

H. G. BULKLEY.

Lumber Drier.

No. 69,964.

Patented Oct. 22, 1867.

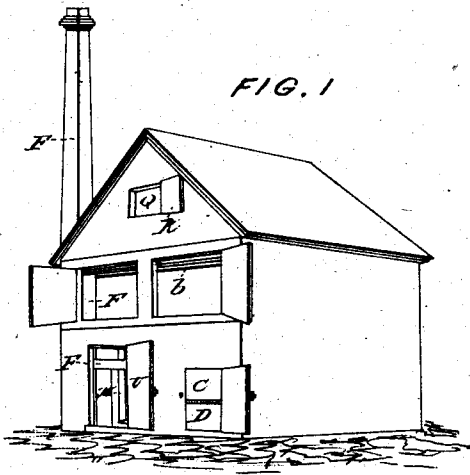


FIG. 1

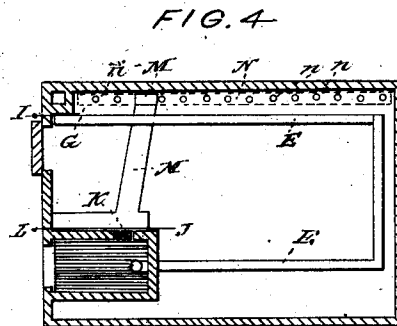


FIG. 4

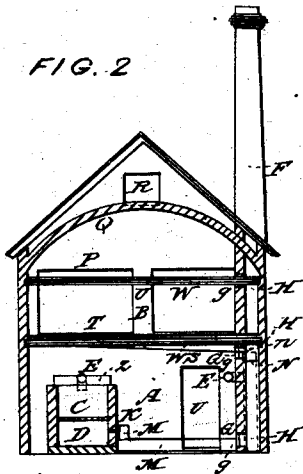


FIG. 2

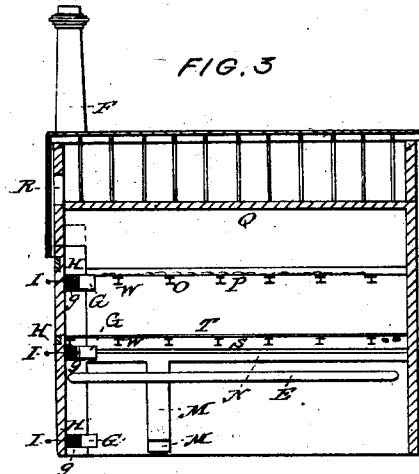


FIG. 3

WITNESSES:

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S. S. Sweden

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United States Patent Office.

HENRY G. BULKLEY, OF NEW YORK, N. Y.

Letters Patent No. 69,964, dated October 22, 1867.

APPARATUS FOR DRYING AND DESICCATING.

The Schedule referred to in these Letters Patent and making part of the same.

TO WHOM IT MAY CONCERN:

Be it known that I, HENRY G. BULKLEY, of the city and county of New York, and State of New York, have invented certain new and useful improvements in Apparatus for Desiccation; and I do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to annexed drawings, making part of this specification, in which—

Figure 1 is a perspective view;

Figure 2 a transverse section,

Figure 3 a longitudinal section, and

Figure 4 a plan of the lower section.

A is the fire-vault, in which heat is made; B is the drying-room, in which the substances to be dried are placed; C is the heater; D, the ash-pit; E, the smoke pipe; F, the flue or chimney; H H H are openings into the chimney, for discharging surplus steam and gases produced from substances while in the process of drying; G G G are steam-slides or registers, for regulating the discharge of steam and gases; g g g are wire gauze over the openings H H H, for the purpose of preventing sparks or flame from passing into the drier; I I I are handles for manipulating the registers G G G; J is a slide or register for regulating the discharge of steam through the openings H; K is openings into the ash-pit D, for discharging the surplus steam into the fire, to be used as a means of supporting combustion; L is a handle for manipulating the register J; M N are return-flues, connecting with the bottom of the drying-room and the ash-pit D, for the purpose of discharging the surplus steam from the drying-room; O is a perforated tile or metal ceiling; P is gravel covering the top O; Q is a fire-proof arch; R is a door in the gable end of the building; n n are openings into the return-flue M N; S is a ceiling covering a large proportion of the fire-vault A; T is lattice-work, resting on the supports W, and to be used when the fire-vault and drying-room are the same size; U is a man-hole door into the fire-vault; W the supports or joists, and Z the water-pan for making steam, and rests on the heater C.

The object of my invention is to secure a fire-proof drying apparatus, which may be operated with safety either in a building designed specially for this purpose, or in a part of any building used for other purposes.

For rapid and safe desiccation it is essential to maintain an even temperature in all parts of the room, in order that no portion of the materials may be over-dried, and it is also necessary to get rid of the surplus steam or vapors produced from the drying substances, and in such a full state of saturation of moisture as will not waste heat. I have demonstrated the advantage of a steam atmosphere over that of heated air for rapid and safe desiccation, and it is well known that too dense an atmosphere of steam will retard desiccation. I have made the improvements, herein described, partially for utilizing the waste steam and gases produced from the drying substances, by using more or less of them as fuel, and for retaining such portion of the steam as is advantageous around the substances while drying, to act as a converter of heat and an ameliorator at the same time, and also for the purpose of discharging all the vapors and gases, not needed for the uses described, into the open air, with as small a sacrifice of heat as possible.

