(No Model.) 2 Sheets—Sheet 1.

J. D. TOMPKINS.

APPARATUS FOR TREATING VEGETABLE SUBSTANCES.

No. 401,610. Patented Apr. 16, 1889.

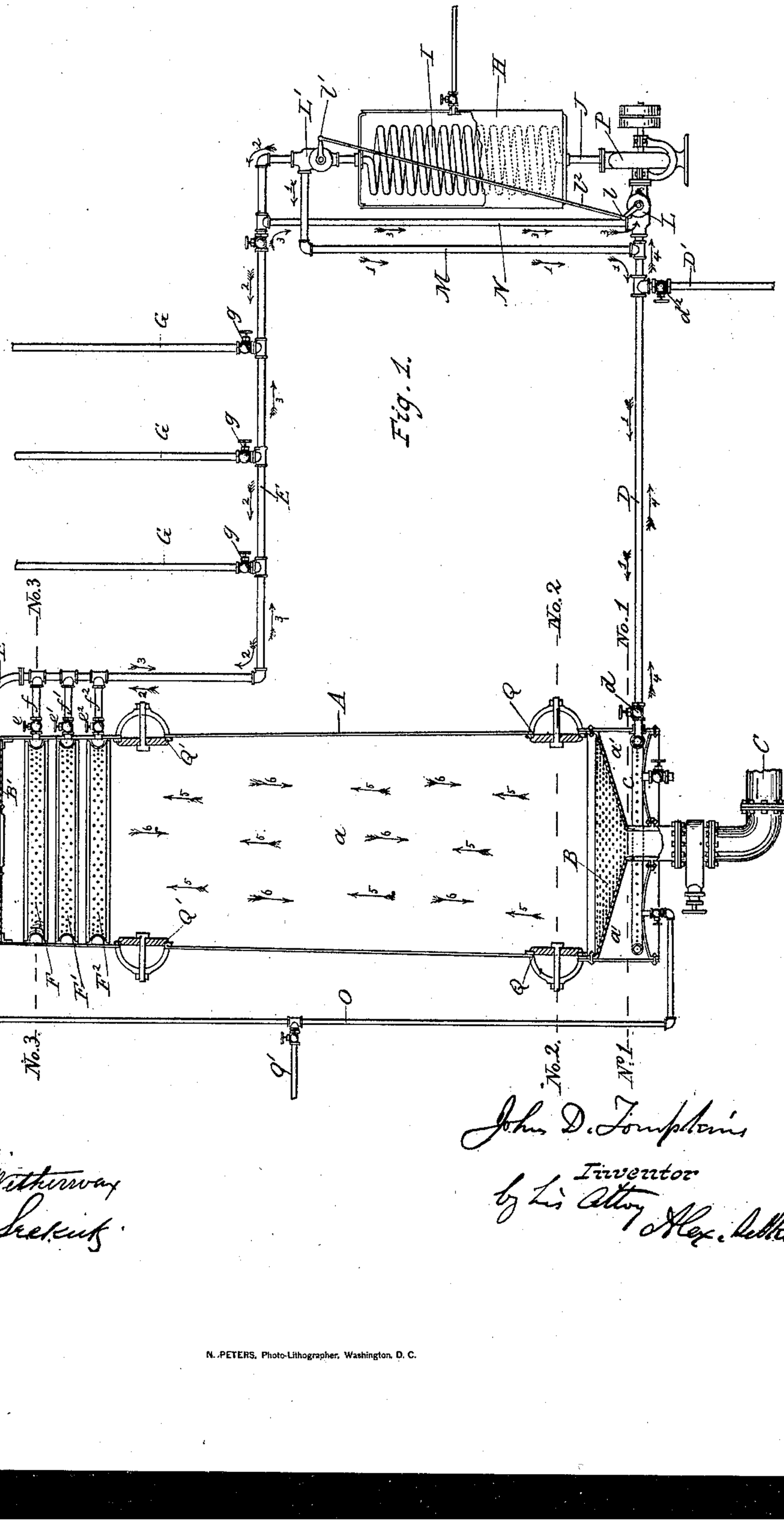

Fig. 1.

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Charles Dieterich.

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 6.

