

June 17, 1952

A. E. DEMPSEY, JR
EVAPORATIVE CONDENSER

2,600,738

Filed Dec. 7, 1948

3 Sheets-Sheet 1

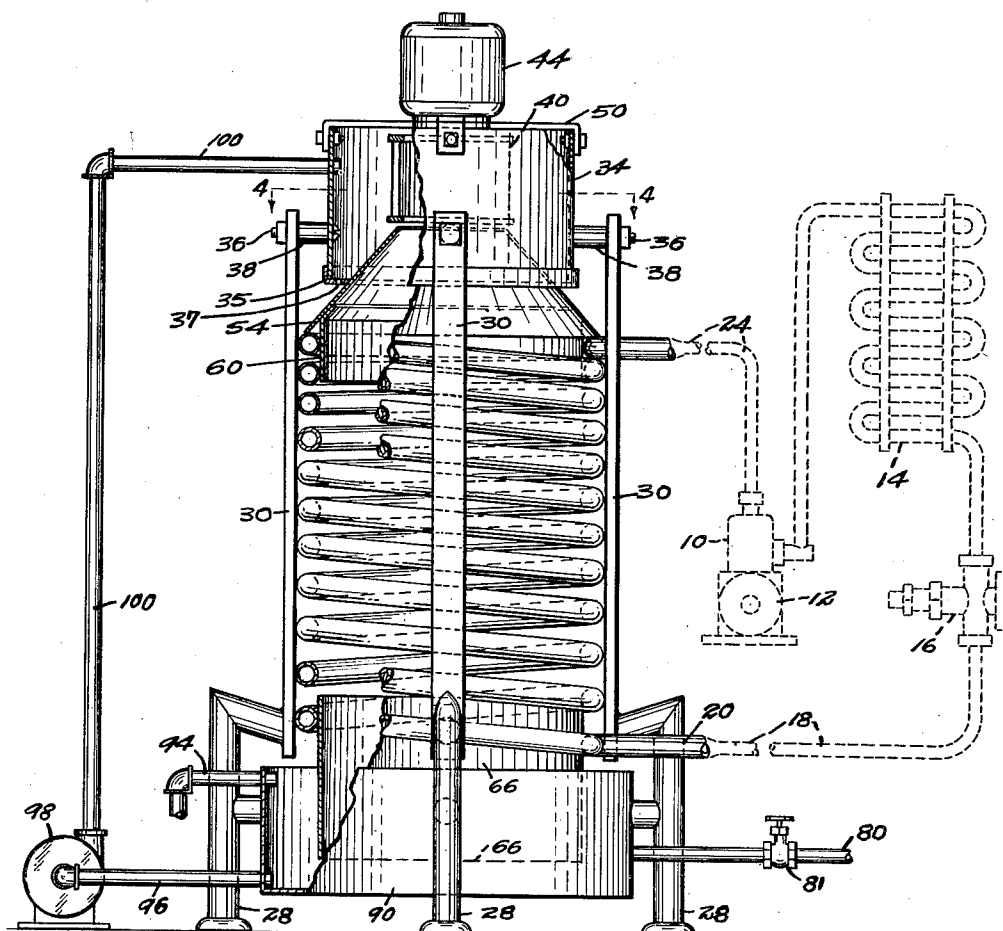


Fig. 1.

