

No. 655,174.

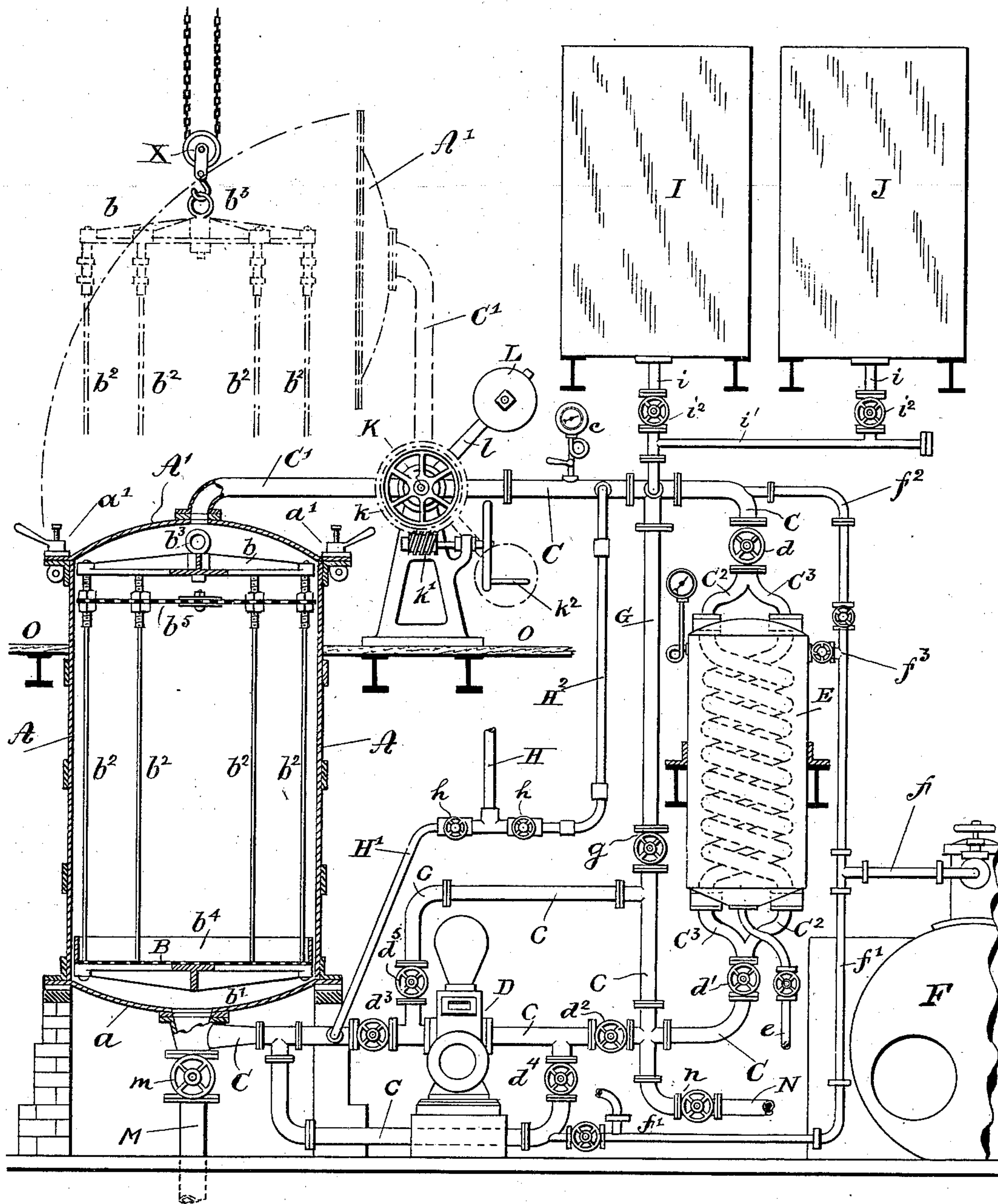
Patented July 31, 1900.