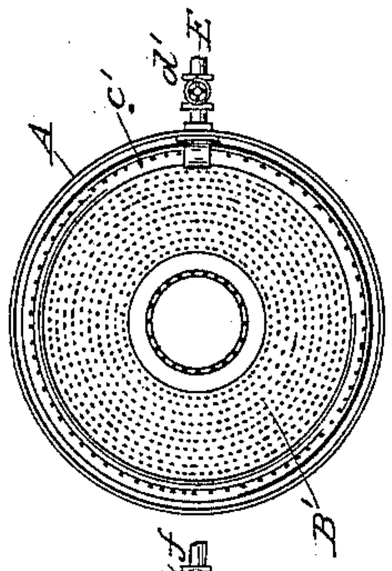


Fig. 5.

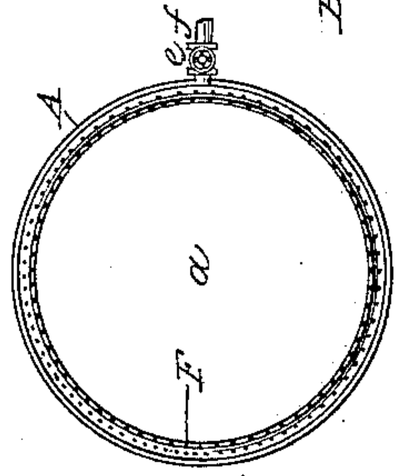


Fig. 4

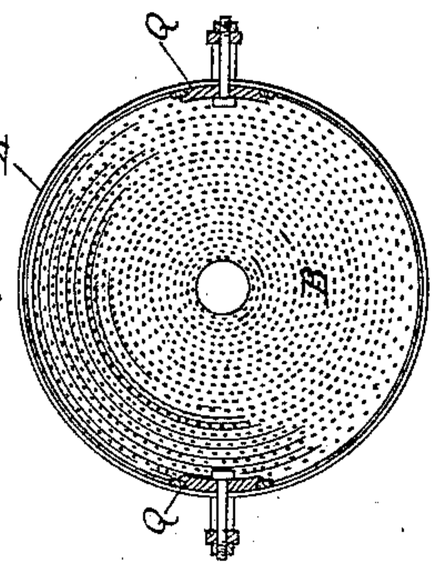


Fig. 3.

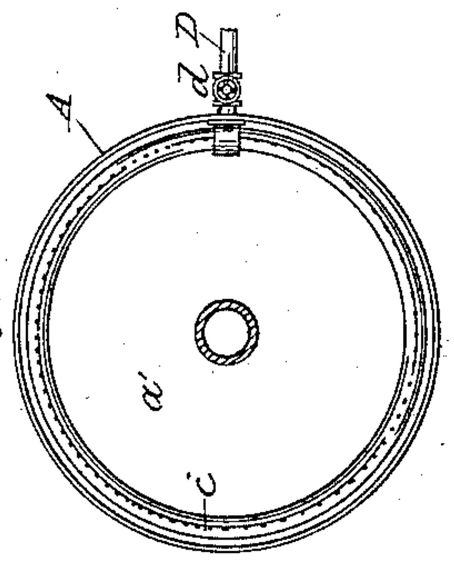
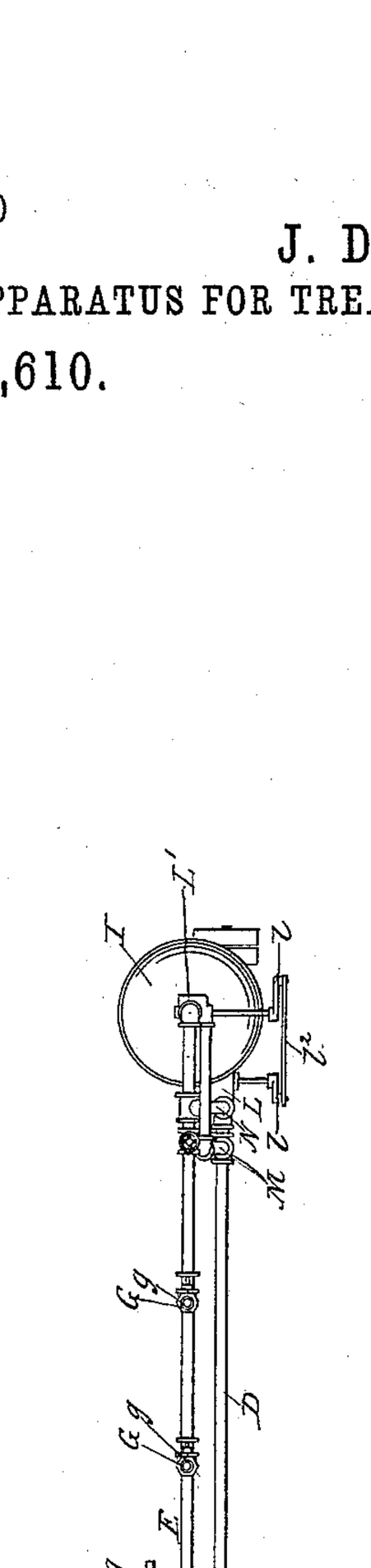


Fig. 2.