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3 Sheets-Sheet 2

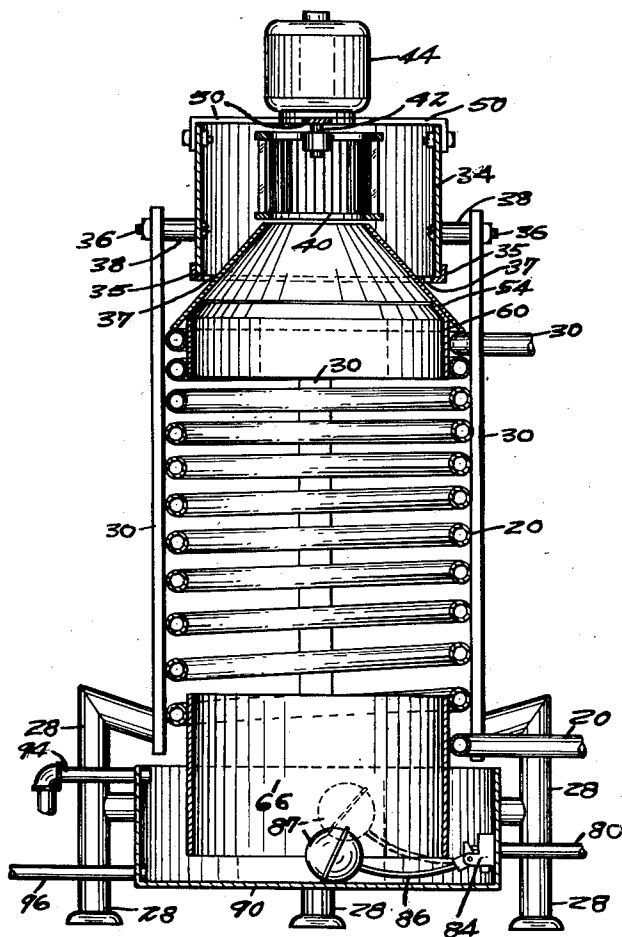


Fig. 2.

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3 Sheets-Sheet 3

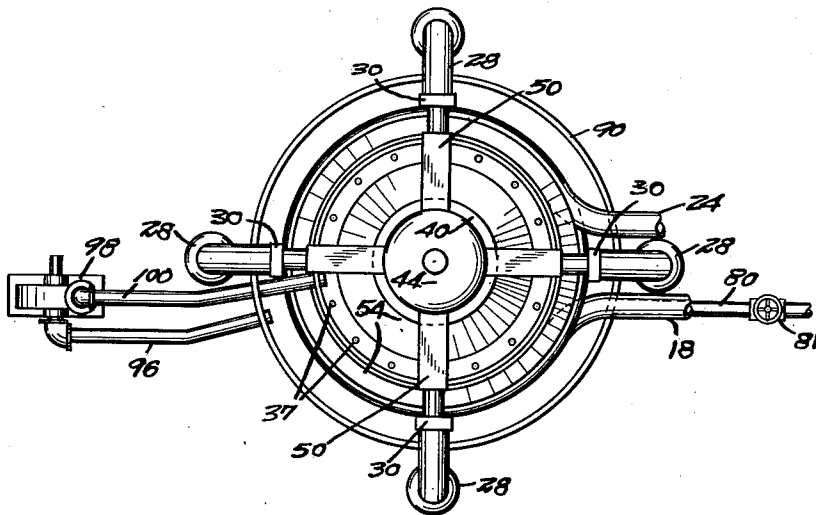


Fig. 3.

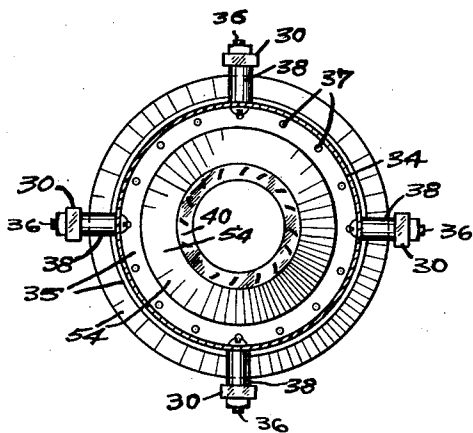


Fig. 4.

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UNITED STATES PATENT OFFICE

2,600,738

EVAPORATIVE CONDENSER

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Application December 7, 1948, Serial No. 63,939

3 Claims. (Cl. 257—37)

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This invention relates to condensers and more particularly it is an object of the invention to provide an evaporative condenser of more efficient construction than heretofore.

The coils of evaporative condensers of the prior art have been enclosed and air passing from one end of the enclosure across the coils to the other end of the enclosure is warmed by those coils it first strikes so that partially warmed air passes across successive coils in the enclosure. The efficiency of cooling is greater, however, in inverse proportion to the air temperature passing across the coils.

It is therefore an object of this invention to provide an evaporative condenser having its coil open to the air so that cool air, which has not been already warmed by other coils, can pass across each turn of the condenser coil for providing greater cooling efficiency.

Yet another object of the invention is to provide an evaporative condenser as described which will require less power input for driving an air propelling fan because of the freedom with which air can pass across the several turns of the coil thereof.

