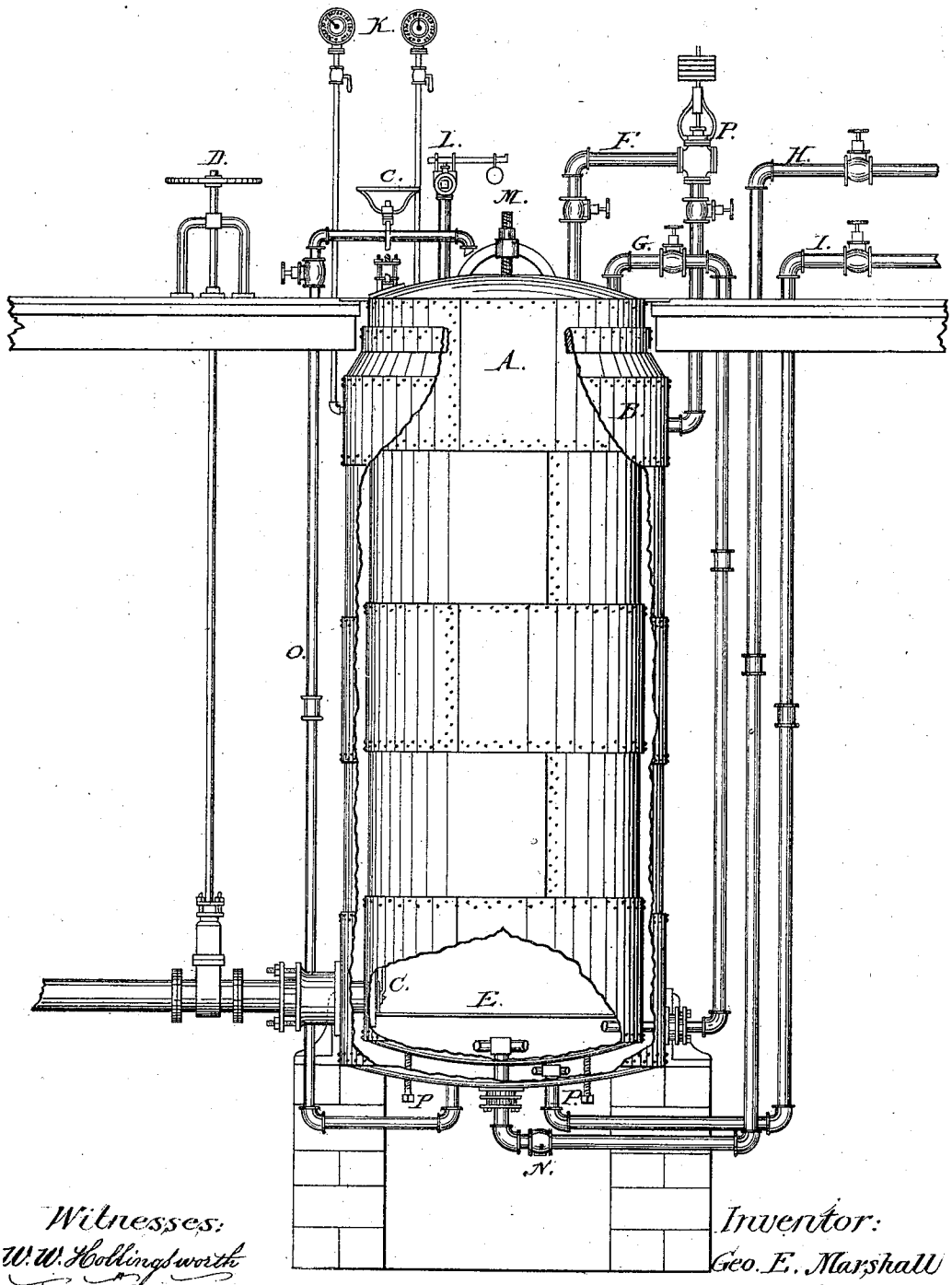
(No Model.)

