(No Model.)

B. P. HARRIS & A. STAGG.

2 Sheets—Sheet 1.

KILN FOR DRYING PURPOSES.

No. 349,091. Patented Sept. 14, 1886.

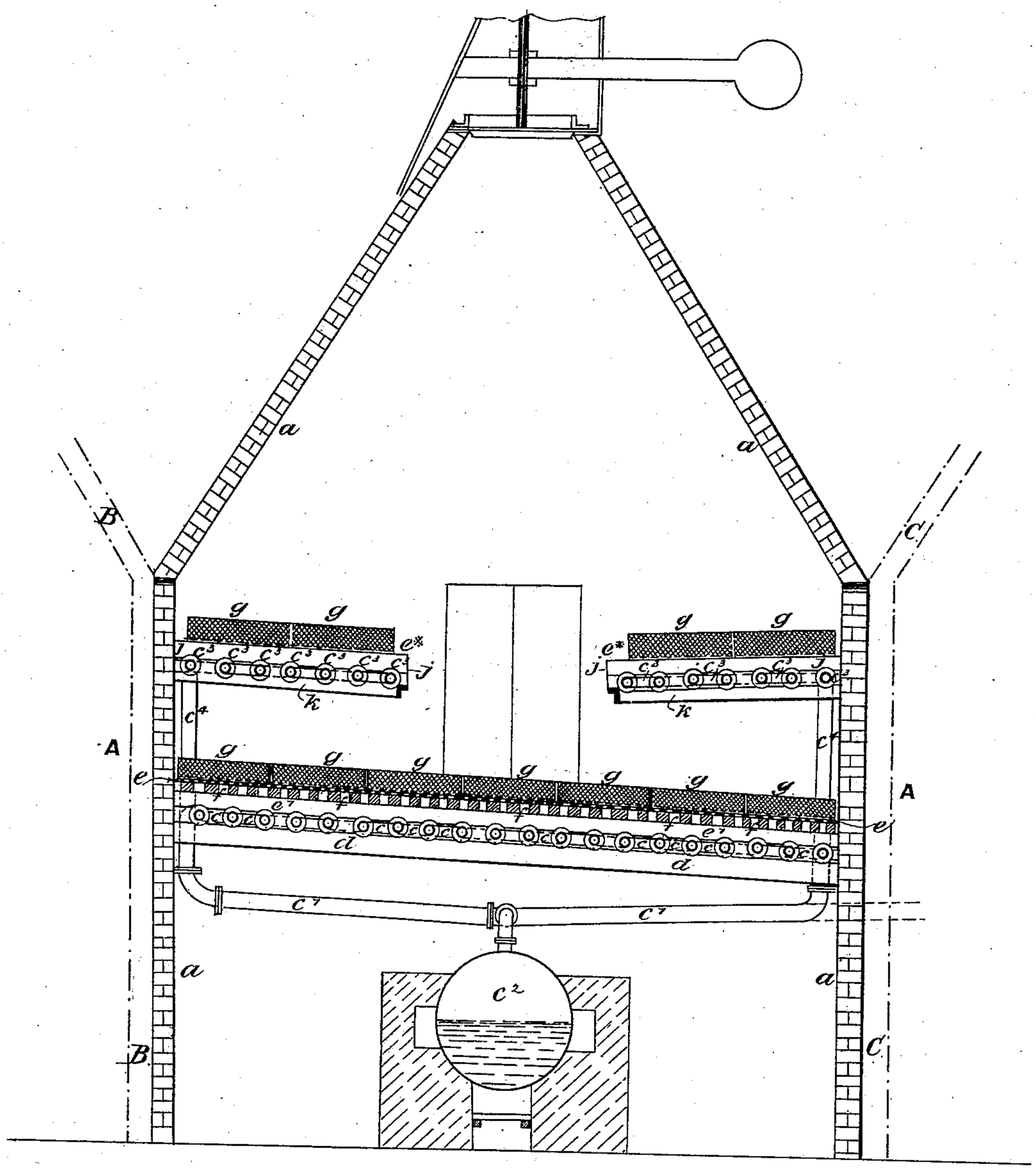

FIG 1

Witnesses:
Wm E. Aughinbaugh
Geo. N. Fincke

Inventors:
Benjamin Preston Harris
Alfred Stagg
by John J. Halsted & Son
their Attys.