C. WETHERWAX.

APPARATUS FOR USE IN TREATING FLAX STRAW.

(Application filed Sept. 7, 1899.)

(No Model.)



WITNESSES:

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APPARATUS FOR USE IN TREATING FLAX-STRAW.

SPECIFICATION forming part of Letters Patent No. 655,174, dated July 31, 1900.

Application filed September 7, 1899. Serial No. 729,788. (No model.)

To all whom it may concern:

Be it known that I, CHARLES WETHERWAX, of Best, in the county of Rensselaer and State of New York, have invented new and useful
5 Improvements in Apparatus for Use in Treating Flax-Straw, of which the following is a full, clear, and exact description.

My invention relates to improvements in an apparatus for treating flax-straw and
10 analogous fibrous matter.

In treating flax-straw to prepare it for use—that is, to obtain the textile fibers therefrom—it is desirable to boil the straw, preferably
15 under steam-pressure, in a chemical solution—such as caustic soda, soda-ash, or crystals—and after washing again treat the straw with certain acid solutions and finally wash it.

The object of my invention is to produce a very simple but comparatively-inexpensive
20 apparatus by means of which the above process may be easily and rapidly carried out. To this end I provide a steam-tight digester in which the straw may be contained, provide means for introducing steam, water, or
25 any necessary solution into the digester, and arrange also for maintaining a circulation of water or other liquid in either direction, so that the straw may be conveniently and expeditiously washed or treated. I also arrange
30 means for introducing steam or heat into the circulation, so as to raise the temperature and pressure to the desired extent, provide simple means for maintaining the water circulation without heating the same when de-
35 sired, provide a convenient means for circulating steam or the heated solution through the apparatus, arrange to conveniently dispose of any debris and dirt, also provide for conveniently charging and discharging the
40 digester, and, in general, arrange the apparatus to carry out the process in the most economical and beneficial manner.

With these ends in view my invention consists of certain features of construction and
45 combination of parts, which will be herein after fully described and claimed.

In the drawing, wherein similar letters of reference designate similar parts, the figure is a general elevation, partly in vertical section, showing the arrangement of the appa-
50 ratus as a whole.

In connection with my invention I use a

digester A, which is preferably cylindrical and which is mounted on a suitable foundation to project upward through a floor or platform O, 55 from which it can be conveniently reached. The bottom *a* of the digester is preferably somewhat dishing to provide for ready drainage and to make room for the cage presently referred to, and the removable top or cover A' 60 is held in place by fastening devices, such as the bolts and nuts *a'*. The digester should be steam-tight and ought to be capable of withstanding a pressure of at least fifty pounds to the square inch. Within the chamber is a ver- 65 tically-movable and removable cage comprising the upper and lower spider-frames *b b'*, which are connected together by tie-rods *b²*, and the cage is thus open-sided and has no obstructions between its top and bottom, so that 70 straw can be conveniently packed within it. As a matter of fact, the straw is usually placed in bundles and with the bundles arranged longitudinally of the digester, so that the circu- 75 lation of liquid can pass readily through the bundles and act on the individual straws. Loose or tangled straws can also be used. The cage has a perforated bottom B to permit the ready passage of liquid and an upturned flange *b⁴* to assist in holding the straw-bundles 80 in place. At the top of the cage is a perforated plate *b⁵*, which holds the bundles in place and through which liquid can pass. This upper plate is preferably made in sections, so that it can be easily taken out and 85 placed in position; but this structure is not shown in detail, as it is not claimed. The cage has also a ring or shackle *b³* at the top, to which a tackle, as X, may be attached to raise and lower the cage. 90