I desire to take advantage of the fact that water or steam is eight-ninths oxygen, and thus use a more concentrated form of oxygen in the steam to burn up the carbon or smoke of the fuel, instead of depending solely upon the oxygen in common air. It is well known that air contains less than one-fourth oxygen, while over three-fourths of its composition is nitrogen, which is neither inflammable nor a supporter of combustion, and only wastes heat as it passes into the flue or into the atmosphere through the incandescent coal, or burning fuel, but by substituting the one-ninth hydrogen of steam for the three-fourths inert and worse than useless nitrogen, in the process of combustion, we make available a substance which affords the most efficient heat known. The great advantage in thus using the oxygen of water in combustion would make it desirable to evaporate water for this express purpose, but when the steam is already generated and in great abundance, as in the case of desiccation, it is only necessary to have a proper device to use so much of the surplus steam as will not diminish but rather increase the intensity of the heat. In this way a large proportion, and sometimes all, of the steam and gases from the drying substances can be used as fuel.

Construction.

I build a room, say fifteen feet high, and as large as may be required, and place joists or iron supports across the room, about eight feet from the bottom. In the lower section I arrange my steam and heating apparatus, so as to fire from the outside. When the room is narrow it is best to spring an arch over it, but when a wide room is required I cover it with a tight metallic ceiling. In case the substances to be dried contain a very large amount of moisture, I cover the room with a perforated metallic or earthen ceiling, and spread about four inches of gravel over it, so as to take off the steam into the open air. This is especially advantageous in drying peat. When it is desirable to have a drier in a store, shop, or factory, as, for instance, for drying tobacco, I use a section of one story for a fire-vault, and a section of another story above for the drying-room. From one or both sides, and at the bottom of the drying-room, I extend return flues M N, for the purpose of discharging the vapors which are expelled from the drying substances into the ash-pit, and using them as a means of supporting combustion. This flue is usually about one foot square, and located beneath the joists, and has openings in the top side. Over the openings K, I place wire gauze, to prevent the passage of sparks, and use a valve or register, J, which is operated by the handle L from the outside, so as to control the amount of steam discharged into the fire. I leave openings at different elevations in the chimney, in order to take off the steam at such points as may be best for different substances, and at such density as I require. These openings I cover with wire cloth, to prevent the passage of smoke or flame, and control the discharge of the steam by means of the registers G G G. For a heater I use any good one which will consume the fuel used in the locality. The steam may be made in any ordinary way, but I prefer a large open pan, located on top of the heater, supplied with water by means of a ball-cock. By this means I can always maintain a due proportion between the amount of heat and steam, which is very desirable, as when we have a high degree of heat a larger amount of steam is required to equalize the heat in all parts of the room and protect the drying substances from charring.

Operation.

As soon as possible I fill the drier with steam, and continue to heat the steam. After keeping up the heat for a time the vapors will begin to be produced from sap or water in the substances drying. They will flow out more readily, inasmuch as the steam atmosphere, instead of parching up the outside of the substances, keeps the pores open, and thus gives free passage to the moisture from the centres. The coldest vapors, often laden with gases which have strong affinity for water, will fall to the bottom of the drier, and must be re-heated and carried up again, and forced through a pervious top, in cases where a large surplus is generated from the drying substances, which can be done only at a waste of heat, or this surplus steam must be taken off at the bottom. An opening into the air will not alone discharge these vapors, but will admit cold air, but the waste heat passing up the chimney has sufficient power to draw off the surplus steam produced in drying most substances. If a room is air-tight above the discharge flues H H H, a steam atmosphere of an even density will be maintained.

Besides the advantages of getting rid of the surplus steam, and at the same time of retaining a steam atmosphere, it is especially essential to get rid of volatile oils and gases, which are set free by certain degrees of heat, but which cannot be set free in heated air without injuring the fibres of those substances. For instance, in drying or curing tobacco, the nicotine, a rank poison, is rapidly taken out by this process, and having a strong affinity for water, when mingled with the vapors, is drawn out into the open air or consumed by the fire, while the aroma of the tobacco is retained and the texture remains soft and tough.

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

1. The openings H K, when covered with wire gauze, or its equivalent, and regulated by valves, and used in connection with a steam atmosphere, for the purposes substantially as specified.
2. The return flues N M, in combination with the ash-pit D, when constructed, arranged, and used in combination with a steam atmosphere, substantially as specified.
3. The mode of consuming waste steam and gases produced from substances while drying in kilns, substantially as described.
4. The perforated ceiling O, when made of fire-proof material, and covered with any incombustible substance, and used with a steam atmosphere, for the purpose and in the manner substantially as specified.
5. The fire-proof drying-kiln, constructed and operated in the manner substantially as described.

H. G. BULKLEY.

Witnesses:

L. E. HOLDEN,
L. G. HOLDEN.