(No Model.)

2 Sheets—Sheet 2.

B. P. HARRIS & A. STAGG.

KILN FOR DRYING PURPOSES.

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Fig. 2.

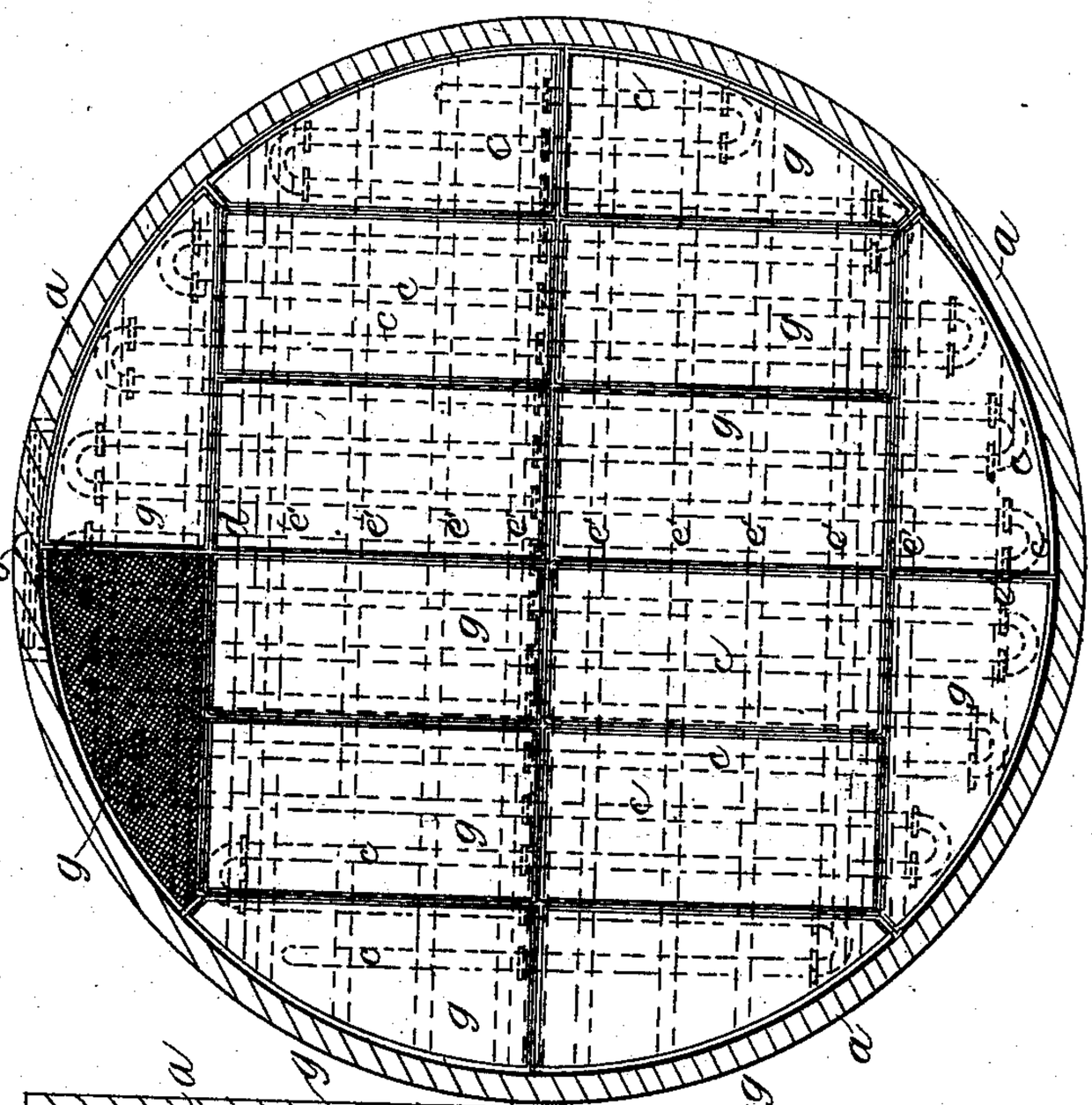


Fig. 3.

