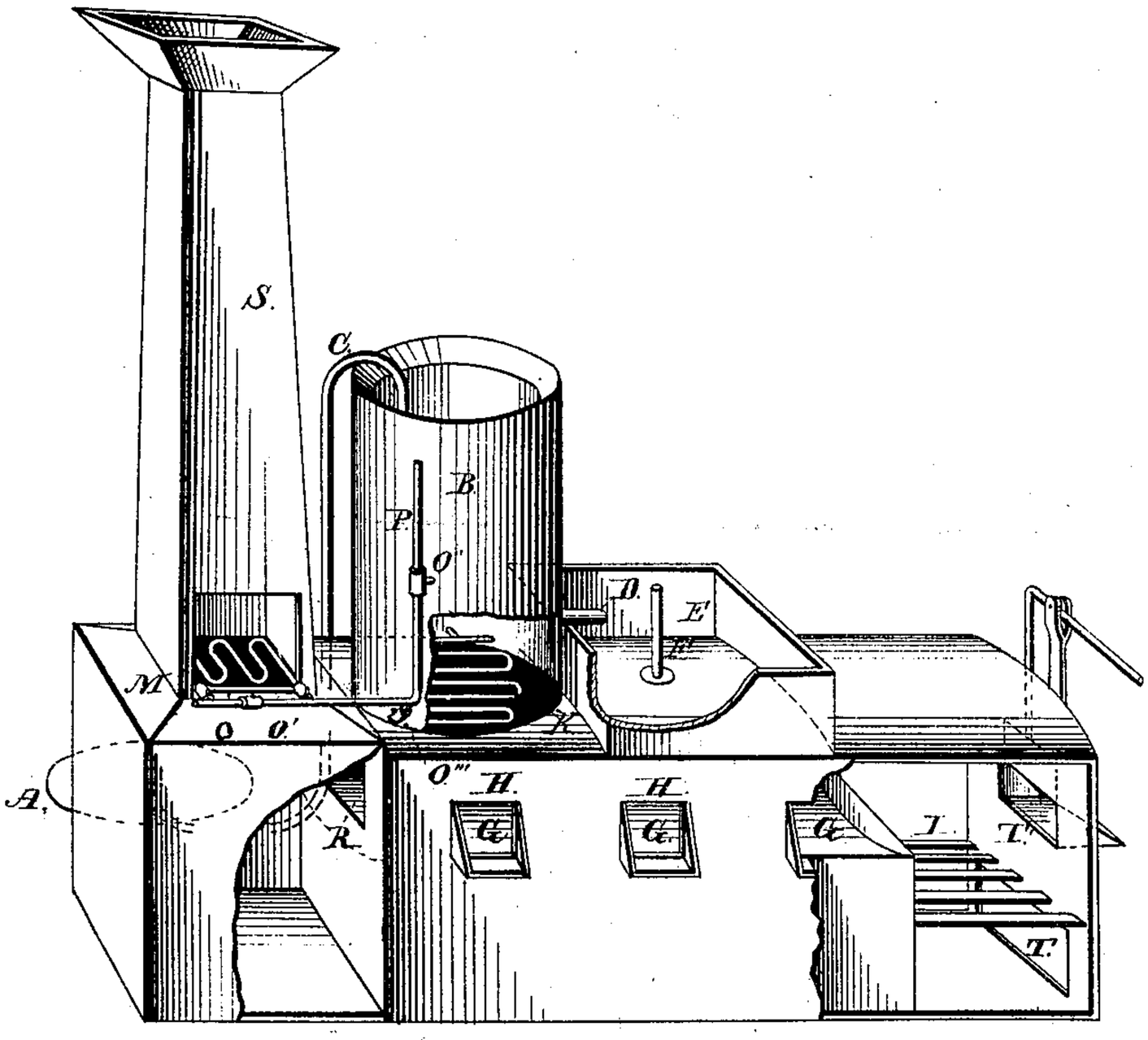
J. W. DIXON.

APPARATUS FOR SAVING SODA ASH.

No. 179,536. Patented July 4, 1876.



Witnesses:

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UNITED STATES PATENT OFFICE.

JOHN W. DIXON, OF WEST MANAYUNK, PENNSYLVANIA.

IMPROVEMENT IN APPARATUS FOR SAVING SODA-ASH.

Specification forming part of Letters Patent No. **179,536**, dated July 4, 1876; application filed March 13, 1876.

To all whom it may concern:

Be it known that I, JOHN W. DIXON, of West Manayunk, Montgomery county, State of Pennsylvania, have invented a new and useful improvement in apparatus for concentrating and saving the caustic soda and other alkali used in the solution to reduce fiber to paper-pulp; 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 the combination of a digester, the main evaporation-chamber, a pipe from one to the other to connect the two together, the auxiliary evaporation pan or chamber, and the incinerating-hearth; also, of the combination, with a paper-pulp digester, of a main evaporation-chamber, a steam-coil within it to heat its contents, an auxiliary evaporation pan or chamber to receive the partially-evaporated alkaline liquor, an incinerating-hearth to burn the foreign materials away and thus to free the alkali, and a pipe to connect the main evaporation-chamber directly with the interior of the digester.

