

Feb. 26, 1929.

1,703,745

E. MORTERUD

OPERATION OF PULP DIGESTERS

Filed Feb. 25, 1927

2 Sheets-Sheet 1

Fig. 1.

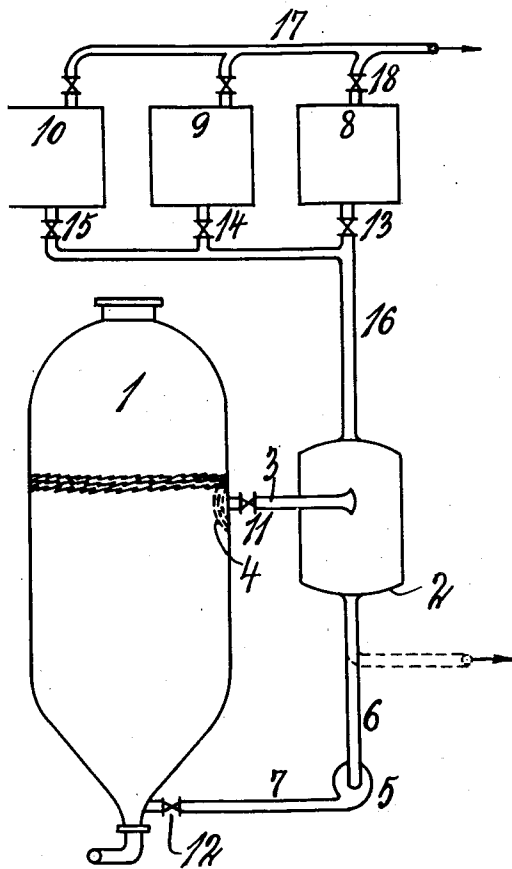
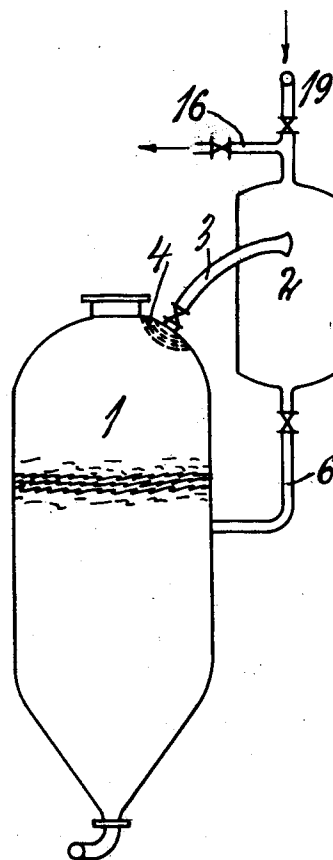


Fig. 3.



INVENTOR

Einar Morterud

by

Langer, Perry, ^{or} Langer Attys.

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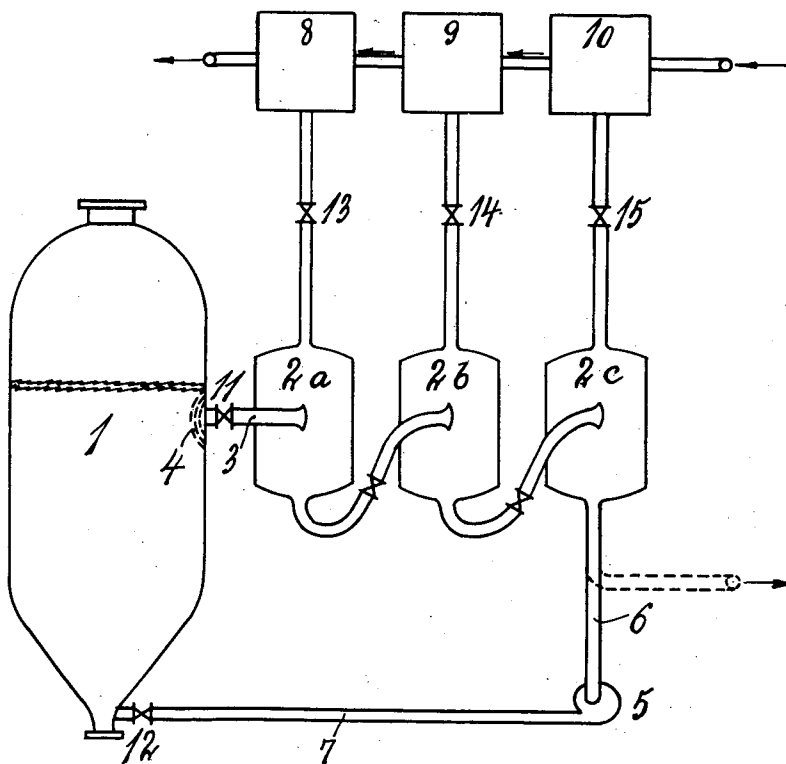
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Fig. 2.