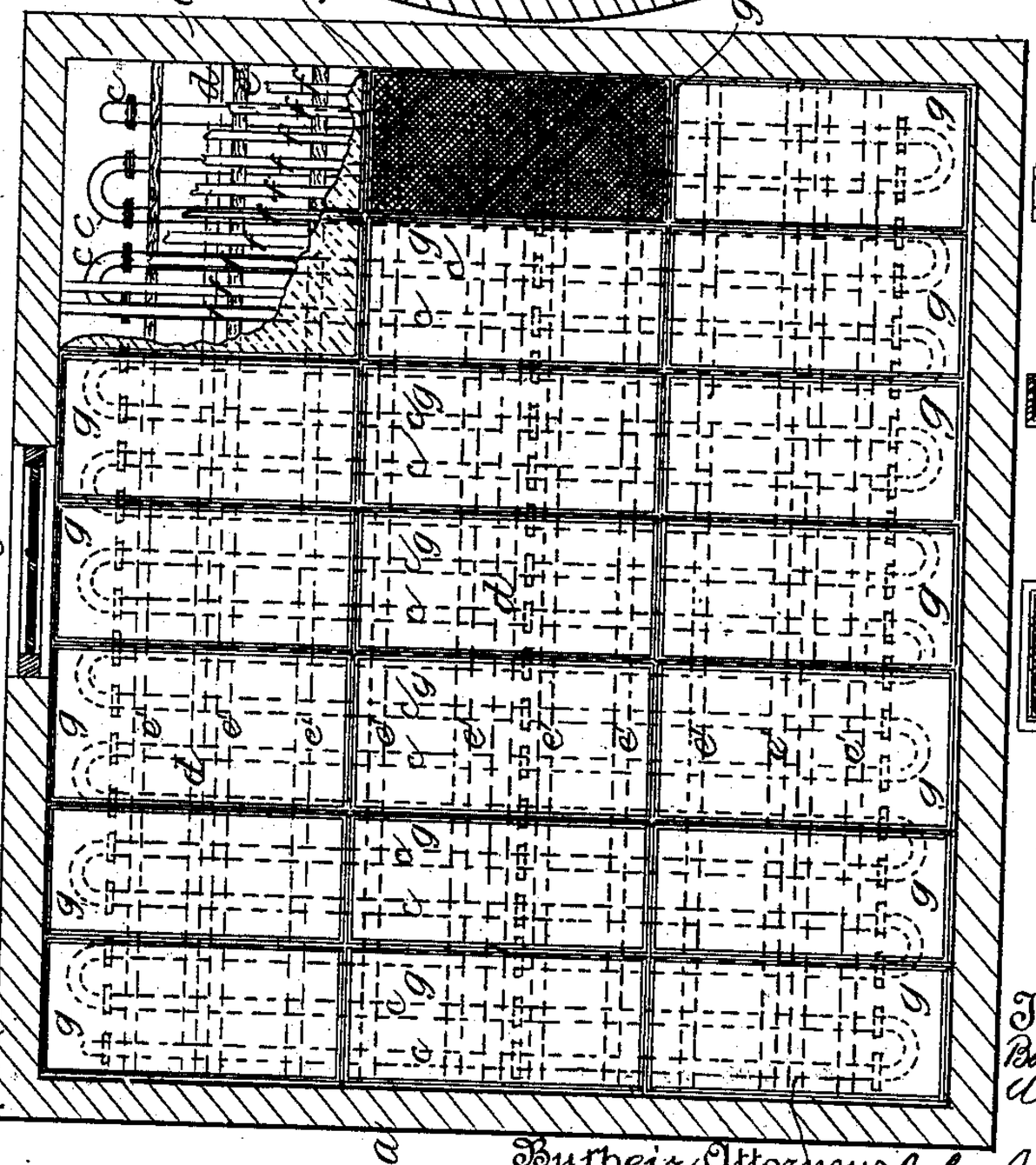
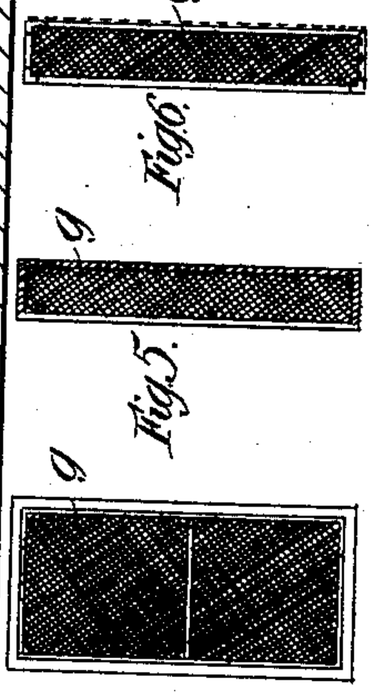


Fig. 4.



