

May 26, 1942.

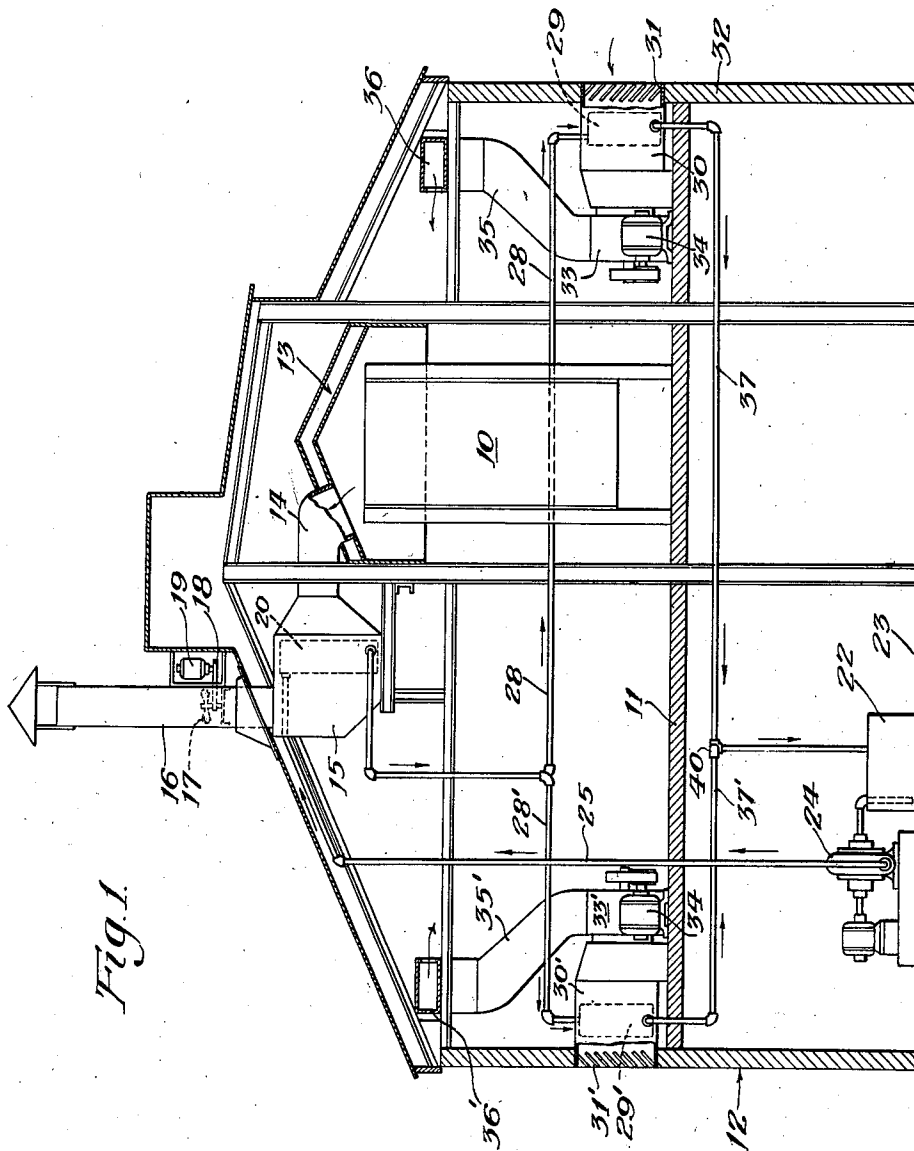
S. R. PORWANCHER

2,284,165

HEATING SYSTEM

Filed June 23, 1939

2 Sheets-Sheet 1



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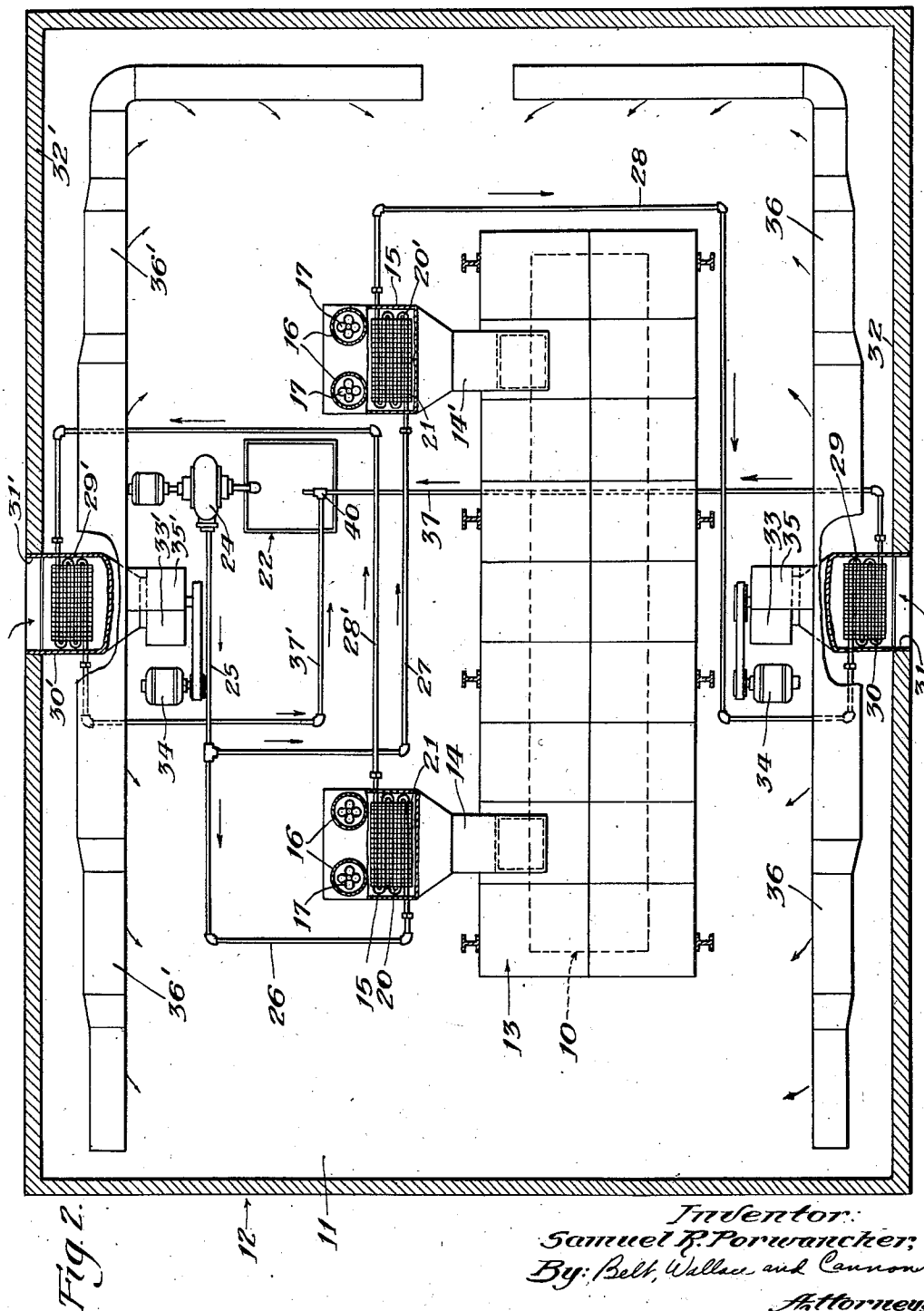
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UNITED STATES PATENT OFFICE

2,284,165

HEATING SYSTEM

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1 Claim. (Cl. 34—86)

This invention relates to heating systems and more particularly to reclaiming heat usually exhausted to the atmosphere or otherwise dissipated without recovery in drying systems of paper making machines that employ air as the heat circulating medium.

In paper making machines, heated air is circulated over the moist fibrous web to effect the desired drying or removal of moisture therefrom, and this air is thereafter exhausted to the atmosphere or otherwise dissipated without having the heat therein extracted therefrom. The primary object of the present invention is to recover heat from the heated drying air passing from a paper making machine prior to the exhausting of such air to the atmosphere or other dissipation thereof.

