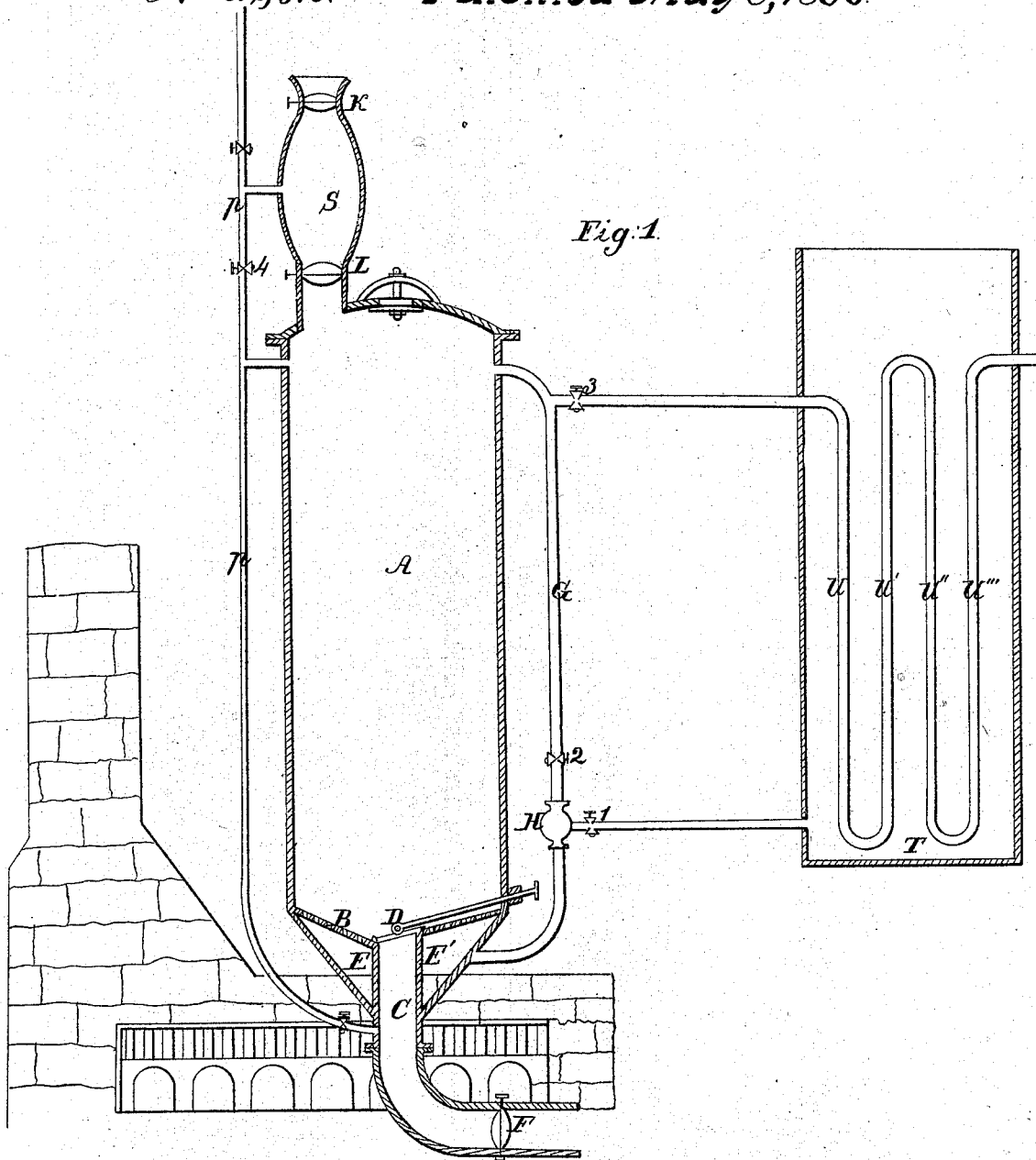


*Dixon & Harding.*  
*Pulp Digester.*

*Nº 54,510.*

*Patented May 8, 1866.*

*Fig. 1.*



*Witnesses:*  
*George Buckley*  
*Edwin M. Harkins*

*Inventor:*  
*John W. Dixon*  
*Eng. & Mfg.*

# UNITED STATES PATENT OFFICE.

JOHN W. DIXON AND GEORGE HARDING, OF PHILADELPHIA, PA.

## IMPROVED APPARATUS FOR THE MANUFACTURE OF PAPER-PULP.

Specification forming part of Letters Patent No. 54,510, dated May 8, 1866.

