Feb. 19, 1935. R. A. HETZER 1,991,980

HEAT RECLAIMER

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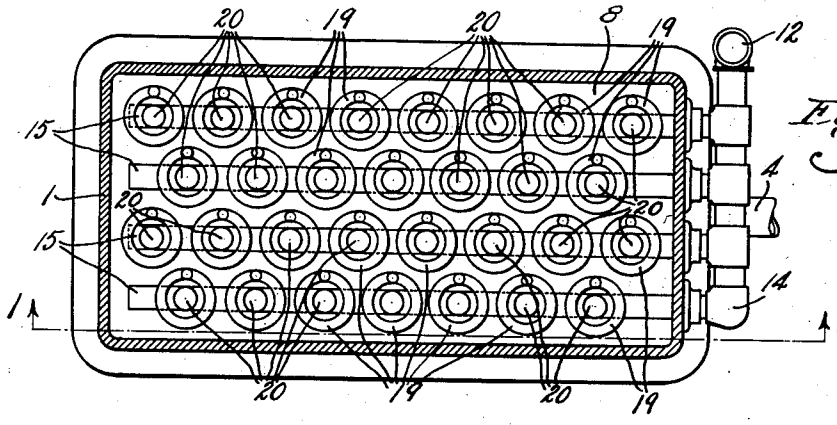


Fig. 2

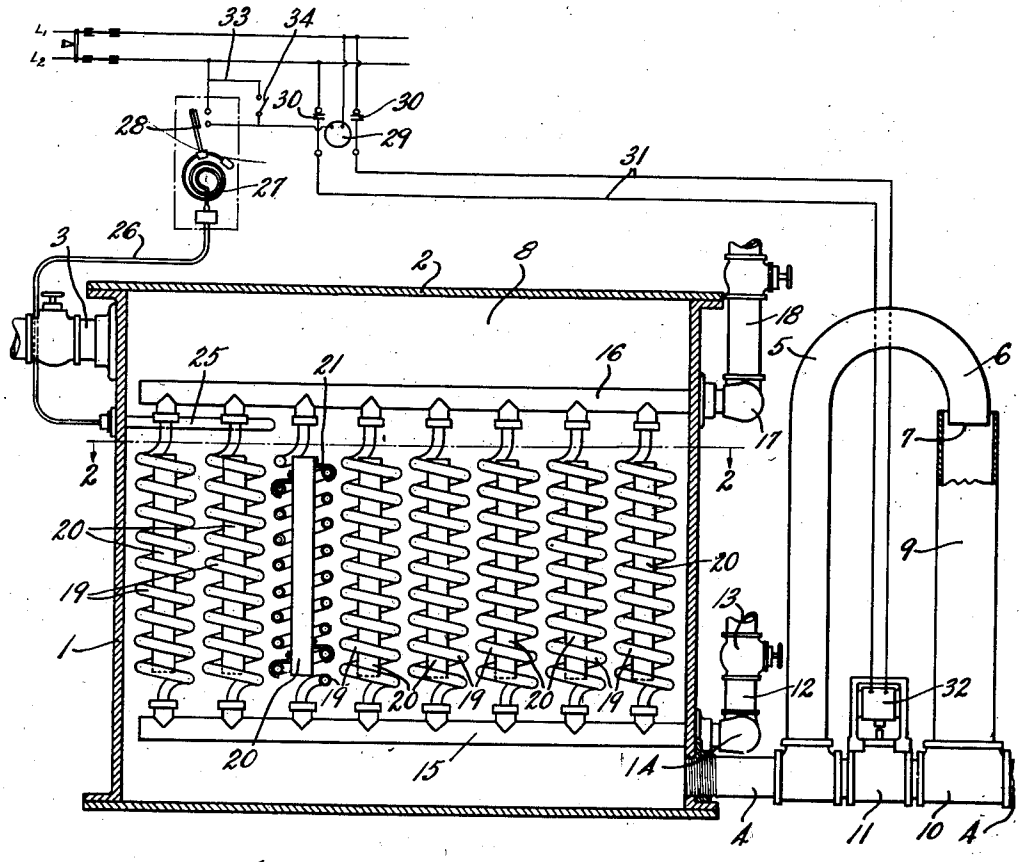


Fig. 1

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HEAT RECLAIMER

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1 Claim. (Cl. 257—229)

This invention relates to heat reclaimers, such as are used for heat exchange purposes. One use of such heat reclaimers, for example, is in laundry establishments where the heat contained in soiled or used wash water may be conserved and utilized by transferring it to the clean water supply which subsequently is further heated and used in any of the laundry processes, such as washing.

The object of the invention is to provide improved apparatus of this kind which is of very simple construction, which is capable of being readily cleaned out or flushed, which is very efficient in operation, which operates upon the counter-flow principle, which is more or less automatic in operation and does not require attention on the part of the operator, and which is arranged to dump the contents of soiled heating water to be replaced by a supply of hotter water in case it becomes too cold or the heat transfer effect is inefficient.

Further objects of the invention are in part obvious and in part will appear more in detail hereinafter.

In the drawing which represents one suitable embodiment of the invention, Fig. 1 is a sectional elevation on approximately the line 1—1, Fig. 2, looking in the direction of the arrows; and Fig. 2 is a sectional plan view on the line 2—2, Fig. 1.

The apparatus shown in the drawing comprises a tank or reservoir 1 provided with a suitable removable cover 2, the cavity 8 therein communicating in its upper portion with a valved supply pipe 3 for admitting the heat containing soiled wash water or other liquid from which heat is to be abstracted and at its bottom with an outlet pipe 4 for said water when cooled.