Witnesses
Wm. Norton
Jos. R. Edson

Inventor
Benjamin P. Harris
Alfred Stagg
By their Attorneys
John J. Halsted & Son

UNITED STATES PATENT OFFICE.

BENJAMIN PRESTON HARRIS, OF SOUTHFLEET, AND ALFRED STAGG, OF MILTON, COUNTY OF KENT, ENGLAND.

KILN FOR DRYING PURPOSES.

SPECIFICATION forming part of Letters Patent No. 349,091, dated September 14, 1886.

Application filed July 6, 1885. Serial No. 170,807. (No model.) Patented in England September 8, 1884, No. 12,143.

To all whom it may concern:

Be it known that we, BENJAMIN PRESTON HARRIS, of Southfleet, near Gravesend, in the county of Kent, England, farmer, and ALFRED STAGG, of Milton, next Sittingbourne, in the same county, England, feltmonger and wool-stapler, subjects of the Queen of Great Britain, have invented certain new and useful Improvements in Kilns or Drying-Floors for the Drying of Hops, Malt, Wool, or other Matters, (for which we have received Letters Patent in Great Britain, No. 12,143, dated the 8th day of September, 1884,) of which the following is a specification.

In the drying of hops and other matters it is of great consequence that the same should be dried to a certain extent, and yet not over-dried or burned; and in order to obtain the best results it is generally desirable to be able to control accurately the temperature of the chamber or kiln and of the heating means for heating the matters to be dried or the atmosphere passed into and between the matters treated. When such heating is effected by direct fire-heat, as is at present generally the case, such control is difficult, and the results obtained are not uniformly satisfactory.

The objects of our invention are to provide efficient means for the drying of hops, fruit, malt, wool, grain, seeds, roots, and other matters with ready control of the heating means, and to avoid danger of overheating or burning the matters under treatment. In the drying of hops, for instance, it is well known that a steady sufficient flow of warm dry air heated to somewhere about 100° Fahrenheit, is adapted to give the best results in quality and flavor for the purposes of brewing, while on the other hand the employment of too high a degree of temperature in the drying is highly detrimental to condition or quality in hops, and deteriorates their value and destroys their useful properties. Again, in the drying of grain and seeds, as well as other matters, it is essential to the preservation of their best qualities and value that a certain mean temperature be not much exceeded, and that such temperature be capable of steady maintenance throughout the drying operation. For this purpose we dispense with the employment of fire as the direct heating means for drying the hops or other matters, and we employ in lieu thereof the heat obtained from steam passing through pipes arranged in proximity to the supporting-floors on which the matters or the appropriate receptacles of those matters rest, and thereby we avoid all scorching, burning, or such-like damage, gain considerable weight in hops in each kiln-load, and obtain better quality and uniformity of quality, retaining the aromatic and other properties of the hops or other matters treated.

In carrying out our invention we employ a kiln or drying-floor with a suitable reticulate or open-work floor having located a short distance below it, but in close proximity, a series of pipes supplied by a suitable steam boiler or heater, with supplemental shelves or brackets supported above the floor and extending from the walls toward the interior of the kiln. This floor and the shelves support the matters to be treated in wire-work sieves or reticulated trays adapted for conveying and holding the matters without necessitating handling or walking over them.