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

In the drawing is shown a perspective view of my apparatus, having parts broken away to show the internal construction.

A is the bottom of a digester; B, the main evaporation-chamber; C, a pipe connecting the two; D, a pipe or nozzle leading from the main to the auxiliary pan or chamber E; F, the handle of a plug closing an opening in the bottom of auxiliary chamber E; G, the incinerating or roasting platform or oven; H H, openings in the side of oven G, to admit a rod or bar to stir the material being burnt; I, the furnace; K, an internal coil of steam-pipe in chamber B; L, an exhaust-steam pipe from the engine of the paper-mill; M, a convolution of pipe for superheating the steam in its passage to coil K, through pipe L; O O′ O″ O‴, cocks for regulating the direction which the steam should traverse; P, a pipe to carry off waste steam; R, a draft and heat passage for carrying heat beneath the evaporating-pans and to the superheating-coil M, through oven G; S, a flue or chimney; T, a draft-door to furnace I; T′, a feed-opening to the furnace I.

The form of a digester for reducing wood, straw, &c., to paper-pulp is well known. A represents the bottom of an upright cylindrical digester.

The object of my apparatus is to save for reuse the caustic soda still remaining in solution in the alkaline liquor, commonly known as "waste liquor," used in the reduction of fiber to paper-pulp, and thus economize the cost of paper manufacture, for the value of the soda-ash forms no inconsiderable part of such cost. The end attained by my invention is rapidity and simplicity of operation, and cheapness both of apparatus and process.

Immediately after the pulp in the digester is reduced, before the waste liquor has time to cool, I draw it off, by means of pipe C, into the main evaporation-chamber B. This is accomplished by blowing it out of the digester A, by steam-pressure, through pipe C to chamber B. The bottom of evaporator B is part of the top of oven G, through which latter passes all the heat of furnace I. By closing cocks O′ O″ and opening cocks O O‴, the exhaust steam from the engine of the paper-mill passes into coil M, is there superheated, and thence it passes into the coil K in the evaporation-chamber B, thence out of the side of chamber B, through which one end of coil of pipe K projects. The liquor comes to evaporator B at almost the same high heat which it possessed in the digester A, and is sustained at that temperature, or nearly so, by the combined heat of the furnace I and the steam-coil K. The evaporation is, therefore, very rapid.

After the operation of evaporation has been partially completed, part of the reduced liquid is run or drawn off into the auxiliary evaporation pan or chamber E, which, in the same manner as chamber B, is exposed to the heat of the furnace. After the liquid has been reduced to a gummy or thick mass in auxiliary pan E, the plug F is extracted, and the mass falls down onto the platform of oven G beneath. Here the heat from the furnace comes into direct contact with it, and it is burnt or roasted, and all foreign matter, consisting of gums, resins, vegetable matter, &c., in the

concentrated mass, is burnt out, leaving the soda free. The mass is stirred from time to time in burning through the openings H H, that all the particles may be operated upon. The residuum is then removed through these openings, and the soda is ready for use again.

If it is desired to dispense with the superheated steam in the operation, cocks O O‴ are closed and cocks O′ O″ are opened, by which means the steam is carried off; or, if it is desired to use the steam without superheating, cocks O and O″ are kept closed and O′ and O‴ are kept open.

After the drawing off of waste liquor from the digester A into chamber B, I introduce hot water into the top of the digester from a hot-water tank or boiler, and wash out what remaining waste liquor or caustic soda there is in the pulp. This enables me at the same time to wash out the pulp, and also save all caustic soda remaining in it, as this hot water, charged with the soda which it has taken up, is then blown into the evaporator B, for reduction, in the same manner as the waste liquor.

Instead of the steam-coil in the evaporation-chamber B, a series of steam-boxes may be used, or an annular steam-chamber around the evaporator B may be employed, the object being to obtain the greatest heating of the contents of the evaporation-chamber without using so great furnace or direct fire heat as will injure the shell of the chamber, or tend to burn it out. I thus use both steam and furnace heat in my apparatus.

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

1. The combination of a digester, the main evaporation-chamber, a pipe from one to the other to connect the two together, the auxiliary evaporation pan or chamber, and the incinerating-hearth, substantially as described.

2. The combination, with a paper-pulp digester, of a main evaporation-chamber, a steam-coil within the latter to heat it, an auxiliary evaporation pan or chamber, an incinerating-hearth, and a pipe connecting the main evaporation-chamber directly with the interior of the digester, substantially as described.

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Witnesses:

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