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APPARATUS FOR THE MANUFACTURE OF PULP

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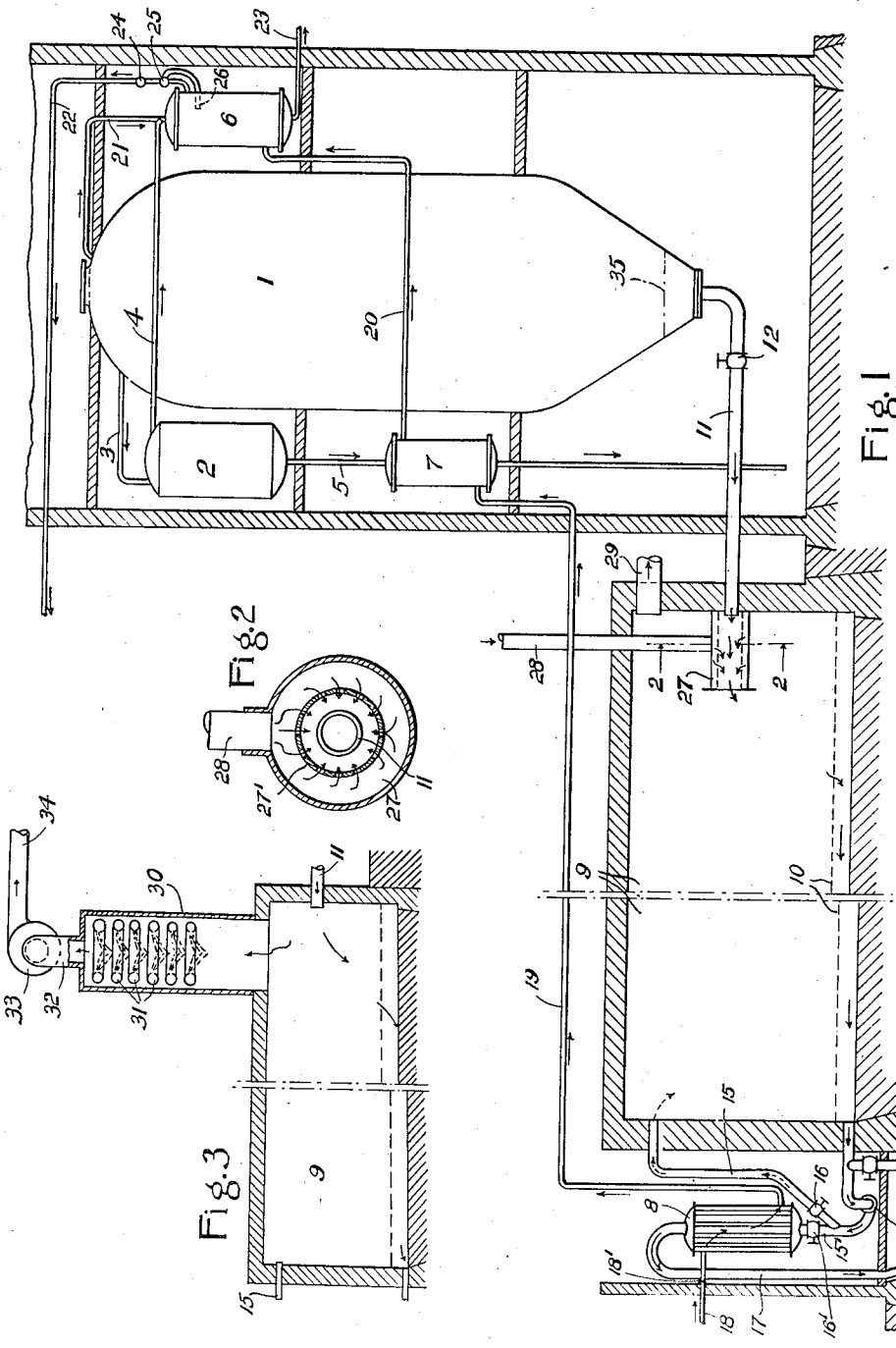


Fig. 1

Fig. 2

Fig. 3

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APPARATUS FOR THE MANUFACTURE OF PULP

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Original application April 23, 1932, Serial No. 607,152, now Patent No. 1,947,888, dated February 20, 1934. Divided and this application February 17, 1933, Serial No. 657,155. In Canada April 20, 1932

2 Claims. (Cl. 92—7)

This invention relates to the manufacture of pulp and particularly to an improved process and apparatus.