A further object of the invention is to provide an evaporative condenser as described which may be more economically constructed, unnecessary and undesirable parts being eliminated in the condenser of the invention with respect to condensers of the prior art.

Still another object of the invention is to provide a condenser the coils of which are readily visible to an inspector or to a casual but interested passerby for seeing any slime deposited upon the coils so that the slime may be removed conveniently, since the coils are readily accessible, to restore the condenser to maximum operating efficiency.

Yet another object of the invention resides in the provision of a condenser constructed in a manner so that corrosion and pitting of the coils thereof, caused by the different types of water available in different communities, may be readily seen by an inspector or operator and in time for repair thereof.

Still a further object of the invention resides in the provision of an evaporative condenser so constructed that water is delivered to the different sides of a coil thereof with even distribution.

Still another object of the invention is to provide an evaporative condenser, the fan driving motor of which may be smaller in proportion to total results, since air is adapted to flow across the turns of the coils thereof more easily than heretofore.

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Another object of the invention is to provide an evaporative condenser the openings between the several turns of the coil of which are proportional to fan capacity and proportional to the distance of each turn from the fan thereof and with respect to the other turns of the coil for greater efficiency.

Still a further object of the invention is to provide an evaporative condenser as described so constructed that the fan thereof functions as a centrifuge to throw any water in the air going past the fan outwardly therefrom against hood walls which convey the said water back to the condenser coil.

Yet a further object of the invention is to provide a condenser as described the coil of which functions as its own frame for eliminating the cost of a frame, and to provide a condenser the coil of which forms its own air passage for eliminating special duct work.

Another object of the invention is to provide a device for the purpose described which is sturdy and durable in construction, reliable and efficient in operation, and relatively simple and inexpensive to manufacture, assemble and utilize.

Other and still further objects and advantages of the invention will become apparent from the following detailed description of a preferred embodiment thereof.

In the drawings:

Figure 1 is a side elevation of the evaporative condenser of the invention, parts of the condenser being broken away for showing the interior thereof, other parts of a conventional refrigeration apparatus being shown in dotted lines and in smaller proportion;

Figure 2 is a vertical section through the evaporative condenser as shown in Figure 1;

Figure 3 is a top plan view as shown in Figure 1; and

Figure 4 is a view-in-section taken along the line 4—4 of Figure 1.

The evaporative condenser of this invention has many uses, but will be here illustrated as used with conventional refrigeration apparatus. Such apparatus includes a compressor 10 shown in Figure 1, driven by a suitable motor 12, and being disposed in series with a cooling coil 14. A valve 16 is conventionally provided in the line 18 leading from the coil 14 to the condenser of a refrigeration system.

On the downstroke of the piston, not shown, in the compressor 10 cold gas, or other refrigerant, is sucked into the compressor and during an upstroke of the compressor piston the re-

refrigerant is compressed. The compressed gas passing through the coil 14 expands taking up heat and cooling the surrounding air.

The line 18 is disposed in communication with the coil 20 of the condenser of the invention, those parts above described and shown in dotted lines being old and conventional.

The coil 20 of this invention is provided with a plurality of spaced apart convolutions, disposed in a helical configuration. The convolutions of the coil 20 define a cylinder which is normally vertically disposed.

The coil 20 is preferably composed of material of sufficient strength such that it forms its own frame and considerable framing is not necessary. The coil 20 is at its upper end disposed in communication with a line 24 which conducts refrigerant back to the compressor 10.

The condenser of the invention is provided with four legs 28 which latter are connected to supporting bars 30 which latter are preferably disposed on four sides of the coil 20. The supporting bars 30 are vertically disposed for the purpose of upholding a cylindrical water hood 34 which latter is provided with an open bottom and open top and is disposed with its axis vertical.

The hood 34 is provided with a lower rim 35 secured thereto. The rim member 35 is secured to the outside of the lower edge of the hood 34 and is provided with a normally horizontal portion extending inwardly of the lower edge of the hood and adjoining the top of the latter described frusto-conical baffle. The normally horizontal part of the rim 35 is provided with a circular row of apertures 37 which latter are spaced apart equidistantly for permitting water disposed in the hood 34 to pass downwardly across the convolutions of the coil 20 evenly as later described.

