2 Sheets--Sheet 1.

J. W. DIXON.

Apparatus for the Manufacture of Paper Pulp.

No. 168,382. Patented Oct. 5, 1875.

Fig. 1.

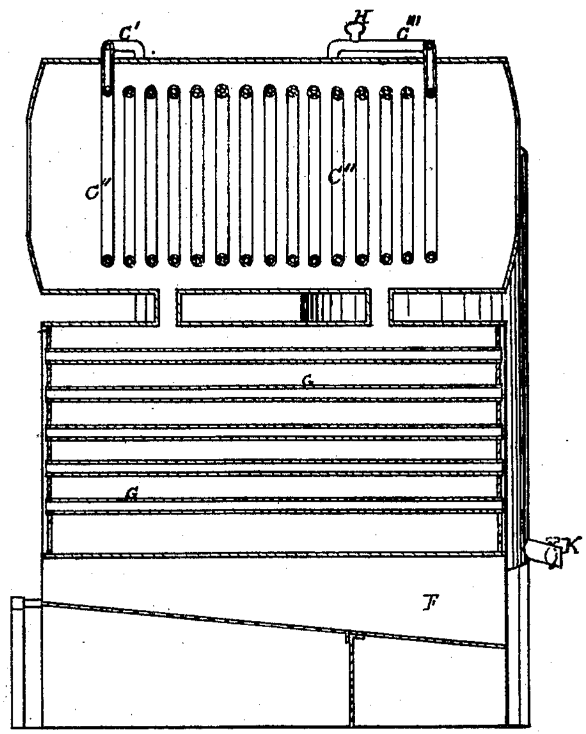

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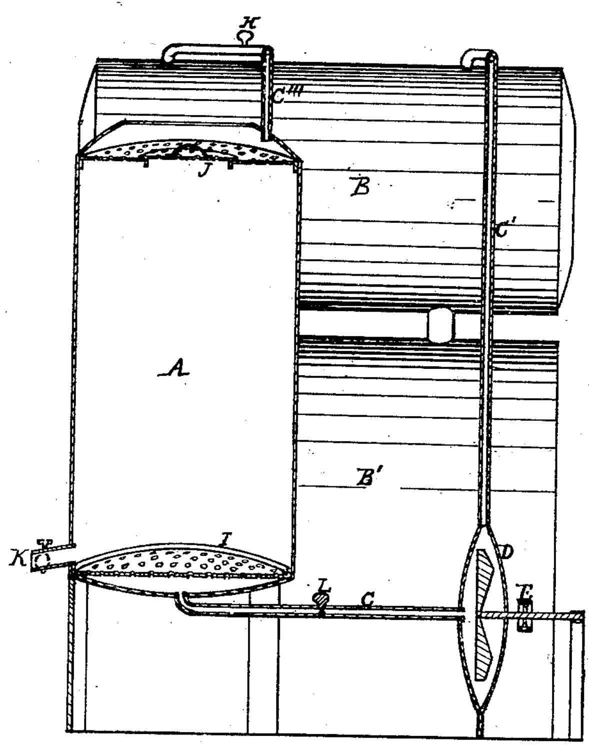
Fig. 2.



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UNITED STATES PATENT OFFICE.

JOHN W. DIXON, OF WEST MANAYUNK, PENNSYLVANIA.

IMPROVEMENT IN APPARATUS FOR THE MANUFACTURE OF PAPER-PULP.

Specification forming part of Letters Patent No. **168,382**, dated October 5, 1875; application filed August 25, 1875.

To all whom it may concern:

Be it known that I, JOHN W. DIXON, of West Manayunk, Montgomery county, Pennsylvania, have invented a new and useful Apparatus for the Reduction of Paper-Pulp from wood, straw, and other vegetable fiber; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the annexed drawings making part hereof.

My invention consists of a digester for reducing fiber to paper-pulp, a coil or chamber for heating the alkaline liquor in the course of its passage from and back to the digester, and a chamber in which said coil or chamber is inclosed, and which also contains steam or hot water for heating the alkaline liquor in said coil or chamber, thus dispensing with the direct action of flame upon said coil or chamber. Also, of the combination of the digester and a heating coil or chamber with an intermediate fan-pump, whereby the circulating alkaline liquor is driven through said coil or chamber without sucking it from the digester.

To enable others skilled in the art to make and use my invention I will describe its construction and operation.

In the drawings, Figure 1 is a vertical longitudinal section of the two sections of steam-boiler, in the upper one of which the coil for heating the alkaline liquor is situated; Fig. 2, a similar view of the digester, connecting parts of the coil of pipe, and the fan-pump; also showing Fig. 1 in elevation.