The object of the invention is to effect economies in manufacture of pulp by an improved recovery of valuable elements from the discharged contents of the digester during and/or after the cooking operation.

A further object of the invention is to cool the pulp and liquor as they are blown from the digester for a purpose hereinafter described.

Referring now to the accompanying drawing which illustrates, by way of example, one convenient form of apparatus for carrying the invention into effect:—

Figure 1 is a diagrammatic sectional elevation of the apparatus,

Figure 2 is an enlarged section on line 2—2 of Figure 1, and

Figure 3 is a fragmentary sectional elevation illustrating a modification of the invention.

1 represents any suitable digester as commonly used for cooking wood chips in the manufacture of sulphite pulp. 2 indicates any convenient recipient or separator tank into which the relief acid from the digester 1 is discharged through a pipe 3. In this tank the free gases are separated from the liquor and the gases are led off along a pipe 4 while the liquor flows down through a pipe 5. 6, 7 and 8 are heat exchangers consisting of a number of pipes made of acid resisting material, through which hot liquid or gas flows, these pipes being surrounded by a cooler liquid flowing in the opposite direction, thus absorbing the heat from the pipes. The heat exchangers are of ordinary construction and the pipes are indicated only on the exchanger 8.

A blowpit 9 is provided and may conveniently be of the type commonly used in pulp mills; that is, of the type comprising a tank having a perforated false bottom 10. The pulp at a high temperature is discharged from the digester 1 into the blowpit 9 through the blowpipe 11 controlled by a valve 12. The pulp is retained in the blowpit while the liquor drains down through the perforated false bottom 10 and in most mills it flows directly to a sewer through a valve controlled pipe 13 although it is preferably employed as disclosed in copending application 607,152, filed April 23, 1932.

With customary blowpit construction and operation the pulp is blown from the digester 1 through the blowpipe 11 into the blowpit 9 and all of the steam and gases escape into the atmosphere through a vomit stack leading from the top of the blowpit. With this present system most of the gases are recovered, as well as most of the heat in the steam. To accomplish this means are provided for cooling the pulp at the point around the blowpipe where it enters the blowpit. In the illustrated form of the invention, these means comprise a cylindrical jacket 27, the inner wall of which is perforated. Cold water enters the jacket 27 through a pipe 28 and passes through the perforated inner wall 27' into the pulp as it enters the blowpit.

The temperature of the pulp and liquor in the digester just before it is dumped may, for example, be approximately 145° C. at 70 lbs. pressure. Thus, if this pulp and liquor are cooled as they leave the digester the pressure is reduced, together with the temperature, resulting in much less expansion of the gases and steam, so that the liquids from the digester, instead of flashing into vapour as soon as they leave the blowpipe, remain to a much greater extent in a liquid form, and instead of creating a pressure in the blowpit, they flow down through the perforated false bottom 10 and either into the heat exchanger 8 through the pump 14 and the pipe 15' having a valve 16' or through pipe 15 having a valve 16 back into the blowpit, as described in the above mentioned application of which this is a division.

The SO_2 gas which is contained in the liquor in the digester is, of course, given off from the liquor as soon as it reaches the reduced pressure in the blowpit. SO_2 gas is readily absorbed in cold water; therefore if too much cold water is added through pipe 28 the SO_2 gas will be absorbed and will flow down through the perforated false bottom and be lost. Also, if insufficient cold water is admitted through the pipe 28, then the steam is not condensed and so the heat would not be recovered in the heat exchanger 8. Therefore, the size of the water jacket, as well as the quantity of water supplied, must be very accurately determined.

The SO_2 gas which is liberated in the blowpit is carried out through a pipe 29 to any suitable gas absorption and recovery system, not shown.

It will, of course, be understood that the arrangement shown on the drawing is only diagrammatic and may be changed considerably without departing from the invention. For instance, the heat exchangers may be arranged differently, or heat exchangers 6 and 7 may be combined into one unit, or a larger number of

heat exchangers may be used to obtain the same final result.

The recipient 2, as shown, is not essential, but is illustrated as a preferred construction. If no recipient is used, as is the case in some mills, then the gas, together with the liquor, may pass through the whole system of heat exchangers.