The hood 34 is supported above the coil 20 and spaced apart therefrom, suitable bolts 36 and spacers 38 being employed for attaching the hood 34 to the vertical supporting bars 30. Within the hood 34 a squirrel-cage fan is disposed upon a vertical shaft 42. The shaft 42 connects the squirrel-cage fan 40 with a suitable driving motor 44 which latter is vertically disposed above the hood 34.

It will be seen that the motor 44 need not be of as great a power for efficient operation as would be necessary with a similar coil condenser, having an outer chassis, since air can flow more freely between the convolutions of the coil 20. It will also be seen that the convolutions themselves form an air duct so that other duct work is unnecessary.

Cross braces 50 are disposed across the top of the hood 34 for securing the motor 44 thereto. Beneath the hood 34 a water directing baffle 54 is provided. The baffle 54 is of frusto-conical shape and is disposed with its axis vertical. The upper end of the baffle 54 is open and is disposed directly beneath the squirrel-cage fan 40. The lower end of the baffle 54 is also open for permitting air to pass therethrough at times when the fan 40 is in operation.

The lower end of the baffle 54 is disposed with its edge above the uppermost convolutions of the coil 20 so that water flowing downwardly across the inclined top of the baffle 54 will flow downwardly across the convolutions of the coil 20 and on all sides thereof.

A skirt 60 is secured to the inside of the bottom of the baffle 54. The skirt 60 is of substantially

a hollow cylindrical shape and is disposed with its axis vertical. The outer sides of the skirt 60 are disposed inwardly and closely adjacent the uppermost convolutions of the coil 20. At the lower end of the coil 20 and on the inner side of the lowermost convolutions thereof a cylindrical guide baffle 66 is provided having an open bottom and an open top. The guide baffle 66, as best shown in Figure 2 is positioned inwardly and in spaced relation to the tank or pan 90.

Beneath the guide member 66 a pan 90 is provided for the purpose of catching water dripping downwardly across the convolutions of the coil 20. The pan 90 is preferably circular and is of a diameter larger than the convolutions of the coil 20. The pan 90 is provided with an outlet pipe 80 in communication therewith and having a valve 81.

The outlet pipe 80 has a valve 84 secured thereto, the valve 84 being of the type employing an arm 86 and a float 87 for opening and closing itself.

The purpose of the valve 84 is to conduct water away from the collecting tank or pan 90 periodically and at times when the pan is sufficiently filled with water.

The pan 90 is also provided with an overflow safety pipe 94 extending into the upper end thereof for preventing overflow of the tank 90. Adjacent the bottom of the pan 90 a cooling water return pipe 96 is disposed and the latter extends to a pump 98.

The outlet side of the pump 98 is connected to a pipe 100 which latter extends upwardly and enters the hood 34 adjacent thereof for recirculating cooling water from the tank 90 to the hood 34.

The convolutions of the coil 20 are preferably spaced apart greater distances from each other in proportion with their distance from the fan 40 so that air passing between those convolutions which are farthest from the fan 40 can pass through more readily for pulling the air evenly between the various convolutions. This is desirable since if the spacing were the same all the way along, the majority of the air would pass between the convolutions nearest the fan since the air pull would be greatest there.

In operation it will be seen that cooling water from the pump 98 is carried to the hood 34 and will flow downwardly to the apertures 37 evenly across the baffle 54 and downwardly across the coil 20, on all sides thereof.

The lower end of the cylindrical skirt 66 should project below the water level in the tank 90 to prevent air from passing from the top of the tank 90 and up under the skirt 66.

The absence of an outer cover or jacket permits air to pass directly between each of the convolutions, so that at least some fresh cool air is striking each convolution.

The cooling water falling down across the coil into the tank 90 is caused to recirculate through the pipe 96 to the pump again.

This invention has provided an evaporative condenser which is more efficient and economical in construction than heretofore, which requires less power for efficient operation and which is of durable and accessible construction.

From the foregoing description, it is thought to be obvious that an evaporative condenser constructed in accordance with my invention is particularly well adapted for use by reason of the convenience and facility with which it may be assembled and operated, and it will also be ob-

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vious that my invention is susceptible of some change and modification without departing from the principles and spirit thereof, and for this reason I do not wish to be understood as limiting myself to the precise arrangement and formation of the several parts herein shown in carrying out my invention in practice except as claimed.