INVENTOR
Einar Morterud
by
Langner, Parry, Ward & Langner ATT'YS.

UNITED STATES PATENT OFFICE.

EINAR MORTERUD, OF TORDEROD, NEAR MOSS, NORWAY.

OPERATION OF PULP DIGESTERS.

Application filed February 25, 1927, Serial No. 170,941, and in Norway March 2, 1926.

The present invention relates to the digestion of wood pulp in closed digesters under pressure and has for its object a process by means of which it is made possible to utilize economically the hot gas and/or steam which has to be discharged from the upper part of the digester.

This discharge of gas or steam takes place during the first part of the digesting process, for instance as turpentine-gas-discharge in the sulphate process and pressure release in the sulphite process. Mainly, however, the said discharge takes place after the digesting process has been concluded, as it is necessary to relieve the pressure somewhat before discharging (blowing) the contents of the digester.

For reasons of heat economy and efficiency it is important that the said discharge takes place during the shortest possible time. In the known processes for digesting pulp it is, however, very difficult to attain this object as a pressure release inside the digester has the immediate effect of causing a more or less violent formation of bubbles and foam, which have to be retained in the digester.

The pressure release therefore has to take place slowly with consequent loss of valuable heat and decrease in thermal economy. According to the present invention the liberation of steam and gas takes place in a separate vessel, through which the liquid is circulated for that purpose and in which there reigns a pressure lower than the pressure in the digester.

If so desired, the liberation of gas and steam may take place in a number of such separate vessels, the liquid being conducted from the digester through a number of liberating vessels arranged in series and with gradually decreasing pressures.

By this means the liberation may take place quickly and at the same time the liberated steam and/or gas may be collected at a high temperature, so as to obtain an economic utilization of the waste heat.

In the drawings which diagrammatically illustrate three different practical embodiments of apparatus, by means of which the process may be carried out,

Figure 1 represents one form of the invention with a single liberating vessel through which the digesting liquid passes;

Figure 2 represents an arrangement having serially arranged liberating tanks, and

Figure 3 represents a further modification in which the material may pass from the liberating tank by gravity to the digester.

In accordance with the embodiment illustrated on Fig. 1, the boiler 1 contains digested pulp at a temperature of approximately 170° C., which has to be discharged from the digester at a temperature of approximately 140° C. corresponding to a pressure of approximately 3.7 atmospheres. 2 is a cylindrical vessel, which communicates with the digester 1 through pipe 3, the opening of which into digester 1 is covered by a screen or sieve 4. Tube 3 opens tangentially into vessel 2.

5 is a centrifugal pump, communicating with the bottom of vessel 2 through tube 6 and with the bottom of digester 1 through tube 7. 8, 9, 10 are vessels for receiving steam and/or gas liberated in vessel 2.

In connection with this apparatus the process is carried out as follows:

Before discharging, the cocks or valves 11, 12 in tubes 3 and 7 are opened, pump 5 is started and valve 13 connecting tube 16 with vessel 8 is opened. Digesting liquid enters vessel 2, the pressure decreases and gas and/or steam is liberated at a temperature of f. inst. 150° C., which may be controlled by opening valve 13 more or less. Through this valve steam and/or gas is introduced in vessel 8, where it is accumulated or absorbed in a suitable liquid under a temperature of about 145° C. In case the heat of the steam is directly absorbed in liquid, the remaining gas is let out through tube 17 by means of valve 18. From vessel 2 the remaining liquid at a temperature of 150° C. is returned to the digester through pump 5 and tubes 6 and 7.

