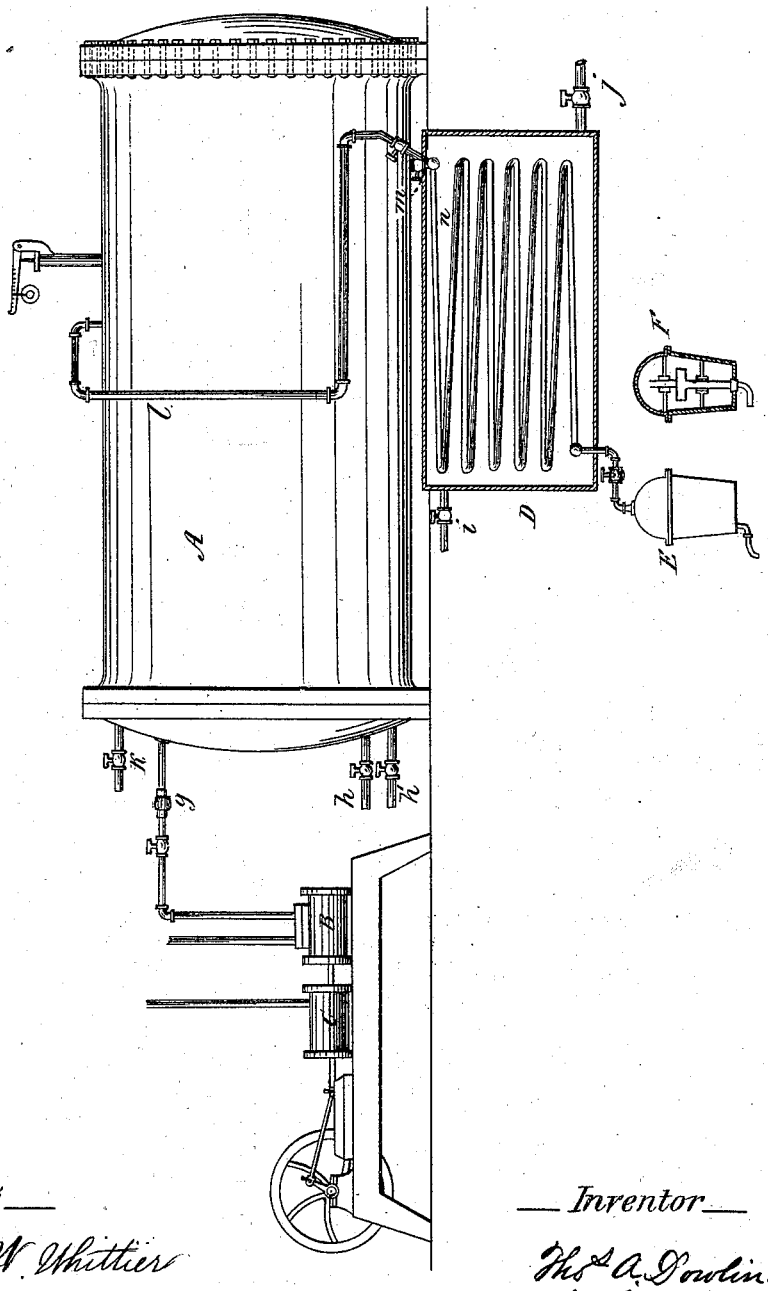
T. A. DOWLING.

Apparatus and Process for Drying Wood and other Substances.

No. 217,273. Patented July 8, 1879.



Witnesses

Elmer W. Whittier

Saml. J. Everbette.

Inventor

Thos A. Dowling

by D. B. Hyde

attorney.

UNITED STATES PATENT OFFICE.

THOMAS A. DOWLING, OF NEW YORK, N. Y.

IMPROVEMENT IN APPARATUS AND PROCESSES FOR DRYING WOOD AND OTHER SUBSTANCES.

Specification forming part of Letters Patent No. **217,273,** dated July 8, 1879; application filed March 19, 1879.

To all whom it may concern:

Be it known that I, THOMAS A. DOWLING, of the city, county, and State of New York, have invented certain new and useful Improvements in Apparatus and Processes for Drying Wood and other Substances, of which the following is a specification.

I use strong vessels of boiler-iron, and cylinder-shaped, provided with a movable cover, with steam-tight fittings, such as are employed for similar purposes in the arts, which vessels, for convenience, I designate as "digesters," the dimensions of which should be according to the general work to be performed.

For convenience and economy it is well to have two or more of such vessels placed side by side, and connected by proper pipes and stop-cocks. Coils of iron pipes are secured around or along the inside of the digester-shell, with their ends projecting outside for external connections; or the digesters may be made double-shelled, with an annular space for steam or hot water between them.

Stop-cocks, blow-off and safety valves, pressure and water gages, and thermometers should be attached.

My invention consists, essentially, in an improved process for treating and drying materials in such digesters, and in the combined apparatus by which I effect the same.

Having inclosed and sealed the wood in the digester, I heat it by a steam-coil or otherwise, and then force into the charge, from an air-pump, air under high pressure. The heat and air, being sealed close with the charge, quickly penetrate its substance and vaporize its moisture, and, being thus under great pressure and hot, it becomes condensed, as if pressed in a mold, in which condition it is dried and cooled, and made secure from subsequent alteration when exposed to the external air. During the process I draw off the vaporized matters by a condensing operation in condenser-conduits, that are sealed from the air by a trap-vessel and dip-pipe. (Shown in the drawing.)

