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CONDENSER FOR REFRIGERATING SYSTEMS

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Fig. 1

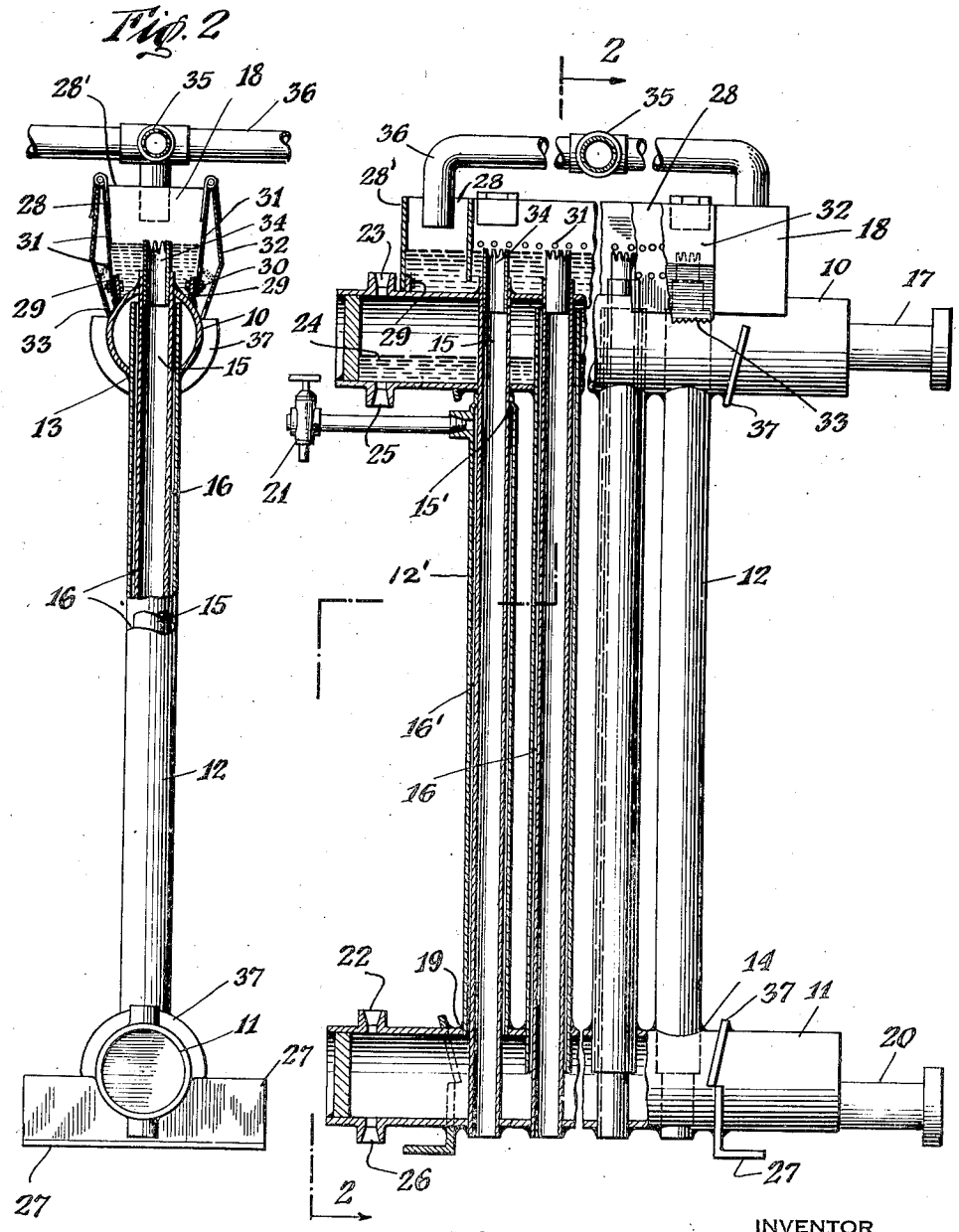



Fig. 2




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## CONDENSER FOR REFRIGERATING SYSTEMS

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9 Claims. (Cl. 257—35)

This invention relates to improvements in condensers, particularly condensers for refrigerating systems as for instance disclosed in my Patent No. 1,993,390 of March 5, 1935, and it is the principal object of my invention to provide a simple, cheap, yet highly effective non-condensible gas separator built into the structure of the double pipe condenser and forming an essential part of it. "Foul" gas separation effected in this manner is very useful for economical operation of refrigerating machines but especially in those smaller size machines which, due to high cost, are not now equipped with a special device known in the art as a foul gas separator or purging drum.