Another object is to utilize heat recovered from the heated drying air from a paper making machine in any of a wide variety of ways.

A more specific object is to employ heat recovered from the drying air passing from a paper making machine to heat or assist in heating the building in which the machine is housed or in the processing of the pulp from which the paper is produced.

Other objects and advantages of the present invention will be apparent from the following description wherein reference is made to the accompanying drawings in which

Fig. 1 is a transverse sectional view taken through a building in which a paper making machine is housed, and with which one form of my invention is associated; and

Fig. 2 is a horizontal sectional view of the building and apparatus shown in Fig. 1.

In the accompanying drawings I have shown a paper making machine 10, the details of which are unimportant for present purposes, and as is illustrated in Fig. 1 the machine is preferably mounted on a floor 11 of a building 12 above the lowest floor of such building.

In the operation of a machine of this type the pulp is formed and then dried, this later operation being effected or assisted by the circulation of heated air through or about the machine, and the moisture removed during the process is carried by the current of heated air through a discharge duct which leads from the building 12. The discharge duct, as shown in Fig. 1, includes an elongated hood 13 which overlies the machine and in which the heated moisture-laden air withdrawn from the zone of the machine 10 is collected. The air flows from the hood 13 through a plurality of ducts opening

through the upper portion of the hood. As herein shown two exhaust or vent ducts 14 and 14' are provided at spaced points along the top of the hood 13. (Fig. 2). In the present instance each duct 14 and 14' opens into an enlarged housing portion 15 and a vent stack 16 extends through the roof of the building 12 from each portion 15. As shown in Fig. 1, each stack 16 has draft inducing means, such as an exhaust fan 17, mounted therein and such means is, in the present instance, driven by a belt 18 from a motor 19 mounted outside of the stack. The fans operate to withdraw heated air from the zone of the machine through the hood 13, ducts 14 and 14' and housing portions 15 and cause discharge of the air so withdrawn to the atmosphere through the stacks 16.

The air which is so circulated is heated by conventional air heating means (not shown) and when drawn through the exhaust ducts 14 and 14' this air still retains a large proportion of the heat which has thus been supplied, plus considerable moisture absorbed from the paper in the paper making machine. In accordance with the present invention, the heat in this exhaust air is recovered in such a way as to be usable either in the paper making process or for heating the building 12 or for other purposes. To this end, each of the housing portions 15 has a heat exchanger mounted therein. Thus, as shown in Fig. 2, the portion 15 in the passage 14 has a coil 20 so mounted therein that the air drawn through this housing must pass over the coil 20 on its way to the exhaust stack 16 leading from this housing. A similar coil 20' is correspondingly mounted in the housing portion 15 in the duct 14'. Preferably the coils 20 and 20' have radiating fins or plates 21 thereon so as to increase the efficiency thereof as heat transfer devices.

A heat circulating medium, such as water, is passed through the coils 20 and 20' so that as the heated air from the zone of the machine flows over the coils or heat exchangers 20 and 20' heat therefrom may be transferred to the medium circulated through the coils or heat exchangers. Heat so taken up by the medium circulated through the heat exchanges 20 and 20' is carried by the medium to other heat exchangers or the like where such heat may be utilized. As heat is extracted from the moisture-laden air by the coils 20 and 20', the temperature of the air usually drops slightly below its dew point, whereby a film of moisture is deposited upon the coils. This is an advantageous feature in that

a damp surface absorbs heat from the passing air more readily than would a dry surface, and hence a more efficient heat exchange arrangement is afforded.

