Dec. 26, 1944. W. H. WINEMAN 2,365,791

COMBINED AFTERCOOLER AND RECEIVER

Filed Oct. 16, 1941

Fig. 1.

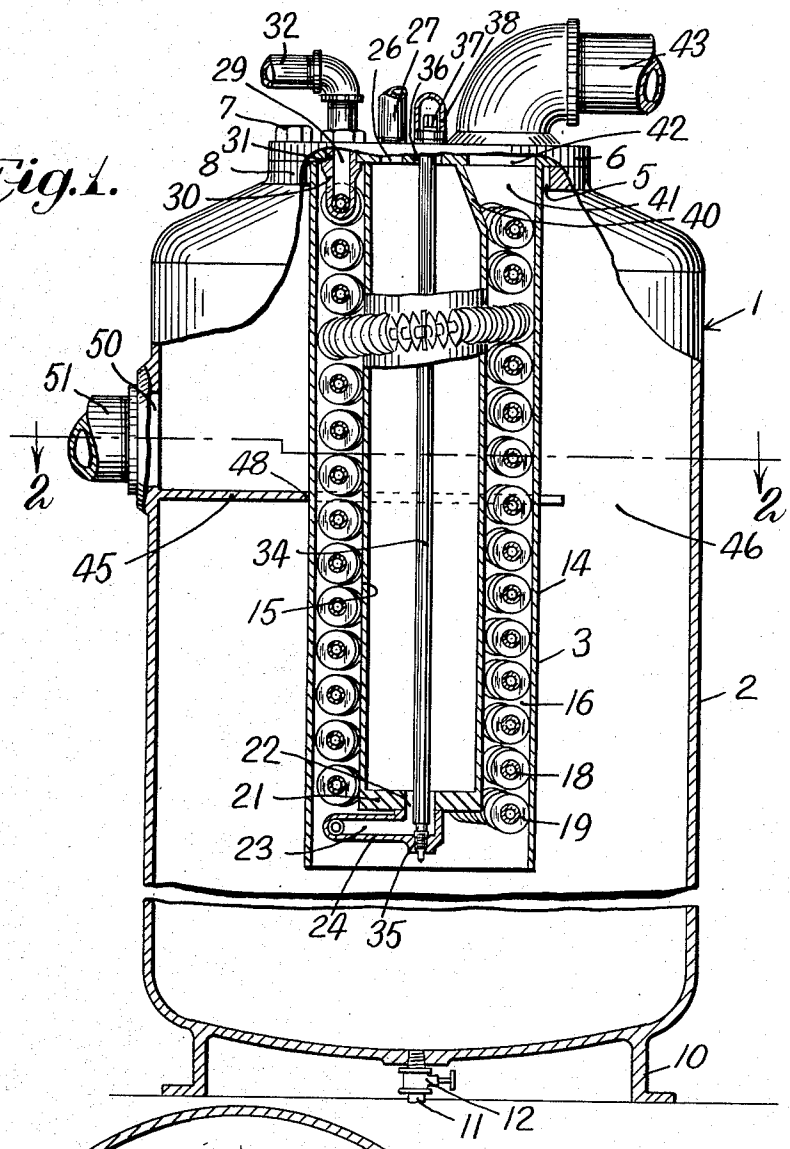
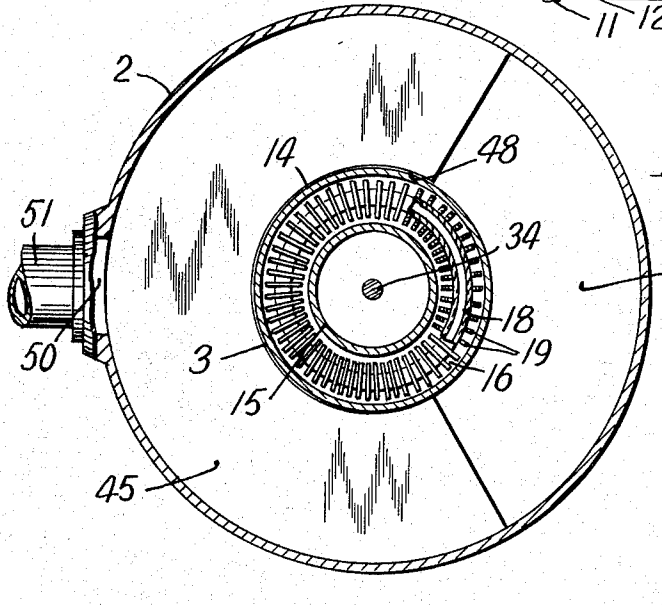


Fig. 2.