Another object of my invention is to provide for cooling water distribution in proportionate amounts and in thin films over the water side of a double pipe vertical condenser unit in which the water flow is controllable in wide limits, say, between ½ gallon to 5 gallons per minute per ton of refrigerating capacity by means of an adjustable ferrule placed at the top of the inner pipe within a water trough mounted on top of the upper header, and in which the water distribution is easily accessible for cleaning or inspection and instantly replaced into correct working position.

These and other objects and advantages of my invention, such as the use of the water distribution system for distributing beer or oil when the action of the double pipe condenser structure is reversed and it is used as a cooling unit, will become more fully known as the description thereof proceeds, and will then be specifically defined in the appended claims.

In the accompanying drawing forming a material part of this disclosure:

Fig. 1 is a sectional front elevation of part of a condenser equipped with a foul gas separator, and constructed according to my invention.

Fig. 2 is a sectional end view thereof as seen in the direction of arrows 2—2 of Figure 1.

As illustrated, the condenser embodies two horizontal headers, the upper header 10 and the lower header 11, which are in communication through the intermediary of a plurality of vertical stand pipes or tubes 12, which are connected by welding to the lower surface of the upper header and to the top of the lower header, as indicated at 13 and 14 respectively. The ends of the tubes 12 reach almost to the opposite sides of the headers and leave appropriate space to allow free passage to the entering hot gas or the leaving of condensed liquid refrigerating agent.

Within the tubes 12 are provided the inner tubes 15 so as to just allow a narrow ring-space 16 between tubes 12 and 15.

The tubes 15 extend clear through both headers and serve as additional cooling means for the gases passing through ring-space 16. The hot gas enters into the upper header at 17 and is cooled there by a water distributing arrangement designated generally as at 18 which will be described later on.

In this improved condenser the separation and purging of the non-condensible or so-called "foul" gases is provided for by forcing the foul gases upward into one of the ring-spaces 16' between the double pipes 12 and 15'. To effect this upward movement, the lower end of one of the pipes 12 is welded flush with the top of the lower header 11, as indicated at 19, preferably located at the opposite end from the liquid outlet 20. The upper end of this ring-space 16' is closed by welding it around the inner pipe 15 just below the bottom of the upper header 10, as indicated at 15' in Figure 1. By allowing the mixture of ammonia and foul gases, collected and trapped above the liquid level in the lower header 11, to rise into 16', it is quickly cooled to the temperature of the coldest cooling water. The cooling water runs in a thin film in a downward direction over the inside surface of the inner pipe 15 and over the outside surface of the outer pipe 12 coming from the water distributing arrangement 18, so that during the counter current movement of the cooling water, the ammonia vapor is effectively condensed out of the mixture while only foul gases remain at the top of the ring-space 16' where they are conveniently drawn off through a simple purge valve 21.

Free access to the ring-spaces 16 for those foul gases present in a liquid receiver or in the upper header 10 is established through piping connecting the liquid receiver to outlets 22 and 23 respectively as shown in my Patent No. 1,993,390.

Lubricating oil is trapped and deposited in the lower part of the upper header 10, as indicated at 24, from where it can be withdrawn through the oil drain 25. The lower header 11 is provided with a drain 26 and is supported by brackets 27.

The cooling water distributing arrangement 18 on top of the header 10 is built as follows:

The side walls 28 and end walls 28' of the water trough are tightly fastened by means of flat rails 29, welded around the header 10, and assembled with bolts 30 and suitable packing. The side walls 28 have two rows of flow holes 31 on each side of the trough and have hinged to the

top water retaining aprons **32** with serrations **33** at their lower ends, the aprons being so dimensioned that they touch the upper header **10** somewhat above its center.

A ferrule **34** with a notched top is snugly fitted into the top of the inner pipe **15** and is adjustable in height for regulating the flow of the cooling water which is received from the main water header **35** through branches **36**.

The aprons **32** extend alongside the water trough for a width covering the vertical stand pipes **12** and the flow of the cooling water toward the ends of the headers **10** and **11** is arrested by means of retaining strips **37**.

The operation of my device will be readily understood from the above description by simultaneous reference to the drawing, and it will be clear that any foul gases present in the condenser structure or the liquid receiver are quickly forced into the closed ring-space between the extreme vertical inner and the shorter outer stand pipe and that only foul gases are left to be drawn off at the closed top of the ring-space due to the separating action of the descending cold cooling water condensing the ammonia vapor out of the rising gas mixture and dropping it as liquid into the lower header.