A shows the digester, that has a coil of steam-pipe close around the inside of its shell, the ends of this pipe projecting through the digester at *h h'*. B represents the forcing air-pump, with its pipe, stop-cock, and check-valve *g*, connecting it to A, C being the driving steam-cylinder. Branch pipes, with proper stop-cocks, lead from *h* and *h'* to a cold-water hydrant or supply for cooling purposes.

D is a cold-water tank, to which *j* is a supply, and *i* a waste, pipe. *n n* show a condensing-coil in the tank, one leg being connected with the bottom of the digester, with a stop-cock at *m*, while the lower leg is attached to a sealing trap-vessel, E, the inside of which is provided with a combined float and valve, as shown in section at F.

A branch or vapor pipe is seen at *l*, the upper end being united with the top part of the digester, and the lower end joined with the coil *n*, and provided with a stop-cock. A "pet" testing-cock and pipe are shown at *k*.

The outlet-pipe of the sealing-vessel E is designed to dip into the fluid of a receiving-vessel, (not shown,) to exclude the air from it.

The operation with my apparatus is as follows: The wood or other substance being properly packed and the digester closed steam-tight, steam from a boiler is admitted to the coil-pipes by the junction *h*, its return being by *h'* to a trap-vessel. The digester is then charged by the pump with air to any desired high pressure. The air having no escape and the pressure being fixed, the pump is stopped. This dense and heated air quickly converts the moisture into steam, the pressure from which compensates for a consequent reduction of the air-pressure and reduction resulting from the action of the condenser, which automatically draws away the vapors by the pipe *l* into its coil *n*, in which there will be a partial vacuum. The condensed fluid will pass into the sealing trap-vessel E until it lifts the float and valve, which will liberate the fluid into a receiving-vessel. (Not shown.) Then they will again drop to their first position, which automatic action will continue until the vapors are all drawn out and the wood dried, and the pet-cock indicates dry air in the digester. Steam should then be shut off from the heating-coil, and substituted cold water turned through it by means of a branch pipe connecting with *h*, to cool the interior of the vessel, the air-pressure being kept up by working the pump when necessary therefor. When the temperature has been cooled down by the

water to, say, 150° Fahrenheit, the air-pressure is liberated by the "blow-off," and the digester may be opened and the charge removed.

By such means the wood will be gradually, rapidly, and thoroughly seasoned and cooled, so that neither cracking nor checking can occur, as is liable when the wood is not cooled under such pressure maintained to the last. Moreover, wood seasoned by my process has a novel texture and appearance, by reason of its compactness of fiber, and consequent improvement in color.

Other contrivances may be substituted for the particular trap-vessel described, other means for heating the interior of the digester, and the steam admitted through the coil-pipe may be superheated by an intermediate furnace; but the supply of dry air under pressure is indispensable, as also the free liberation and sealed condensation of the vaporized fluids.

I am aware of a closed vessel for burning coffee, which is provided with a coil of pipe in a heating-chamber. A constant current of air is forced through this pipe, and is heated in its transit, but passing from the pipe freely into and circulating through the coffee from the bottom of the vessel to the top, into which an outlet-pipe prolonged into a condensing-coil is fixed, the pipe being still further prolonged to a second condensing and receiving vessel for the products of condensation. A waste-pipe is fixed into the top of this third vessel for the air-outlet, by which it escapes constantly and freely to the atmosphere, interrupted only by a weighted valve placed in the pipe between the digester and condenser to check the air-flow at that point.

It would seem unnecessary to point out the great distinction in the functional duties of the two inventions, and the impossibility of effecting my desired result in wood with the coffee apparatus. I heat the contents of the drying-vessel, and obtain pressure therein in such a manner as to control and govern each step separately. I confine my heat and seal up my pressure, retaining both from first to last; and my pressure once obtained needs very little work afterward from the pump. I cause the air to enter directly into the operating-chamber, where it is stored and heated under high pressure, to quickly and effectually penetrate the wood, and eventually compress its fibers. I dry the material and the air surrounding it simultaneously, by drawing off gradually the disengaged vapors into an automatic sealing and condensing apparatus, which operates by both vacuum and pressure, while I prevent the air of the drying-chamber from escaping into the atmosphere at all.

I am also aware that in a lumber-drying apparatus a continuous circuit of air has been maintained by a blast apparatus, a condenser and heater being used in the circuit, and the condensed water discharged freely into the outer air. I disclaim the invention of such a combination.

What I claim, and desire to secure by Letters Patent, in my improvement for drying wood and other substances, is—

1. The following elements in combination: a sealed vessel or operating-chamber, provided with an internal coil of pipe for steam-heating, or with other heating contrivance, an air-pump for high pressure, and a condensing apparatus for vaporized matters, all arranged substantially in the manner and for the purposes set forth.

2. An automatic condensing and sealing apparatus, in combination with an air-forcing pump and heating contrivance, and operating chamber, for treating wood and other substances, for the purpose and in the manner described.

3. The described process of drying wood and other substances, by subjecting them to heat in a closed chamber while subjected to confined air-pressure, and gradually drawing off therefrom the cooled vapors by a condensing apparatus, and cooling the treated substance while under such constant air-pressure, substantially as described.

THOS. A. DOWLING.

Witnesses:
JOHN HARDMAN,
A. J. KENDALL.