I claim:

1. In a condenser, the combination which comprises a vertically disposed pipe coil having an outlet connection at the upper end and an inlet connection at the lower end, a frusto-conical shape baffle positioned upon the upper end of the said coil with the diameter of the lower end of the baffle being less than the outside diameter of the coil, said baffle having a depending skirt extended downwardly and positioned against the inner surface of the coil, a horizontally disposed water collecting tank below the coil and positioned to receive water dripping from the coil, a cylindrical guide baffle positioned inwardly and in spaced relation to said tank and extended upwardly into the lower end of the coil and extended downwardly into the tank and to a point below the level of water in the tank, spaced vertically disposed supporting bars positioned against the outer surface of the coil and having outwardly offset lower ends extended over the peripheral wall of the tank, means supporting the said tank by the said offset lower ends of the support bars, a cylindrical hood having a perforated inwardly extended rim on the lower end positioned above the said frusto-conical shape baffle on the upper end of the coil, means supporting the said hood from the said support bars with the hood positioned to feed water supplied thereto to the outer surface of the said frusto-conical shaped baffle, a horizontally disposed fan mounted on the upper end of the frusto-conical shaped baffle and positioned in the said cylindrical hood for exhausting air from the interior of the coil, and means recirculating water from the tank to the hood.

2. In a condenser, the combination which comprises a vertically disposed pipe coil having an outlet connection at the upper end and an inlet connection at the lower end, the spaces between the convolutions of said coil increasing in width progressively toward the lower end of the coil, a frusto-conical shape baffle positioned upon the upper end of the said coil with the diameter of the lower end of the baffle being less than the outside diameter of the coil, said baffle having a depending skirt extended downwardly and positioned against the inner surface of the coil, a horizontally disposed water collecting tank below the coil and positioned to receive water dripping from the coil, a cylindrical guide baffle positioned inwardly and in spaced relation to said tank and extended upwardly into the lower end of the coil and extended downwardly into the tank and to a point below the level of water in the tank, spaced vertically disposed supporting bars positioned against the outer surface of the coil and having outwardly offset lower ends extended over the peripheral wall of the tank, means support-

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ing the said tank by the said offset lower ends of the support bars, a cylindrical hood having a perforated inwardly extended rim on the lower end positioned above the said frusto-conical shape baffle on the upper end of the coil, means supporting the said hood from the said support bars, with the hood positioned to feed water supplied thereto to the outer surface of the said frusto-conical shaped baffle, a horizontally disposed fan mounted on the upper end of the frusto-conical shaped baffle and positioned in the said cylindrical hood for exhausting air from the interior of the coil, and means recirculating water from the tank to the hood.

3. In a condenser, the combination which comprises a vertically disposed pipe coil having an outlet connection at the upper end and an inlet connection at the lower end, the spaces between the convolutions of said coil increasing in width progressively toward the lower end of the coil, a frusto-conical shape baffle positioned upon the upper end of the said coil with the diameter of the lower end of the baffle being less than the outside diameter of the coil, said baffle having a depending skirt extended downwardly and positioned against the inner surface of the coil, a horizontally disposed water collecting tank below the coil and positioned to receive water dripping from the coil, a cylindrical guide baffle positioned inwardly and in spaced relation to said tank and extended upwardly into the lower end of the coil and extended downwardly into the tank and to a point below the level of water in the tank, spaced vertically disposed supporting bars positioned against the outer surface of the coil and having outwardly offset lower ends extended over the peripheral wall of the tank, means supporting the said tank by the said offset lower ends of the support bars, a cylindrical hood having a perforated inwardly extended rim on the lower end positioned above the said frusto-conical shape baffle on the upper end of the coil, means supporting the said hood from the said support bars, with the hood positioned to feed water supplied thereto to the outer surface of the said frusto-conical shaped baffle, a horizontally disposed fan mounted on the upper end of the frusto-conical shaped baffle and positioned in the said cylindrical hood for exhausting air from the interior of the coil, means recirculating water from the tank to the hood, and means regulating the water level in the tank.

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