The liquid is introduced to and circulation maintained in the digester by means of the circulation-piping C, which includes a pump D for maintaining circulation, and one end of the circulating-piping terminates or enters 95 the bottom of the digester, and the top terminal section C' enters the top or cover of the digester. The circulation-pipe has a pressure-gage *c*. Any suitable pump may be used in connection with this pipe, and a preferred 100 form of pump is one of the direct steam-driven type. It is desirable to maintain steam-pressure in the digester and to have the liquid heated for certain conditions, and to

this end the circulation-piping C passes through a steam drum or heater E, the piping at this point being formed into branches C^2 C^3 , which are preferably coiled, as illustrated, and a greater number of coils may be used, if desired. Each branch should be at least as large in cross-section as the main piping, so that the rate of flow through the heater will be diminished and the heating capacity consequently raised. The steam-drum is supplied with heat by a pipe f , leading from the boiler F and terminating in downward and upward extending branches f^1 and f^2 , the latter also connecting with the steam-drum E through a valve f^3 . The upper and lower branches f^2 and f^1 of the steam-pipe are controlled by suitable valves, as shown, and they enter the upper and lower parts, respectively, of the piping C, so that when desired the steam may be made to enter and circulate through the digester independently of the liquid-supply for the purpose of hastening the preliminary heating of the digester and circulation system. The steam-drum E, and the digester as well, should each be provided with a safety-valve, gage, cock, and thermometer, and the heater has also a valve-controlled exhaust and drain pipe e . The circulation-pipes C are controlled by the valves d d^1 d^2 d^3 d^4 d^5 , so that the circulation may be made to pass upward or downward through the digester, the heating apparatus cut out, or a cold-water circulation maintained, as will be more particularly described below.

The heater may be cut out when desired and the circulation maintained through a bypass pipe G, which is controlled by a valve g and which connects the upper and lower members of the circulation-piping C—that is, enters members of the piping C, connected with opposite ends of the steam-drum E. Sometimes it is desirable to circulate water through the digester independently of the pump, and to this end a high-pressure water-pipe H connects by branches H^1 H^2 , controlled by the valves h , with the circulation-piping C at points connected to opposite ends of the digester between the digester and the heater. The solutions are introduced into the circulation from the tanks I J, which are connected with the circulation system—that is, with the piping C—by the pipes i and i^1 , the pipes i being controlled by suitable valves i^2 . The digester is provided at its lower end with a drain-pipe M, controlled by a valve m , the pipe being of large diameter, so that when the circulation is downward through the digester the valve m may be opened to permit the dirt and refuse to flow off through the pipe M, and the circulation system is also provided at a point between the pump and heater with a drain-pipe N, controlled by a valve n , so that when the circulation is upward through the digester the matter to be discharged may pass off through the said pipe N. In this connection it should be stated

that when acid solutions are used in the circulation-pipes the pipes, digester, and all parts exposed to the action of the acid should be lined with non-corrodible enamel or other suitable material.

When the digester is to be charged or discharged, it must of course be uncovered, and to this end the removable top is secured to the terminal section C' of the pipes C, which section acts as a cantaliver and is connected at the point K to an ordinary trunnion-joint working in stuffing-boxes, this arrangement not being shown in detail, as such stuffing-boxes are in common use and their structure is well known. One of the trunnions of the joint is secured to a worm-wheel k , which gears with the worm k' , mounted in suitable guides, and, as illustrated, adapted to be turned manually by means of the crank k^2 ; but it will of course be understood that it may be turned by any suitable power. A second trunnion of the joint K is provided with a lever l , carrying the weight L to counterbalance the top of the digester A and the pipe-section C' . It will be seen that by loosening the fastening-bolts a' and working the worm-gear just described the top of the digester may be easily raised to the position shown in dotted lines or as easily lowered to place.