A is the pulp-digester; B B′, the two sections of the steam-boiler; C C′ C‴, the connections of the coil of pipe C″ with the digester; D, the fan-pump, located between pipes C and C′; E, pulley for driving the pump D; F, the furnace for heating the steam-boilers; G, the tubes of tubular boiler B′; H, a cock; I J, lower and upper perforated diaphragms in the digester A, and which contain the stock to be reduced between them. This stock—wood, straw, &c.—is introduced through a man-hole in the upper diaphragm J, and finds exit through the opening K, which is secured closed by a valve or cock.

In practice, the lower diaphragm I is slanted toward the opening K, to facilitate the removal of the pulp after the operation is complete. L is a cock to stop the flow of the alkaline liquor into coil C″.

The apparatus is operated as follows: The stock—wood or straw, &c.—to be reduced to paper-pulp is introduced into digester A between diaphragms I and J, through the opening in the top of the digester and the man-hole opening in the diaphragm J. Opening K should, of course, have first been closed. The alkaline solution or liquor is then poured into the digester on the stock until the stock is covered, or the digester nearly full. The man-hole in diaphragm J is then closed, and the top of the digester also. This liquor-cock L, being open, will then have filled pipe C′ to the height of the liquor in the digester. The boilers B B′ (ordinary steam-boilers to run the motive parts or machinery of the paper-mill) are then steamed up and the coil of pipe C″ in boiler B is thus heated by contact with the steam and hot water therein. The fan-pump D is then started by the belt on pulley E, and the alkaline liquor is thus projected through pipe C′ into the coil C″ in the boiler, being highly heated in its passage through the latter, thence through open cock H into the digester, through the diaphragm J, and the inner contained stock, through diaphragm I and open cock L on pipe C, to the fan-pump D, to be once more projected through the coil. The great body of the alkaline liquor makes this operation continuous. Thus a continuous circulation is kept up. The pump D, being a fan-pump, simply drives forward such liquor as flows into it from the digester, thus obviating a difficulty heretofore experienced, viz: the suction of the fine pulp into the openings of the lower diaphragm I of the digester, and the consequent prevention of the circulation of the liquor.

The difficulties heretofore experienced in reducing stock to pulp by this general process, in addition to that named in the latter end of the last paragraph, have been as follows: The coil C″, used to heat the alkaline liquor in its passage through it, has been heated by the direct fire of a furnace beneath it. When coal was thrown onto this fire the pipes became cooled, and when the heat came up the lower part of the coil was often so highly

heated that its contents were converted into steam, the pressure of which drove back the incoming liquid, requiring very heavy and expensive coils of pipe to withstand its steam-pressure, and the lime and soda in solution in it was also left deposited in the coil, precipitated by the evaporation of the absorbent liquid; so the pipes were sometimes filled up by this burnt and caked sediment. By the means which I have described, however, I am enabled to economize the surplus heat engendered in the water of my steam-boilers by the coil C″ immersed therein, thus, also, using but one furnace to heat both the steam-boilers and the coil C″; but whether the coil is thus placed in the steam-boiler, or a special tank or boiler and furnace is provided for it, the heating by immersion in hot water or steam still possesses these advantages, viz: that the coil is not subjected to the direct burning effect of the furnace-fire and cannot, therefore, be easily burned up, nor are its contents subjected to the danger of evaporation from the intense heat of a white fire. Again, in coaling up the furnace, the water retains the heat required until the combustion of the new coal renews and sustains the supply. I am thus enabled to use lighter and less costly coils, and am enabled to sustain a uniform temperature both of the coil and the liquor in the digester.

The conversion of the alkaline liquor into steam by heat of a direct fire on the coil, also produces a top pressure of steam in the upper end of digester A, thus compressing the mass of pulp between the diaphragms down upon the lower diaphragm I, choking it up and rendering free circulation impossible. This disadvantage is removed by my improved device.

The coil C″ can be supplanted by a section of straight pipes, or small chambers, or other device suitable for the purpose and an equivalent of the coil, and this coil can be heated by hot air instead of steam or hot water, the former being an equivalent of the two latter.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In combination with the digester A, the chamber B, and a coil or chamber within the same, whereby the alkaline solution, in its passage to the digester through said coil or chamber is heated by means of steam or hot water in said chamber, substantially as described.

2. The combination of the digester and the heating coil or chamber, with the intermediate fan-pump, whereby the alkaline solution is driven through the said coil or chamber without being sucked from the digester, substantially as described.

JOHN W. DIXON.

Witnesses:

GEORGE E. BUCKLEY,

WM. F. DIXON.