G. E. MARSHALL.

BOILER FOR DIGESTING WOOD FOR PAPER PULP.

No. 286,031. Patented Oct. 2, 1883.



Witnesses:
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UNITED STATES PATENT OFFICE.

GEORGE E. MARSHALL, OF TURNER'S FALLS, MASSACHUSETTS.

BOILER FOR DIGESTING WOOD FOR PAPER-PULP.

SPECIFICATION forming part of Letters Patent No. 286,031, dated October 2, 1883.

Application filed July 23, 1883. (No model.)

To all whom it may concern:

Be it known that I, GEORGE E. MARSHALL, a citizen of the United States, residing at Turner's Falls, in the county of Franklin and Commonwealth of Massachusetts, have invented a new and useful Improvement in Boilers for Digesting Wood into Pulp to be used in the Manufacture of Paper.

My invention relates, principally, to the manufacture of wood pulp for paper by the "chemical process;" and it consists of improvements in the construction and operation of the digester, in which the chipped wood is reduced to the soft or pulpy state to be worked.

The manufacture of wood pulp by the chemical process has, from its invention down to the present time, been attended by very disagreeable and expensive features. It is a well-known fact that all wood-pulp digesters, of whatever description, leak more or less when a certain pressure has been attained. Generally, when the pressure due to the steam heat has reached sixty pounds per square inch, the digester begins to leak, and as the pressure is increased to one hundred or more pounds the leakage is also increased, and it frequently happens that as much as one-fourth or one-third of all the boiling liquors in the digester are lost in this manner, and necessitates charging the digester with an excess of alkaline liquor. The leakage is forced out through the riveted seams of the digester in the form of a fine spray and charges the surrounding atmosphere with an exceedingly offensive and suffocating vapor, which is unhealthy and injurious for the men working in the vicinity, who are obliged to inhale some portions of it. It frequently happens that the leakage is so great as to prevent the disintegration of the wood, thereby causing the total loss of the charge. Various methods of riveting digesters have been adopted. Plates have been planed to a true surface at the laps of the seams. Rivets have been even screwed in through the laps and headed cold. Digesters have been made of steel in order to have a close-grained surface at the seams. But none of these various methods have proved successful in preventing the leakage; and it is a well-known fact that wood-digesters will be run but a few weeks without recalking and replacing rivets, and the utmost care and skill of the boiler-maker has failed to produce digesters that will not leak at or through the seams. The filling and discharging of the digester two or three times daily, thus exposing it to temperatures varying from 150° to 320° Fahrenheit, produces expansion and contraction sufficient to cause the iron or steel plates to "creep" at the seams, and thus wear away the calking. When the pressure has reached a certain point, it opens the seams sufficiently to allow the escape of the very volatile liquor composed of the caustic alkali and other products generated in the process of the disintegration of wood. Even in the pulping of wood plain, without chemicals, the escape of the pinic, pyroligneous, and other acids is annoying and injurious. By my invention I overcome all these difficulties, and have constructed and successfully operated for several months wood-digesters that are perfectly tight, not leaking at all, and have therefore changed the manufacture of chemical wood pulp from the most disagreeable, offensive, and wasteful process known in the whole art of paper-making to a pleasant, safe, and economical system, always producing sure results, and worked with more ease and comfort than the ordinary process of boiling rag stock.

The accompanying drawing illustrates my invention, and forms part of this specification.

To make my specification plainer, I proceed to give a description of the digesters as I have made and used them without, however, being bound by fixed measurements or figures given.

The drawing represents a stationary upright wood-digester with its appurtenances.

A, the digester, is six feet in diameter and sixteen feet long, made from one-half inch iron or steel boiler-plates—all seams double riveted.

B, the outer shell or jacket, is six feet and eight inches in diameter, and connected to the digester at a distance of from eight to twelve inches below the top of the same, the upper end of jacket B being drawn in to a diameter two inches greater than the diameter of the digester, for the purpose of placing the digester within the jacket.