It will also be clearly understood that the amount of cooling water running downwardly by gravity from the water trough is regulated by the position of the notched ferrule at the top of the inner vertical pipe, when only small amounts of cooling water are at hand, the ferrule is placed in a low position allowing water to run only through the lower flow holes in the side walls of the trough to cover the outside surfaces of the outer vertical pipes while at the same time enough water is flowing through the notches on the top of the ferrule to wet the entire inner surface of the inner pipe. With larger amounts of cooling water at hand, the ferrule is raised higher up allowing water to run also through the upper row of flowholes delivering larger quantities to the outer surfaces of pipes **12**. The water running through the flow holes is deflected downward by the aprons and is evenly distributed along the upper header and over the outer vertical pipes by the serrations at the lower end of the aprons which contact the header somewhat above its center. During operation it is easy to inspect the water flow from the inside and the outside of the trough, as it is a simple matter to swing the apron upward on its hinges and to bring it back into correct working position without any adjustment being required.

In case of operation where the action of the structure is reversed and it is used as a cooling unit for beer, milk, oils and other fluids the simplicity of the fluid distributing device is especially valued by those skilled in the arts not only for its ease of operation but also for its accessibility of all parts which are quickly taken apart for cleaning and sterilization and as quickly reassembled.

It will be understood that I have described and shown the preferred form of my invention only, as an example of the many possible ways to practically construct the same, and that I may make such changes in its general arrangement and in the construction of its minor details as come within the scope of the appended claims, without departure from the spirit of my invention, and the principles involved.

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

1. A condenser for refrigerating systems comprising an upper and a lower header, a plurality of vertically arranged double pipes connecting both headers, an extreme outer pipe from the top of the lower header closed around its concentric inner pipe below the upper header, providing a ringspace between them for the mixture of foul gases and refrigerating agent from the lower header, a means distributing a cooling medium from the top acting to eliminate the refrigerating agent by condensation from the mixture, and means to discharge the foul gases.

2. In a condenser for refrigerating systems, a double pipe trap incorporated with the structure, means for leading the mixture of foul gases and refrigerating agent to said double pipe trap, means for cooling the mixture with the coolant used in the system to separate the refrigerating agent by condensation from the mixture, and means to discharge the foul gases.

3. In a condenser for refrigerating systems comprising a plurality of single pipes, headers supporting said pipes, an extreme outer single pipe from the top of the lower header to the bottom of the upper header closed below said upper header, and providing a space for the mixture of foul gases and refrigerating agent from the lower header, a means for distributing a cooling medium from the top acting to eliminate the refrigerating agent by condensation from the mixture, and means to discharge the foul gases.

4. A condenser for refrigerating systems comprising side rails connected to the upper header, a water trough secured to said rails, double rows of flow holes formed in the walls of said trough, serrated and hinged aprons for downward deflection of the cooling water and notched ferrules adjustable for regulation of the water flow within wide limits.

5. A condenser for refrigerating systems comprising side rails connected to the upper header, an oblong trough for water secured to said rails, each side wall of the water trough having multiple rows of flow holes, notched ferrules fitted adjustably into inner pipes, and serrated and hinged aprons deflecting the flow of the cooling water downward along the upper header and over the outer pipes in thin films.

6. In a water distributing device for condensers in refrigerating systems, including an upper header, an oblong water trough mounted on top of said upper header, said water trough having a lower and an upper row of flow holes in each side wall, a notched ferrule adjustably fitted into inner pipes within the trough to guide a thin film of water into inner pipes, hinged and serrated aprons to guide a thin film of cooling water running through said flow holes over outer pipes.

7. In a water distributing device for condensers in refrigerating systems, an oblong water trough mounted on top of the upper header, a lower and an upper row of flow holes in each side wall of said water trough, hinged and serrated aprons opposing said flow holes to guide a thin film of cooling water over the outside surfaces of single vertical pipes.

8. In a cooler for refrigerating systems a fluid distributing trough comprising demountable side walls with rows of lower and upper flow holes in said side walls, serrated aprons hinged at their tops to the tops of the said side walls and opposing the said flow holes in said side walls, and notched ferrules fitted into the inner pipes to

regulate the flow of the fluid through the inside pipes and over the outside pipes.

9. In a cooler for refrigerating systems a fluid distributing trough comprising demountable side walls with rows of lower and upper flow holes in said side walls, serrated aprons hinged at their tops to the tops of the said side walls and opposing the said flow holes in said side walls to regulate the flow of the fluid over the outside surfaces of single vertical pipes.

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