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UNITED STATES PATENT OFFICE.

JOHN D. TOMPKINS, OF BRAINARD, ASSIGNOR TO THE TOMPKINS PAPER STOCK COMPANY, OF ALBANY, NEW YORK.

APPARATUS FOR TREATING VEGETABLE SUBSTANCES.

SPECIFICATION forming part of Letters Patent No. 401,610, dated April 16, 1889.

Application filed February 9, 1888. Serial No. 263,503. (No model.)

To all whom it may concern:

Be it known that I, JOHN D. TOMPKINS, a citizen of the United States, residing at Brainard, in the county of Rensselaer and State of New York, have invented certain new and useful Improvements in Apparatus for Treating Vegetable Substances for Making Fiber or Paper-Stock, of which the following is a specification.

My invention relates to improvements in apparatus for cooking vegetable substances for making paper-stock or fiber.

The object of my invention is to effect the more perfect circulation of the cooking-liquors commonly employed for treating fibrous substances in apparatus of this class and to provide means for heating the cooking-liquors exterior to the digester. I attain these objects by the means illustrated in the accompanying drawings, forming a part of this specification, in which—

Figure 1 is a sectional elevation of a digesting apparatus embodying my invention. Fig. 2 is a view from above of the same. Fig. 3 is a sectional plan view taken at line 1 in Fig. 1. Fig. 4 is a sectional plan view taken at line 2 in Fig. 1. Fig. 5 is a sectional plan view taken at line 3 in Fig. 1. Fig. 6 is a sectional plan view taken at line 4 in Fig. 1.

The same letters of reference refer to like parts throughout the several views.

In the drawings, A represents any suitable upright vessel, made of iron or steel, and with any selected size as to height and diameter as will be suitable for holding the charges of material to be treated. This vessel is provided with a suitable strainer or perforated diaphragm, B, in its lower end portion and between the lower liquor-chamber, a', and the digesting-chamber a. In the upper end portion of this vessel is the upper strainer or perforated diaphragm, B′, between the said digesting-chamber a and the upper liquor-chamber, a^2. A discharge-pipe, C, provided with a suitable valve for the discharge of the cooked material from the digesting-chamber, is made to connect with the vessel in such a way as to communicate with the digesting-chamber a. In the drawings this discharge-pipe (marked C) is shown to lead from an opening made relatively about central through the lower strainer, B; but, if desired, this discharge-pipe can be made to lead from an opening made through the shell of the digester above the lower strainer, and in such a case this lower strainer would preferably incline from one side toward the opening leading to the discharge-pipe C, as is commonly practiced. In the upper end of this digesting-vessel is made a suitable man-hole, C′, provided with a cover, b, and the usual crow's-foot and bolt or equivalent fastenings for closing said man-hole, and this man-hole communicates through the passage-way B^2 to the digesting-chamber a, so that the material to be operated with can be readily introduced into the said chamber without any portion of it entering the liquor-chamber surrounding the walls of the said passage-way. The walls of this passage-way B^2 are shown to be perforated, so that the cooking-liquor rising up into this passage-way can have ready passage through the walls thereof into the upper liquor-chamber, a^2.

D is the lower main pipe between the pump P and the lower liquor-chamber, a', which pipe is provided with valve d, for opening or closing communication of said pipe with said liquor-chamber at will.

E is the upper main pipe between the upper portion of the digesting-chamber a or the upper liquor-chamber, a^2, or both, and the pump P, and d' is a suitable valve for opening and closing at will the upper end of this main pipe E at its communication with the upper liquor-chamber, a^2. These main pipes D and E are shown to be respectively connected with perforated ring-pipes c c' in the respective liquor-chambers a' and a^2, through which ring-pipes the liquor will pass into or from the said liquor-chambers, accordingly as the liquor is drawn and discharged by the said main pipes.