To this end the two heat exchangers or absorbing devices 20 and 20' are incorporated in a fluid circulating system which includes a liquid supply tank 22 on the lower floor 23 of the building 12, and by means of a motor driven pump 24, liquid, which may be water, from the tank 22 is forced upwardly through a riser pipe 25 (Fig. 1) and thence through a branch pipe line 26 (Fig. 2) into one end of the heat absorbing coil 20 and through another branch pipe line 27 to one end of the corresponding coil 20'. A pipe line 28 leads from the other end of the coil 20 to a heat exchanger or transfer device 29 which, in the present instance, is positioned in an air intake duct 30 through which fresh air is supplied to the interior of the building 12. As herein shown the intake duct 30 is connected to receive air through a grilled opening 31 in a side wall 32 of the building 12, and is provided with an intake blower 33 which is belt driven from a motor 34. Air drawn from the exterior of the building 12 through the duct 30 is discharged by the blower 33 into a riser duct 35 from which it is distributed about the building 12 through side discharge openings in connected overhead distributing ducts 36.

The heat exchanger 29 is herein shown as being of the same type as the exchangers 20 and 20' and since water heated in the heat exchanger 20 flows through pipe line 28 to the heat exchanger 29, air drawn over and about the pipes of the heat exchanger 29 is heated by the heated water which is forced through the pipes by the pump 24. From the coil 29 the liquid drains back to the tank 22 through a pipe line 37.

In the present system there is also provided a second air intake duct 30' having a grilled intake opening 31' in the wall 32' of the building, the duct 30' having a blower 33' discharging through a riser 35' and overhead distributing ducts 36' disposed along side 32' of the building. The intake duct 30' is also provided with a heat exchange device 29', similar to the heat exchanger 29, and which is supplied with heated water from the heat exchanger 20' through a pipe line 28'. This liquid is discharged into the tank 22 by a return pipe line 37' which, as shown in Fig. 1, joins with the line 37 at 40.

By way of example, if air withdrawn from the zone of the machine 10 to flow through the exhaust ducts 14 and 14' and housing portions 15 over the heat exchangers 20 and 20' has a temperature of from 170° F. to 180° F., sufficient heat may be taken therefrom in the heat exchangers 20 and 20' to reduce the temperature of this air to about 90° F. before discharge of the air 60 through the stacks 16. The heat so extracted

from the air in the heat exchangers 20 and 20' is carried by the medium circulated through these heat exchangers to the heat exchangers 29 and 29' where it may be utilized to heat fresh air taken in through the intake ducts 30 and 30' to a temperature of from 75° F. to 80° F. and this air so heated is discharged from the ducts 36 and 36' to heat the interior of the building 12.

Of course, the heat circulating medium flowing through the heat exchangers 20 and 20' could be directed to means other than heat exchangers as 29 and 29' to have heat picked up thereby transferred to other than intake air for the building 12. For example, water heated in the heat exchangers 20 and 20' could be employed in the paper making process or be otherwise utilized.

While I have illustrated and described a selected embodiment of my invention, it is to be understood that this is capable of variation and modification and I therefore do not wish to be limited to the precise details set forth but desire to avail myself of such changes and alterations as fall within the purview of the following claim.

I claim:

25 The combination with a building having side walls and a paper making machine disposed within the building through which a heated fluid medium is circulated for the purpose of absorbing moisture from paper material produced therein, a heat reclaiming system comprising an exhaust hood overlying and partially enclosing said machine, an exhaust passage leading from said hood and communicating with the atmosphere outside the building, an exhaust fan in said passage for withdrawing heated air from the vicinity of the machine and discharging the same to atmosphere, a heat exchanger in said exhaust passage having coils through which a liquid may be circulated out of direct contact with the air flowing through said passage but in heat exchange relation therewith to absorb heat therefrom, there being an inlet passage in one of the building side walls, a heat transfer device situated adjacent said inlet passage and remote from said heat exchanger and having coils through which a liquid may be circulated out of direct contact with air passed over said heat transfer device but in heat exchange relation therewith to transfer heat thereto, means interconnecting the coils of said heat exchanger and said heat transfer device in a closed circulatory system, and pump means embodied in said system operable to circulate a liquid therethrough for carrying heat absorbed in said heat exchanger to said heat transfer device, and a distributor duct communicating with the inlet passage and having a discharge outlet for air positioned adjacent the upper regions of the building and remote from the paper making machine.

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