Among the many advantages of this feature of the invention, the following may be mentioned:—

1. Heat which, up to now, has been wasted in the blowpits is recovered.

2. The gases which are liberated in the blowpit are recovered.

3. The necessity of a vomit stack is eliminated, thus saving considerable expense.

4. The disagreeable and sometimes destructive odors and gases are not emitted into the atmosphere.

The foregoing description and accompanying drawing are given by way of illustration only, and any modifications may be resorted to within the scope of the appended claims without departing from the invention.

For example, instead of using the water jacket 27 and the SO_2 exhaust pipe 29, the gases may be cooled and condensed in the manner indicated in Figure 3. A cooling tower 30 is placed over the blowpit, which tower is of rectangular, round, or other cross section and has inside of it a number of nozzles 31, which spray cooling liquid onto the gases and vapours as they rise. At the top of the tower is an opening 32 to which is connected the suction of a fan 33.

In operation, the digester is blown in the usual manner and the steam and gases which usually go out through the vomit stack are drawn up through the cooling tower 30 by the fan 33. The gases and vapours come in contact with the cold water sprays from the spray nozzles 31. The steam is condensed and falls back into the blowpit 9 while the gases are sucked up through the opening 32, through the fan 33, and out through a pipe 34, to any suitable gas absorption and recovery system.

In order to recover heat, cold water, or other liquid to be heated, for example cooking liquor, is pumped under pressure into the top of the heat exchanger 8 through a pipe 18 while the hot liquor from the blowpit 9 is pumped through the heat exchanger 8 in the opposite direction. The cold liquid to be heated flows over the outside of the exchanger pipes while the hot liquor is on the inside in the known manner. The heat from the liquor is thus transferred to the cold liquid. The liquid from the heat exchanger 8 passes through a pipe 19 to the heat exchanger 7 where it absorbs more heat from the hot liquor which is flowing through the heat exchanger from the recipient 2. The liquor from the heat exchanger 7 is allowed to go to the sewer. The water or other liquid from the exchanger 7 is carried through the pipe 20 to the exchanger 6 where it absorbs more heat from the gases from the recipient 2 as well as from the top relief gases from the digester flowing through a pipe 21. The liquid, which by this time will have reached a temperature of, say, 90 to 95° C. or more, as it leaves the heat exchanger 6, is carried through a pipe 22 to a tank, not shown, for use as required. The gas from the heat exchanger 6 flows along a pipe 23 to any suitable recovery tower or other apparatus as desired.

It may be very important when water is being heated in the heat exchangers, that the water should be free from any trace of acid, and in such instances there must be no leakage of acid or gas out from the pipes into the water. When it is necessary to accomplish this, the pressure outside of the exchanger pipes is always kept at a pressure which is greater than the pressure inside the pipes. In this way if there should be any break or leak in the pipes carrying the acid, then the liquid will lead into the acid and not the acid into the water.

To accomplish this, a pressure relief valve 24 is placed in the water line 22 as it leaves the last heat exchanger 6 and this valve may be regulated so that the pressure on the water in the system is always kept at a pressure which is higher than that of the hot fluids in the system. A check valve 18' may be provided in the supply pipe 18 to prevent reduction of pressure in the event of failure of the pump supplying the liquid to be heated.

In addition to this, a thermostatically controlled valve 25 may also be provided in the water line 22, a controlling thermometer 26 being placed in the heat exchanger 6. This valve 25 is of known construction and may be set to open at any desired temperature, for instance 90° to 95° C., and will close as soon as the temperature drops below this point.

In this way both the pressure of the water, as well as the temperature of the water, are controlled as desired.

The invention thus provides for a maximum recovery of the voluble gases and heat in the charge to the digester.

This application is a division of my copending application Serial No. 607,152, filed April 23, 1932, issued as U. S. Patent No. 1,947,888, dated Feb. 20, 1934.

I claim:

1. In apparatus for manufacturing pulp including a digester, a blowpit and a blowpipe connecting the digester and the blowpit, the combination with the discharge end of said blowpipe and within the blowpit of a confined pulp cooling chamber and means for admitting cooling fluid to said chamber.

2. Apparatus for manufacturing pulp comprising in combination a digester, a blowpit, a blowpipe connecting the digester and the blowpit and a confined cooling chamber at the discharge end of said blowpipe, said chamber being defined by a perforated wall, a closed jacket surrounding said chamber and means for admitting cooling water to said jacket and forcing the same through said perforations into the confined cooling chamber.

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