In the accompanying drawings, Figure 1 shows by vertical section our invention modified and applied to a kiln of circular section; and Fig. 2 shows by sectional plan, taken at the line A A, Fig. 1, such an arrangement of kiln-floor with a series of reticulated trays or sieves—say for hops—upon it. Fig. 3 shows a similar plan of a floor of a kiln of square section or ground plan. Figs. 4, 5, and 6 show separately by plan, side, and sectional view, respectively, one of the reticulated trays or sieves *g*.

a indicates the walls; *b*, a suitable door for ingress and egress and removal of goods.

c are a series of steam-pipes supported on beams or girders *d*, supported by the walls of the kiln *a*.

c' are steam-pipes supplying steam from the steam-boiler c^2 to the pipes *c*.

e' are joists or supports for the battens *f*, or it may be metal gratings in lieu thereof, to support a perforated zinc or other reticulate or open-work floor, *e*, on which are laid the sieves *g* with the contained matters being treated.

c^3 c^3 are supplemental pipes conveying steam to and fro under the brackets or shelves e^* e^*,

supported on girders or supports *j;* and *k k* are other supports for the series of heating steam-pipes c^3. c^4 are also pipes of supply therefor.

Pipes for return or exhaust ends of the zig-zag or series of steam-pipes are connected to a siphon or trap, to intercept the condensed water or return it to the boiler, as will be well understood.

If it be desired for some purposes steam-heated pipes may be applied within the chamber, supplementary of the series below the floors.

Fig. 3 shows by cross-section a kiln of rectangular form *a*, the arrangement of the trays *g* on the floor *e*, a portion of that floor *e*, a portion of the battens *f*, a portion of the heating-pipes *c*, a part of one of the beams *d*, parts of joists *e'*, and the position of the door *b*, also substantially as already described with respect to a circular kiln, excepting as regards adaptation to variety of form of kiln.

In operating upon the goods to be dried—such as hops, for instance—we place the hops in the wire or other open-work trays *g*, and we place these in series best adapted for filling the kiln floor or floors *e*, the trays being of rectangular or other form to fit to each other and to the kiln sides *a*. By these means the hops may be readily transported into and from the kiln, avoiding any necessity for treading upon and consequently injuring the hops, as is now commonly the practice, if not the necessity, in passsing to and from the interior of the kiln *a*.

The dotted lines B C respectively indicate the position which contiguous kilns may occupy and be served by the same steam-boiler as the central kiln, branch pipes taking a supply of steam to each side kiln.

The series of pipes *c*, for conveyance of the steam under the floors *e*, may be substituted by series of chambers or hollow plates, ample air-spaces between being left for passage of air.

Owing to the improved treatment which is afforded to hops especially by our process, we are enabled to dispense with sulphuring to a great extent; but where such process is desired to be resorted to and the sulphur-vapors introduced into and among the goods in the chamber, this may be produced by means of fire-heat from a small fire in a portable fire-place; or where a fire-place already exists, as in most old kilns, such may be utilized for the purpose, or the vapor be introduced in any convenient known manner. When the natural draft of air through the kiln or chamber created by our heating means is insufficient, or is desired to be augmented, we use a fan or other suitable forcing means to force or draw air in below the floor *e* and up therethrough and past the steam-piping.

Driers having perforated floors and steam-pipes below said floors have been used before. Perforated trays, constituting in themselves the floors of the driers, have also been used; but, not so far as we are aware, have wire-work sieves or reticulated trays in conjunction with other and independent perforated floors been used.

What we claim, therefore, and desire to secure by Letters Patent, is—

1. A kiln for drying hops, malt, wool, or other like materials, having a perforated floor, a series of open-work trays supported upon said floor for holding the material to be dried, and steam-pipes supported below said floor, substantially as shown and described.

2. A kiln for drying hops, malt, wool, or other materials, having a perforated floor, brackets or shelves *e*, supported above said floor and extending from the walls toward the interior of the kiln, and steam-pipes supported below said floor and brackets, all substantially as shown and described.

3. A kiln for drying hops, malt, wool, or other like materials, having a perforated floor, brackets or shelves *e*, supported above said floor and extending from the walls toward the interior of the kiln, open-work trays supported upon said floor, and brackets and steam-pipes supported below said floor and brackets, all substantially as shown and described.

In testimony whereof we have hereunto set our hands in presence of the subscribing witnesses.

BENJAMIN PRESTON HARRIS.
ALFRED STAGG.

Witnesses:
HORATIO ARTHUR ERITH DE PINNA,
JOHN ALFRED DONNISON.