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COMBINED AFTERCOOLER AND RECEIVER

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1 Claim. (Cl. 257—229)

This invention relates to a combination of an aftercooler and a receiver, and more particularly to a receiver having incorporated therein a cooling device through which compressed fluid passes into the receiver where the fluid is dried and then reheated before it is discharged to a point of use.

An object of this invention is to provide an improved device for treating and storing compressed fluid. Another object is to provide improved means for removing liquid from a compressed fluid and then heating the fluid before it is discharged to a point of use. Still another object is to provide improved means for treating a compressed fluid, said means including an improved receiver having incorporated therein an improved cooling device through which the compressed fluid passes into the receiver where liquid is removed from the fluid, and the fluid is then directed about the cooling device so that it absorbs heat from the incoming fluid before it is discharged to a point of use. Other objects and advantages of the invention will appear during the course of the following description.

In the accompanying drawing in which for purposes of illustration one embodiment of the invention is shown.

Fig. 1 is a central vertical section, with parts shown in elevation, through the improved aftercooler-receiver.

Fig. 2 is a horizontal sectional view taken on the line 2—2 of Fig. 1.

Referring to the drawing it will be noted that the improved aftercooler-receiver, generally designated 1, comprises a receiver 2 having incorporated therein an improved cooling device 3.

The receiver 2 is shown herein as a cylindrical shaped tank having, at its upper end, an opening 5 which is closed by a cover plate 6 secured to the receiver as by bolts 7 extending into a flange 8 formed on the receiver surrounding the opening 5. The receiver is supported by an L-shaped flange 10 secured to its lower end as by welding, and opening into the lower end of the receiver is a drain pipe 11 having a manually controlled valve 12 which may be opened for draining liquid from the receiver when necessary.

The improved cooling device 3 comprises concentric cylindrical shaped casings 14 and 15 secured to the cover plate 6 as by welding, and extending through the opening 5 axially into the receiver. The casings 14 and 15 are formed to provide between them an annular space 16 within which a coiled conduit 18, having numerous, closely spaced radiating disks 19 along its length, is arranged. The lower end of the inner casing 15 in the illustrative construction shown terminates a bit short of the outer casing 14 and is closed by an end wall 21. Opening through the end wall 21 is a passage 22 communicating with a passage 23 formed in an element 24 which is secured, as by welding, to the lower surface of the wall 21. The lower end of the coiled conduit 18 is connected in any suitable manner to and opens into the interior of the element 24 and communicates with the passage 23. The cover plate 6 has an opening 26 in communication with the space within the casing 15, and herein shown threaded into this opening is a conduit 27 for conducting a cooling liquid into the casing. The upper end of the coiled conduit 18 is connected in communication with a passage 29 in an element 30 which extends through an opening 31 in the cover plate 6 and is suitably connected to a discharge conduit 32.

Extending axially through the casing 15 and through the port 22 in the end wall 21 is a rod 34 having its lower end threaded into an opening 35 in the element 24. The upper end of the rod extends through an opening 36 in the cover plate and has a head portion 37 which may be engaged by a wrench for turning the rod and opening the port 35 so that cooling liquid may be drained from the casing 15 and from the coiled conduit 18 if desired. To prevent cooling liquid from continuing to flow into the casing 15 when the port 35 is open, there will, of course, be provided suitable valve means in the supply conduit 27. Surrounding the head portion 37 of the rod 34 is a cap 38 which is suitably secured to the cover plate 6 for preventing an escape of cooling liquid through the opening 36.

A portion of the casing 15 at the upper end of the latter is bent, as at 40, to provide an enlarged space 41 between the casings 14 and 15, and a relatively large opening 42 in the cover plate 6 leads into the space 41 for delivering compressed fluid from a conduit 43 to the space 41 and to the space between the casings 14 and 15 surrounding the coiled conduit 18.