Located in the upper portion of the digesting-chamber and below the upper strainer, B′, to a greater or less distance are two or more perforated chambered rings, which are concentric to the digesting-chamber. The draw-

ings show three of these perforated chambered rings, though the number can be increased. These chambered rings can be set at any suitable distance apart, usually from twelve to thirty inches from center to center, as may be found desirable. These rings F, F′, and F² are suitably perforated at the sides facing the chamber *a*, while the portions facing the shell of the vessel can be unperforated. In the drawings the shell of the vessel is shown to form a wall to the chambers of the respective rings; yet, if preferred, these chambers can have walls all around independent of the wall or shell of the digesting-vessel. These chambered rings F, F′, and F² are respectively connected with the main pipe E by means of the branch pipes *f*, *f′*, and *f²* in any suitable manner, and these branch pipes are each provided with a suitable valve, *e*, *e′*, and *e²*.

D′ is a pipe connected with pipe D and provided with a valve, *d²*, and leading from any suitable water-tank, from which water can at will be drawn and discharged into the digesting-vessel. One or more pipes, G, connecting with pipe E, provided with valves *g*, and connecting with suitable tanks, can be used for drawing liquor from the digester and discharging the same into the tanks, or for drawing from the tanks and discharging the same into the digester, as may be required.

H is a steam heating-drum which is capable of holding steam under pressure of, say, one hundred to one hundred and fifty pounds per square inch, more or less. I is a coil of pipe contained within said drum, and having its ends passed through the walls of said drum for connection with the pump P and with any suitable pipe, as, say, pipe J. This steam-drum can be located at any convenient place and receive its steam from any suitable steam-generator, and it can be of any suitable form and be located as may be selected in relation to both the digesting-vessel and the pump P, and any selected system of piping can be used to connect the ends of the coil I with the pump and the respective main pipes E and D, as will be thought to be economical or advantageous. The drawings show this heating-drum and its inclosed coil I to be vertical in its position, yet it can be made to be horizontal, if selected.

L is any suitable two-way valve connected with the inlet-opening of the pump, and L′ is a similar two-way valve connected with the outlet or discharge of the pump or a discharge-pipe connected with the discharge end of the pump. The drawings show this last-named valve to be connected with the discharge end of the coil I, which receives the liquor discharged from the pump. The main pipe D is shown to connect with one of the ways of the two-way valve L, and another pipe, as pipe N, connects with the other way of said valve L and the main pipe E. The main pipe E is shown to connect with one of the ways of the two-way valve L′, and a pipe, M, connects with the other way of this two-way valve L′ and the main pipe D. These two-way valves L and L′ are operated by any suitable mechanism and can be operated simultaneously, when by suitable levers, *l* *l′*, and a connecting-rod, *l²*, both of these valves may be moved, so as to cause the liquor discharged from the pump to be conducted into main pipe D, and thence discharged into the lower end of the digesting-vessel, as indicated by arrows 1, or be conducted into the main pipe E and thence discharged into the upper end of the said vessel. When the liquor is forced in direction of arrows 1 in Fig. 1, the liquor will be drawn in direction of arrows 3 from the upper end of the digesting-vessel into the pump, and when it is forced in direction of arrow 2 in the same figure the liquor will be drawn from the lower end of the digester into the pump in direction of arrows 4, the proper valves between the two two-way valves L and L′ and the digester being, respectively, closed and opened, as will be readily understood by the examination of drawing Fig. 1.

O is a live-steam-receiving pipe leading from any suitable steam-generator through pipe O′ and discharging into either the upper or lower ends of the digester, or into both ends, as may be preferred. Suitable valves are provided for controlling the admission of the steam as it may be required within the digester or be cut off from the same.

O² O² are pipes leading from the upper end of the digester to any suitable tank, if preferred, or into the air for discharge of steam from the digester when required.

Q Q are man-holes made in the lower end of the walls of the digester at near the lower strainer, B, through which man-holes access can be had to the material within the digesting-chamber *a*. These man-holes are closed by suitable closing-plates and adjuncts known to the trade.

Q′ Q′ are man-holes in the shell of the digester at a point between the upper strainer, B′, and the middle of length of the digester for access to the material within, so that an operator can, by means of any suitable rod or bar, work with the material within when from any cause it may lodge. These upper man-holes, like the lower ones, are closed by suitable plates and adjuncts well known for that purpose.