When it is desired to charge the digester, the cover-bolts a' are unfastened, and by means of the gearing described above the cover A' is raised to the position shown in dotted lines. The tackle X is then hooked to the shackle b^3 and the cage lifted until the tray B is within about three feet of the top edge of the digester. A tier of flax-straw bundles is then placed ends up in the tray or same space filled with tangled straws and the cage lowered until the top of the straw is within, say, three feet of the top of the digester, a second tier of bundles placed on top of the first, and the cage again lowered and charged until it is filled, when the perforated plate or grating b^5 is placed on top of the mass to prevent the straw being carried over with the liquor, and so obstructing the piping C, when the circulation takes place in the upward direction. The cage is now lowered to its final position and the cover A' replaced by a reverse movement of the gearing k k' . The cover-bolts a' are screwed up, so as to make a steam-tight joint, and the straw is then treated to the necessary operations. If the digester and circulation system are to be heated before starting the pump, the steam is turned on direct through the pipes f , f^2 , and f^1 , the valve f^3 being kept closed, if desired, and it will be seen that the steam will circulate around through the entire system, including the digester. If the digester is to be flushed with cold water, it may be done in either an upward or downward direction without the use of the pump, in which case the valves d , d^1 , d^2 , and d^3 are closed, and if the circulation is to pass through the digester in an upward di-

rection the valve *m* is closed, the valve of the pipe *H*² closed, and the valve *n* opened. If the circulation is to be in the opposite direction, the valve of the pipe *H*¹ is closed, the valve *n* closed, and the valves of the pipes *H*² and *M* opened. Likewise it will be seen that if the circulation is to pass through the heater—that is, through the coils *C*² *C*³—the valves *d* and *d'* are left open, while if the heater is to be cut out the valves referred to are closed and the valve *g* of the by-pass pipe *G* opened, so that the circulation will pass through the said pipe *G* instead of through the heating-coils.

In carrying out the invention it is better to have the circulation of the solutions and washing-water maintained in the upward direction through the digester, because by so doing the tight packing of the straw by gravitation and the pressure due to the movement of the liquid is prevented, the straw being, on the contrary, loosened and suspended by its tendency to flow in the liquid, which is thus circulated more thoroughly and uniformly through the mass, while in the case of the washing-water the dirt and dissolved vegetable matter which tend to float are more readily carried off by the water.

From the foregoing description it will be seen that by proper manipulation of the apparatus the circulation may be made to pass through the whole or any necessary part of the apparatus either cold, heated, or a separate steam circulation, and it will be further seen that the apparatus is very simple and capable of very convenient use. It will further appear that provision is made for maintaining the correct temperature and steam-pressure.

While I have necessarily shown a precise system of piping in valves, still it will be understood that the said parts may be rearranged to a certain extent and to meet the requirements of different plants without departing from the spirit of the invention.

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

1. An apparatus of the kind described comprising a digester having a removable cover and a removable cage open from top to bottom, a circulation system of piping connected

to opposite ends of the digester, a heater forming a part of the said circulation system and comprising branch pipes contained in a steam-drum, and a by-pass pipe and valves arranged to cut out the said heater, substantially as described.

2. An apparatus of the kind described comprising a digester, a system of circulation-pipes with terminals connected to opposite ends of the digester, a pump and heater included in the circulation system, and a steam-pipe connected to the heater and also to the circulation-pipes direct, substantially as described.

3. An apparatus of the kind described comprising a digester having a removable cover, a circulation system of pipes connected to opposite ends of the digester, a pump in the circulation system, a drain-pipe connected to the lower end of the digester, a second drain-pipe connected to the circulation-pipes at a point between the pump and the top end of the digester, and the system of valves and pipes for reversing the circulation, substantially as described.

4. In an apparatus of the kind described, the combination with the digester and circulation-piping, the pump and the heater forming a part of the circulation system, of a high-pressure water-pipe connected with the top and bottom of the digester, and a system of valves to cut out the pump and heater and to promote circulation either upward or downward through the digester, substantially as described.

5. The combination with the digester, the circulation system connected to opposite ends thereof and including a pump and heater, of a system of valves and pipes whereby the said pump and heater may be singly or collectively cut out of circulation, substantially as described.

6. The combination with the digester and its removable top, of the piping system connected to the top and bottom of the digester, the upper terminal of the piping system forming a cantaliver attached to the said digester-cover, and a gear mechanism for working the said cantaliver, substantially as described.

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Witnesses:

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