After this first stage of the process has been completed, the temperature of the digester contents has been lowered from 170 to about 160° C.

Now the same process is repeated with the only difference that valve 14 for vessel 9 is opened, the latter vessel being utilized for accumulating the steam and/or gas heat at a temperature of approximately 135° C.

During this second stage the temperature of the digester contents is reduced from 160 to 150° C.

At the third stage, the vessel 10 is utilized by opening valve 15, whereby the desired temperature and pressure reduction in the digester has been completed and the steam

and/or gas liberated has been accumulated in successive stages at the highest possible temperature.

It will be obvious that any number of stages may be used in order to reduce the digester temperature and pressure successively to the values desired.

The number of stages used and the temperature interval between the several heat accumulating vessels is determined in accordance with the purposes for which it is desired to use the heat of the steam or gas liberated.

In accordance with the arrangement illustrated on Fig. 2 the digesting liquid, from which it is desired to liberate steam and/or gas with the object of reducing the pressure, is passed through a number of liberating vessels 2^a, 2^b, 2^c, arranged in series.

Each of the liberating vessels 2^a, 2^b, 2^c operates at a certain pressure and temperature, which is controlled by means of the valves 13, 14, 15, and the steam and/or gas liberated transfers its heat to a suitable medium in the vessels 8, 9, 10, which in this instance are supposed to be given the form of surface condensers. As a result of this process it will be seen that the temperature of the digesting liquid is reduced to about 140° C., whereas the heat of the steam and/or gas liberated is retained (by means of the cooling fluid passing through the surface condensers) at a temperature of 145° C.

On Fig. 3 there is diagrammatically illustrated an arrangement for turpentine-gas-discharge from the digester. In accordance with this form, the turpentine-gas and steam is let out through a tube into liberating vessel 2 where the gas and steam is separated from the liquid carried with it, the steam and gas being let out to a suitable accumulator or the like through tube 16.

The remaining liquid is collected in vessel 2 and pressed back into the digester after termination of the liberating process for instance by steam pressure introduced at the top of vessel 2 through tube 19.

By mounting vessel 2 at a sufficiently high level, the steam pressure may be dispensed with and the liquid collected in 2 may be returned to the digester by gravity.

Even with this arrangement it is obvious that a pump such as 5 may be used for returning the liquid from vessel 2.

Claims:—

1. In a process for digesting wood pulp

in closed digesters under pressure, the method for reducing the pressure in the digester immediately before the discharging, and after the digesting process has terminated, which consists in conducting the digesting liquid from the digester to a separate gas and steam liberating vessel under a reduced pressure liberating steam and/or gas from the digesting liquid in said vessel and returning the liquid to the digester.

2. In a process for digesting wood pulp in closed digesters under pressure, the method for reducing the pressure in the digester immediately before the discharging, and after the digesting process has terminated, which consists in conducting the digesting liquid from the digester to a number of separate gas and steam liberating vessels arranged in series under gradually decreased pressures, liberating steam and/or gas from the digesting liquid in said vessels and returning the liquid to the digester.

3. In a process for digesting wood pulp in closed digesters under pressure, the method for reducing the pressure in the digester immediately before the discharging, and after the digesting process has terminated, which consists in conducting the digesting liquid from the digester to a separate gas and steam liberating vessel under a reduced pressure liberating steam and/or gas from the digesting liquid in said vessel in a number of stages at gradually decreased pressures, accumulating the heat of the gas and/or steam liberated in suitable heat accumulating apparatus, and returning the liquid to the digester.

4. In a process for digesting wood pulp in closed digesters under pressure, the method for reducing the pressure in the digester which consists in conducting the digesting liquid from the digester to a number of separate gas and steam liberating vessels, arranged in series under gradually decreased pressures liberating steam and/or gas from the digesting liquid in said vessel and returning the liquid to the digester, liberating steam and/or gas from the digesting liquid in said series of vessels, and accumulating the heat of said liberated steam and/or gas in the cooling liquid of a series of surface condensers.

In testimony whereof I have signed my name to this specification.

EINAR MORTERUD.