The walls of the digester are shown to be tapering from the lower head to the upper one, so that the diameter of the digesting-chamber will be gradually enlarged as it runs downwardly from the upper strainer to the lower one. This is of great advantage in cases where the material cooked is not reduced to a pulpy condition, as is the case with rags or straw for straw-board and old manila rope or jute-butts and other substances, and with this tapering form of wall of this digester and the man-holes Q and Q′ these classes of material can be readily removed from the

digesting-chamber through the lower manholes, one or both, as may be required, while reduced wood, straw, and grasses can be blown out through discharge-pipe C.

When valves *e e′ e²* are closed and valves *d d′* are opened and valves *d²* and *g* are closed and the two-way valves are suitably turned, so that the circulation of the liquor through the respective pipes is in direction of arrows 1 and 3, the liquor will be drawn from the upper end of the digester and forced through the heating-coil I, and thence into the lower end of the digester, and as the valves *e e′ e²* are successively opened from time to time the direction of circulation of the liquor will be continued in the same direction as indicated by said arrows 1 and 3, only the draft of the liquor will be at points lower in the digester, as from the chambered rings F F′ F², successively, and when the two-way valves are reversed the circulation will also be reversed. When the circulation through the pipes E, D, N, and M is in direction of arrows 1 and 3, the circulation of the liquor through the digesting-chamber will be upwardly, as indicated by arrows 5, while when the circulation through said pipes is in direction of arrows 2 and 4 the circulation of the liquor through the digesting-chamber will be downwardly, as indicated by arrow 6.

When in operation, with the cooking-liquor forced through the coil I in the heating-drum H, and the former being drawn by the pumps through pipes N E and either of the perforated rings in the upper portion of the digesting-chamber, or the liquor-chamber above the upper strainer, the liquor will pass through valve L into the pump, and after being highly heated in passing through the coil I in the heating-drum it will be forced through pipes M and D into the lower liquor-chamber, and by the draft of pipe E above and the pushing force of the pump from below the strainer the heated liquor from the coil will constantly counteract the tendency of the material while being cooked from settling down hard on the lower strainer.

The above-described improvements are of great advantage, as they enable a single pump to do the work of two pumps, and also enable the draft on the liquor at the upper end of the digesting-chamber to be lowered at will and as may be required by the settling down of the charge as its cooking is progressing; and, further, the digesting-vessel is adapted to be used for treating old rope, rags, jute-butts, and other similar material, which before treatment is substantially pure fiber, but uncooked, as well as wood, grasses, straw, &c., which require to have their lignine dissolved before a separation of the fiber is effected.

What I claim as new, and desire to secure by Letters Patent, is—

1. In an apparatus for treating vegetable substances for making paper-stock, the combination, with the digesting-vessel and a liquor-circulating pump, of a series of perforated chambered rings which are at intervals apart within the upper portion of the digesting-chamber and neighboring the wall of the same, and a corresponding series of branch pipes leading from a main pipe connecting with the inlet of the pump to said perforated rings, and a main circulating-pipe which leads from or is connected with the outlet of the pump and the lower end of the digester, substantially as and for the purposes set forth.

2. The combination, with the digesting-vessel and the two systems of liquor-circulating pipes, of a single pump having at its inlet a two-way valve and at its outlet a similar valve, these valves being operated at will and effecting within the digesting-chamber alternating upward and downward circulation of the cooking-liquor through the body of the material being treated, substantially as and for the purposes set forth.

3. The combination, with the digesting-vessel and a single pump, of two systems of liquor-circulating pipes, one connecting with the upper portion of the digesting-vessel and the other with the lower portion of the same, a two-way valve between each system of said pipes and the pump and which can be operated at will, and a heating-coil between the said pump and one of the two-way valves, whereby the pump, revolving in one direction, will force the water continuously through the heating-coil in one direction to be introduced into the digesting-vessel from below or from above and the reverse at will, substantially as and for the purposes set forth.

4. The combination, with the digesting-vessel and a single pump operating between the two main pipes, which connect, respectively, with the opposite ends of the said vessel, of the two-way valves L L′, respectively, between said main pipes and the pump, and pipes N and M, substantially as and for the purposes and operations set forth.

5. The combination, with the digesting-vessel and the coiled pipe contained within the steam heating-drum, of the two sets of liquid-circulating pipes connected each with an opposite end of the said vessel, a single pump between said coiled pipe and one of said sets of pipes, the two-way valve L, connecting both sets of pipes with the inlet of the pump, and the two-way valve L′, connecting said two sets of pipes with the coiled pipe, all substantially as and for the purposes set forth.

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