### *To all whom it may concern:*

Be it known that we, JOHN W. DIXON, of the city of Philadelphia and State of Pennsylvania, and GEORGE HARDING, of the same place, have invented a new and useful Improvement in Apparatus for Making Pulp out of Wood, Straw, &c.; and we do hereby declare the following to be a full and exact description thereof, reference being had to the annexed drawing, making a part of this specification, in which—

A represents a strong digester, capable of resisting heavy pressure. B is a lower perforated diaphragm, having a passage, C, for the escape of the pulp. Below B is a space, EE', for the accumulation of the liquid. The passage C is closed by a valve at D or at F, except when the pulp is to escape.

In this particular apparatus the digester is shown as heated by fire placed below the digester, although all of the improvements herein described, except one combination, could be used with any other form of heating apparatus. A circulating tube passes from below the diaphragm B to the upper part of the digester. In the course of this tube a rotary or reciprocating pump, H, is placed. This pump is to be driven by machinery, and produces a constant circulation of the digesting-liquid from the lower chamber, E, below the diaphragm, through G, into the upper part of the digester, or, vice versa, from the upper part of the chamber down through tube G and the pump into the bottom of the digester, and thence upwardly, by virtue of the force of the pump, through the mass to be pulped. When it is desired to withdraw the pulp the valves D and F may be both opened and the material permitted to escape directly on the valve. D may be first opened, and the material permitted to pass into the tubular space or passage between D and F, and then, when the valve D is closed and the valve F opened, the material between D and F will escape.

In order to facilitate the withdrawal of the valve D and prevent the pulp from escaping with too great a shock a small steam-pipe extends from the upper part of the digester into the space between D and F, and by opening the cock 1 the pressure on both sides of D is put in equilibrium. This cock is to be closed before F is opened. In this way a portion of the contents can be quietly withdrawn at any time while the pulping operation is still going on.

The operation of the apparatus is as follows: The wood, straw, or other material, in a finely-divided state, is to be introduced through the man-hole at the top of the digester A. A solution of caustic soda, or lime, or water alone, or other digesting-liquid, is to be introduced, and when the digester is closed up heat is to be applied below to the bottom of the digester, and the pump started, the cocks 2 being open and cocks 1 and 3 closed. The pump may be operated so as to force the liquid from below B through G into the top of the digester, whence it would descend through the material being pulped, or the pumps may be used to force the heated liquor vice versa—that is, up through the diaphragm B and through the mass being pulped to the top of the digester, whence it would descend outside through G again into the pump and the bottom of the digester.

Fresh material may be introduced while the operation is going on by opening the valve K and introducing the charge of wood, &c., between the valve K and valve L. The valve K is then to be closed and the valve L opened, when the charge falls by its own gravity into the boiler.

In order to relieve the valves of pressure from the inside we employ the tube *p*, when the cock 4 places the space between K and L in equilibrium with the digester by causing steam to pass between K and L.

By opening the cock 1 and closing cock 2 and opening cock 3 the pump can be made to force fresh water or liquid into the bottom of the digester from a heating apparatus, T, or tank T, (such as described in a former patent of J. W. Dixon,) where it becomes heated, and then up through the material, and the refuse liquid could pass through cock 3 into the coil U U' U'' U''', and thus heats the incoming liquid entering through cock 1 in the manner fully described in other patents heretofore granted to us. The introduction of fresh water below into the digester, in combination with the introduction of fresh charges of material above, would cause the fresher water always to be in contact with the most finished pulp.

So far as relates to the subject-matter of the five first claims, hereinafter set forth, any other mode of heating the circulating liquid might be adopted, such as an exterior boiler or coil or a coil within the main digester.

Having thus described our improvement, what we claim as our invention, and desire to secure by Letters Patent, is—

1. The pulp-digester, in combination with a lower perforated diaphragm having a central pulp-passage, a circulating tube or tubes connecting the upper and lower part of the digester.

2. The pulp-digester, in combination with a lower perforated diaphragm, a central pulp-passage, a circulating tube and pump, to produce a circulation through the mass from bottom to top, or vice versa.

3. The two valves D and F in the pulp-escape tube, for withdrawing a portion of the contents without interfering with the operation within the digester.

4. The charging-pipe S, with its double

valves, for introducing fresh material without disturbing the operation.

5. The combination of pulp-digester, circulating tube, and pump, when the fire is applied directly beneath the digester.

6. The continual forcing in of fresh liquid below and upward through the mass to be pulped, in combination with the introduction of the fresh charges of the material into the digester above, whereby the cleaner liquid would always be in contact with the pulp most cooked.

JOHN W. DIXON.  
GEORGE HARDING.

Witnesses:

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