The outlet pipe 4 is preferably arranged so that a more or less definite level of liquid may be maintained within the cavity or the chamber of the device. For this purpose, the outlet pipe 4 is normally closed by a valve 11 and is provided with an upwardly extending overflow drain pipe 5, the downward leg 6 of which terminates in an open end at 7, such open end directing the stream of out-flowing liquid into a pipe 9 communicating beyond the valve 11 with a T 10 in the discharge pipe 4, the valve 11 being adapted for either automatic or manual operation in a manner which will later appear. The overflow pipe 5 rises to a height suitable for maintaining the desired liquid level in cavity 8.

The liquid to be heated comes by way of supply pipe 12 having a hand valve 13, the supply pipe communicating with a header 14 located on the outside of the casing 1 and communicating with a series, four being shown, of parallel manifolds 15 near the bottom of chamber 8. These manifolds lie beneath and in corresponding relation to a series of like discharge manifolds 16 in the upper portion of the chamber 8, the latter communicating with a discharge header 17 leading to the valved outlet pipe 18.

The corresponding lower and upper manifolds are connected in pairs by a series of pipe coils 19, shown as of helical form, causing the water travelling through them to move with a swirling motion and with sufficient agitation to avoid any tendency to produce a central core of liquid which does not come in contact with the inner pipe surface. There is a hollow cavity within each pipe coil and to avoid a core of the heating liquid travelling through the central cavity of the pipe coil without contacting the outer surfaces of the pipes, I preferably insert into each pipe coil a suitable baffle, such as cylindrical member 20, of tubular form with its ends closed, and held in suitable supports 21. The pipe coils of the single row connecting an upper and lower header are quite close together and preferably are in staggered relation to and close to the pipe coils of the next adjacent row, as shown in the drawing, so that throughout the mass of pipe coils, the pipe portions are always fairly close together and throughly break up the space within the cavity 8, so that the heating water unavoidably comes into intimate contact with one or the other of the pipe coils.

With such an arrangement, the heating water is admitted to the cavity 8 by opening the valve in the inlet pipe 3, the valve 11 being closed. The chamber 8, therefore, fills up with heating water to a level determined by the height of the overflow pipe 5 and any additional heating water passes out through the overflow pipe 5, pipe 9 and T 10 to the outlet pipe 4. If water to be heated is now introduced through the pipe 12 and is permitted to flow through the coils 19 to the pipe 18, it will obviously rise in the pipe coils, absorbing heat through the pipe coils as it moves upwardly. The result is operation by the counter-flow principle, the hottest portion of both the heating and heated water being in the upper portion of chamber 8. The process goes on indefinitely with an efficient transfer of heat to the water within the pipe coils.

Should the heat transfer reach a point where it becomes inefficient, such as by dropping the temperature of the heating water, a condition might be reached where the water to be heated

would be cooled, instead of being heated, with a loss of energy. This condition may arise in a laundry, for instance, during the dinner hour. At such a time the valves 3 and 13 are closed and the apparatus is not in use. The water in chamber 8 becomes cool and the heat reclaimer would be inefficient for a period after starting up. To avoid such condition, I preferably provide the apparatus with means sensitive to the temperature of the heating water for controlling the valve 11. The means shown comprises a bulb 25 located in the upper portion of the chamber 8 beneath the supply pipe 3 in the path of the entering liquid and below the level of liquid maintained therein and sensitive to the temperature of said liquid, such as by containing an expansible material. Said bulb communicates by a pipe 26 with a Bourdon tube or the like 27 adapted by its motion of expansion and contraction to actuate a switch 28 in a circuit including a contactor coil 29, the latter adapted to open or close two sets of contacts 30 in a circuit 31 to a solenoid or electro-magnet 32. The contacts of switch 28 may be short-circuited by a circuit 33 including a hand switch 34.

With this arrangement, if the temperature of the upper strata of the heating liquid drops below an efficient value, the effect of such temperature upon the bulb 25 is reflected in contraction of the Bourdon tube 27, which closes the switch 28, energizes coil 29, closes contacts 30 and energizes the solenoid 32, thereby opening valve 11 and dumping to the sewer through the pipe 4 all of the contents of heating water within chamber 8. Upon resuming operations, the valves 3 and 13 are reopened. The chamber is thereupon refilled with incoming fresh hot soiled water, which contacting the bulb 25 as it enters the chamber, expands Bourdon tube 27, de-energizes solenoid 32 and permits valve 11 to close. In other words, this arrangement replaces an inefficient supply of heating water with an efficient supply thereof and automatically avoids an inefficient heat exchange condition. For clean out or other like purposes, the dumping valve 11 may be opened by closing the hand switch 34 with actuation of the valve 11, as before. By taking off the cover 2, the inside of the chamber may be flushed out with a hose or the like, as is obvious.

What I claim is:

Heat reclaiming apparatus of the character described, comprising a reservoir, a supply pipe for heating liquid connected to the upper portion of said reservoir, means for maintaining a predetermined level of liquid in said reservoir, conduits arranged generally vertically in said reservoir and submerged in said liquid, means causing an upward flow of fluid to be heated in said conduits, a drain pipe connected to the lower portion of said reservoir, a valve in said drain pipe, means for operating said valve, and a thermostatic control for said valve-operating means, said control comprising a heat sensitive element located in the upper portion of said reservoir and in the path of the incoming heating liquid and beneath the normal liquid level, the parts being arranged to open said valve when said element is cooled and to close said valve when said element is heated.

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