of the cooling sections 62—88 provide corrugations 74—75 therein so as to define the increased radiating surfaces preferably though not essentially in convolute form to provide minimum resistance to the flow of the refrigerant or cooling medium and permits the use of a heavy refrigerant in the cooling sections. This is especially desirable in the lower section 88 in that it can be flooded with a heavy refrigerant such as Freon which is circulated under head pressure of no more than eighty pounds. A light refrigerant such as ammonia requires a much higher head pressure in the neighborhood of 155 pounds so that this feature is especially desirable.

Then, too, the upper cooling sections 62 can be tilted to render the interior thereof accessible for cleansing purposes and at the same time permit access to the interior of the lower section 88. This is accomplished without resort to flexible conduits or hose that would otherwise be required in directing the cooling medium through the upper cooling section 62. Flexible hose is not desirable in that it frequently leaks and the maintenance requirements thereof are especially great. Then, too, flexible conduit or hose is not conducive to utmost sanitation and the housing mount 52 serves to provide a means of tilting the upper section 62 and yet afford the use of rigid intake and discharge pipes 50—69 that are connected to a suitable source of supply of a cooling medium which may be cold water or even a refrigerant depending upon the best usage for any particular installations dictated by commercial practice.

Various changes may be made in the embodiment of the invention herein specifically described without departing from or sacrificing any of the advantages of the invention or any features thereof, and nothing herein shall be construed as limitations upon the structure, its concept or embodiment as to the whole or any part thereof except as defined in the appended claims.

I claim:

1. In a liquid cooler, the combination with a cylindrical chamber having spaced corrugated double walls joined only at their extreme peripheral edges to define a closed cylindrical pressure chamber constituting a part of a closed refrigerant system, of means for circulating a refrigerant over the interior corrugated surfaces of said cylindrical chamber, said last named means including a pressure confining path throughout the interior of said cylindrical chamber, means for directing liquid over the exterior corrugated surfaces of said cylindrical double walls to ef-

fect the cooling thereof, a sectional casing surrounding said chamber, and means for slidably mounting said casing sections relative to each other for enabling access to said chamber.

2. In a liquid cooler, the combination with a cylindrical chamber having corrugated double walls, of means for circulating a cooling medium over the interior corrugated surface of said cylindrical double walls, means for directing liquid over the exterior corrugated surface of said cylindrical double walls to effect the cooling thereof, said last named means including a pressure confining path throughout the interior of said cylindrical chamber, and an adjustably mounted casing surrounding said chamber in spaced relation with the exterior surface thereof for ready removal to afford complete access to said cylindrical chamber.

3. In a liquid cooler, the combination with a cylindrical chamber having convolutely corrugated double walls joined only at their extreme peripheral edges to define a tortuous path for a refrigerant under pressure, said corrugated double walls having their confronting surfaces in uniformly aligned spaced relation to define a substantially unobstructed uniform path for a cooling medium, of means for circulating a cooling medium under pressure over the interior corrugated surface of said cylindrical double walls, means for directing liquid over the exterior corrugated surface of said cylindrical double walls to effect the cooling thereof, a sectional casing surrounding said chamber, and means for movably mounting said casing sections relative to each other for access to said chamber.

4. In a liquid cooler, the combination with cylindrical chamber having corrugated double walls, said corrugated double walls having their confronting surfaces in substantially uniform spaced relation to define an unobstructed path for a cooling medium, of means for circulating a cooling medium over the interior corrugated surface of said cylindrical double walls, means for directing liquid over the exterior corrugated surface of said cylindrical double walls to effect the cooling thereof, and an adjustably mounted casing surrounding said chamber said casing consisting of movable sections in spaced relation with the exterior surface thereof for ready removal to afford complete access to said cylindrical chamber.

5. In a liquid cooler, the combination with superposed cylindrical chambers having double walls, said chambers being in axially aligned contact to define continuous external double wall surfaces of tubular means for movably mounting said cylindrical chambers relative to each other, means constituting a part of said mounting means for circulating cooling mediums in each of said cylindrical chambers, means for directing liquid over the exterior surface of said cylindrical double walls of each of said chambers to effect the cooling thereof, and a sectional casing adjustably mounted relative to said chambers to permit their relative movement for access thereto.

6. In a liquid cooler, the combination with superposed cylindrical chambers having corrugated double walls, said chambers being in axially aligned contact to define continuous external double wall surfaces of means for circulating cooling mediums in each of said corrugated cylindrical chambers, means for directing liquid over the exterior corrugated surface of said cylindrical double walls of each of said chambers to effect the cooling thereof, a casing surrounding said chambers in spaced relation with the exterior surface thereof, and means for displacing said casing relative to said chambers to permit access to said chambers.

7. In a liquid cooler, the combination with superposed cylindrical chambers having double walls, said double walls having their confronting surfaces in spaced relation to define an unobstructed path for a cooling medium, said chambers being in axially aligned contact to define continuous external double wall surfaces of means for circulating cooling mediums in each of said cylindrical chambers, means for directing liquid over the exterior surface of said cylindrical double walls of each of said chambers to effect the cooling thereof, a casing surrounding said chambers, means for displacing said casing relative to said chambers, and means for displacing one of said chambers relative to the other of said casings when said casing is displaced relative to said chambers.

8. In a liquid cooler, the combination with superposed cylindrical chambers having double walls, said double walls having their confronting surfaces in spaced relation to define an unobstructed path for a cooling medium, said chambers being in axially aligned contact to define continuous external double wall surfaces of means for movably mounting said cylindrical chambers relative to each other, means for circulating cooling mediums in each of said cylindrical chambers, means for directing liquid over the exterior surface of said cylindrical double walls of each of said chambers to effect the cooling thereof, a casing surrounding said chambers, means for displacing said casing relative to said chambers, and means for displacing one of said chambers relative to the other of said casings when said casing is displaced relative to said chambers.

BENJAMIN G. NEWHALL.