A wrought-iron ring, one inch thick by four or five wide, and made in sections, fills the space between the end of the jacket and the

digester, and two rows of rivets are put through the jacket-ring and the digester. Four screws, P, one and one-eighth inch diameter, are put through the lower end of the jacket with a re-enforcing plate to assist in supporting the weight of the digester.

The jacket B should be covered with felting, asbestus, or some other non-conducting substance, to preserve a uniformity of temperature and to prevent undue condensation in cold weather. It is also connected with the digester by suitable stay-bolts to guard against the explosion of the one or the collapse of the other.

The digester is provided with the usual perforated false bottom, E, extending across at a height of from ten to twelve inches from the bottom of the digester.

C is a gate operated by a rod passing up through the digester, with a hand-wheel and screw at top, shutting over the end of the blow-off pipe D, and is used to prevent the wood from entering the pipe leading to the blow-off valve at D while the wood is being treated. The blow-off valve is at D, used to discharge the contents of the digester, and is connected to a heavy eight-inch wrought-iron pipe passing through a stuffing-box in the jacket B, and screwed into a heavy wrought-iron ring riveted inside of the digester, as shown in the drawing.

G is a two-inch iron pipe connecting the top and bottom of the digester, and is used while the steam-pressure is being raised to conduct the liquor from the bottom to the top of the digester for the purpose of removing any pulp that may have passed through the perforated false bottom, it being important to keep the space under the false bottom clear of fiber; and as the pressure is greater at the bottom of the digester than at the top until the full pressure required is attained, the opening of the valve in this pipe will cause the liquor to circulate from the bottom to the top of the digester, carrying with it any fiber remaining in the liquor. This pipe may also be used to circulate the hot liquor from the bottom to the top of the digester while the pressure is being raised.

F is a two-inch pipe extending upward from near the top of the jacket, having an arm extending across and down into the top of the digester, and contains a pressure-valve, P, for the purpose of regulating the steam-pressure in the space between the jacket and the digester, and for relieving the pressure on the outside of the digester when its contents are being discharged through the blow-off valve D, insuring the digester from the danger of collapsing from outside strain by pressure in the jacket. This pressure-valve P is controlled by weights, which can be regulated according to the indications of the steam-gages K K, one of which connects with the jacket and the other with the digester.

The steam for treating the stock in the digester is admitted through a pipe, H, directly to the alkaline liquor, all attempts to treat the stock by the heat of the steam within the jacket proving insufficient, it not penetrating to the center of the digester, and leaving a core of "uncooked" wood in the middle.

I is an inch-and-a-half pipe for conveying steam into the space between the jacket and the digester, for the purpose of maintaining a pressure equal to or greater than the pressure within the digester, thus balancing the pressure inside the digester with an outside pressure, and thus preventing all leakage of liquor through the seams of the digester.

L is a safety-valve.

M is a man-hole.

N is a check-valve.

O is a hot-water pipe to be turned into the man-hole for washing out the digester with the hot water obtained by the condensation of the steam in the jacket, which is a very great convenience over the former way of washing the digester with cold water.

I am aware that jackets have been placed on digesters and boilers for some purposes, but not in the way nor for the attainment of the same objects as mine.

What I claim is—

1. A digester for wood pulp, constructed substantially as described, whereby the pressure of the boiling liquor at the seams or laps of the digester is equalized by the pressure of the steam in the space between the digester and its surrounding jacket.

2. The combination of the blow-off valve D and its connections with the digester, substantially as described.

3. The combination of the pipe F and its pressure-valve with the digester, substantially as described.

4. The combination of the circulating-pipe G with the digester, substantially as described.

5. The combination of the hot-water pipe O with the digester, substantially as described.

GEORGE E. MARSHALL.

Witnesses:

JAMES S. GRINNELL,

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