Arranged in the receiver between the casing 14 and the walls of the receiver is a baffle plate 45. This baffle plate is located in the upper portion of the receiver and is so formed as to provide an opening 46 through which fluid may pass between the ends of the receiver at one side of the latter. The baffle plate is shown as being welded to the walls of the receiver, and between the baffle plate and the casing 14 is a slight clearance 48 so that

the cooling device may be removed from the receiver if desired.

Opening through the walls of the receiver, at the side of the latter opposite the opening 46 and just above the baffle plate, is a port 50 communicating with a discharge conduit 51.

From the foregoing description the mode of operation of this device will be readily apparent. A cooling liquid, such as water, is delivered through the conduit 27 to the space within the casing 15 and is then conducted through the port 22 in the bottom of the casing and the passage 23 to the coiled conduit 18, through which it flows to the discharge conduit 32. Compressed fluid, such as air, is delivered from a source, as from a compressor, through the conduit 43 to the space 41 at the top of the cooling device 3. The compressed air at this time is at a high temperature and is relatively heavily laden with moisture and with particles of oil. The compressed fluid passes through the annular space between the casings 14 and 15, over the radiating disks and the coiled conduit 18, and the inner side of the annular stream also moves in contact with the relatively cold wall 15 of the chamber into which the cooling water first flows, and is rapidly cooled as it approaches the lower end of the receiver. By the time the fluid is discharged from the lower end of the cooling device into the receiver, the moisture and any oil vapors are largely condensed, and the condensed moisture and oil settles out and to the bottom of the receiver in the relatively large chamber in the bottom of the receiver where the air velocity is much reduced. The dry and considerably cooled air then passes upwardly between the wall 14, surrounding the cooling device, and the walls of the receiver, and flows through the opening 46 into the upper portion of the receiver where it then passes in both directions around the casing 14 to the discharge conduit 51. It will be noted that the upper portion of the casing 14 will be at a temperature much nearer to that of the incoming compressed fluid than the temperature of the air as it is discharged into the lower end of the receiver, and so the dry air, as it flows over the casing on its way to the discharge conduit, will be re-heated and made capable of doing a maximum amount of work.

As a result of this invention it will be evident that there has been provided a very compact unit for effecting a treatment of compressed fluid and for storing the fluid for use. It will further be noted that by reason of the cooling device extending into the receiver, there is obtained a cooling of the compressed fluid for effecting a condensation of moisture, a separation of the moisture when the fluid is discharged into the receiver, as well as a considerable separation upon the disks of the cooling liquid conduit, and a reheating of the moisture-free fluid as it is directed through the upper portion of the receiver and to a point of use. The construction disclosed reduces the cost below that of the apparatus which would otherwise be required for the multiple functions performed. It reduces the space occupied. There is no need for a relatively heavy-shelled aftercooler. A relatively high velocity of air discharge from the aftercooler unit promotes the separation of the oil and water from the air. The air leaving the receiver and passing to a point of use contains more energy than if all of the heat subtracted by the aftercooler were thrown away. Accordingly not only is a most efficient drying and freeing from oil effected, but the air is restored to substantially ambient temperature before it leaves the receiver. Other advantages of the invention will be clearly apparent to those skilled in the art.

While there is in this specification specifically described one form which the invention may assume in practice, it will be understood that this form of the same is shown for purposes of illustration, and that the invention may be modified and embodied in various other forms without departing from its spirit or the scope of the appended claim.

What I claim as new and desire to secure by Letters Patent is:

In a device of the character described, in combination, a cylindrical shaped fluid-receiving tank having an opening at its upper end, a fluid cooling device extending through said opening axially into said tank, said cooling device including concentric cylindrical casings providing an annular space therebetween, a coiled conduit arranged within said annular space for conducting a cooling liquid, means for delivering cooling liquid to the space within the inner one of said concentric casings, fluid conducting means for connecting the space within said inner casing to the lower end of said coiled conduit, means for discharging a moisture containing fluid under pressure through said annular space over said coiled conduit and into the lower portion of said tank, a baffle plate extending between the walls of said tank and the outer one of said concentric casings for directing fluid from the bottom to the upper portion of said tank along one side of the latter, means for discharging fluid from the opposite side of said tank and at the upper side of said baffle plate, manually controlled means for at will draining cooling liquid from said coiled conduit and said inner casing into the lower end of said tank, and means for draining said cooling liquid and liquid separated from said pressure fluid from the bottom of said tank.

WADE H. WINEMAN.