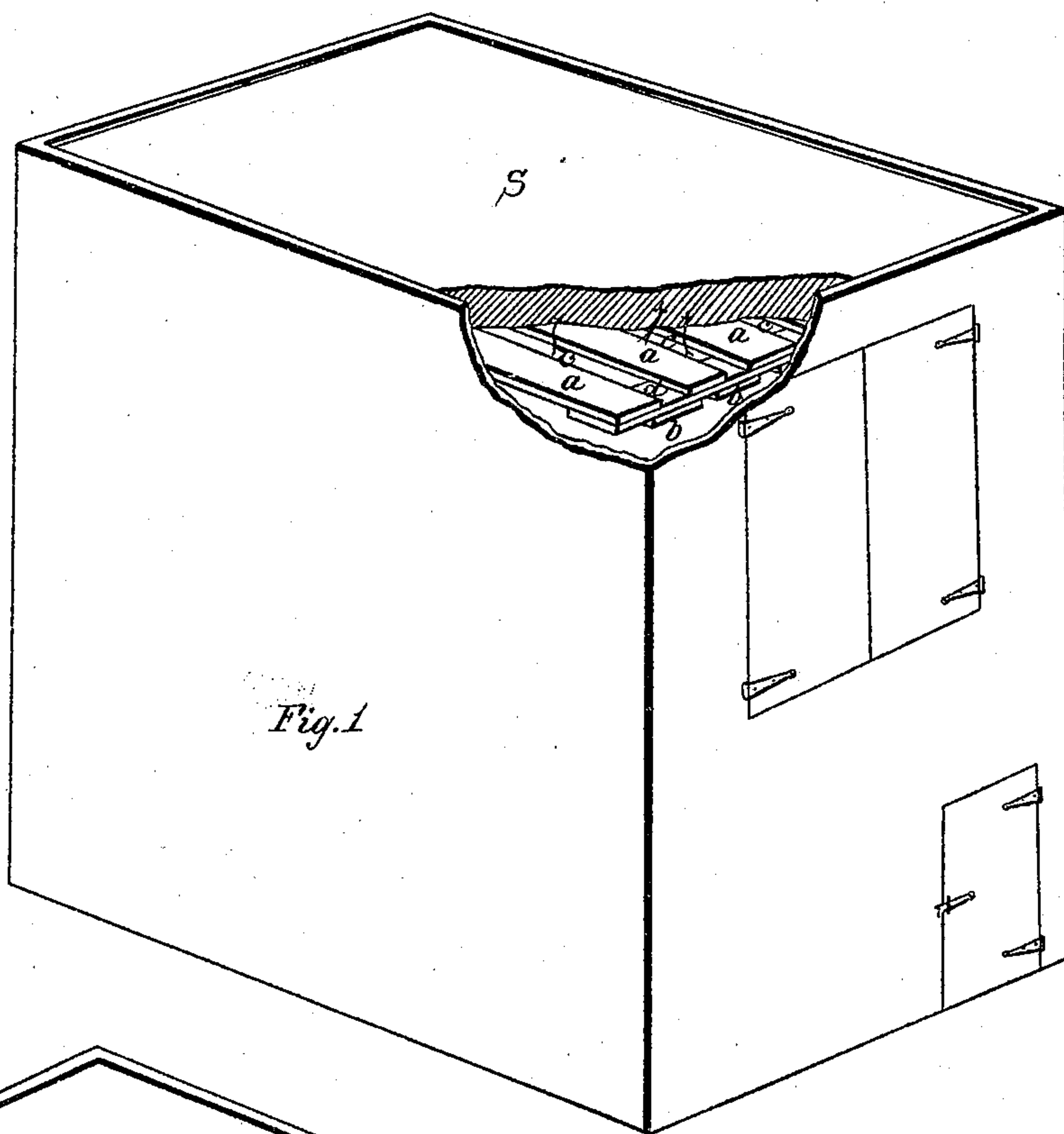


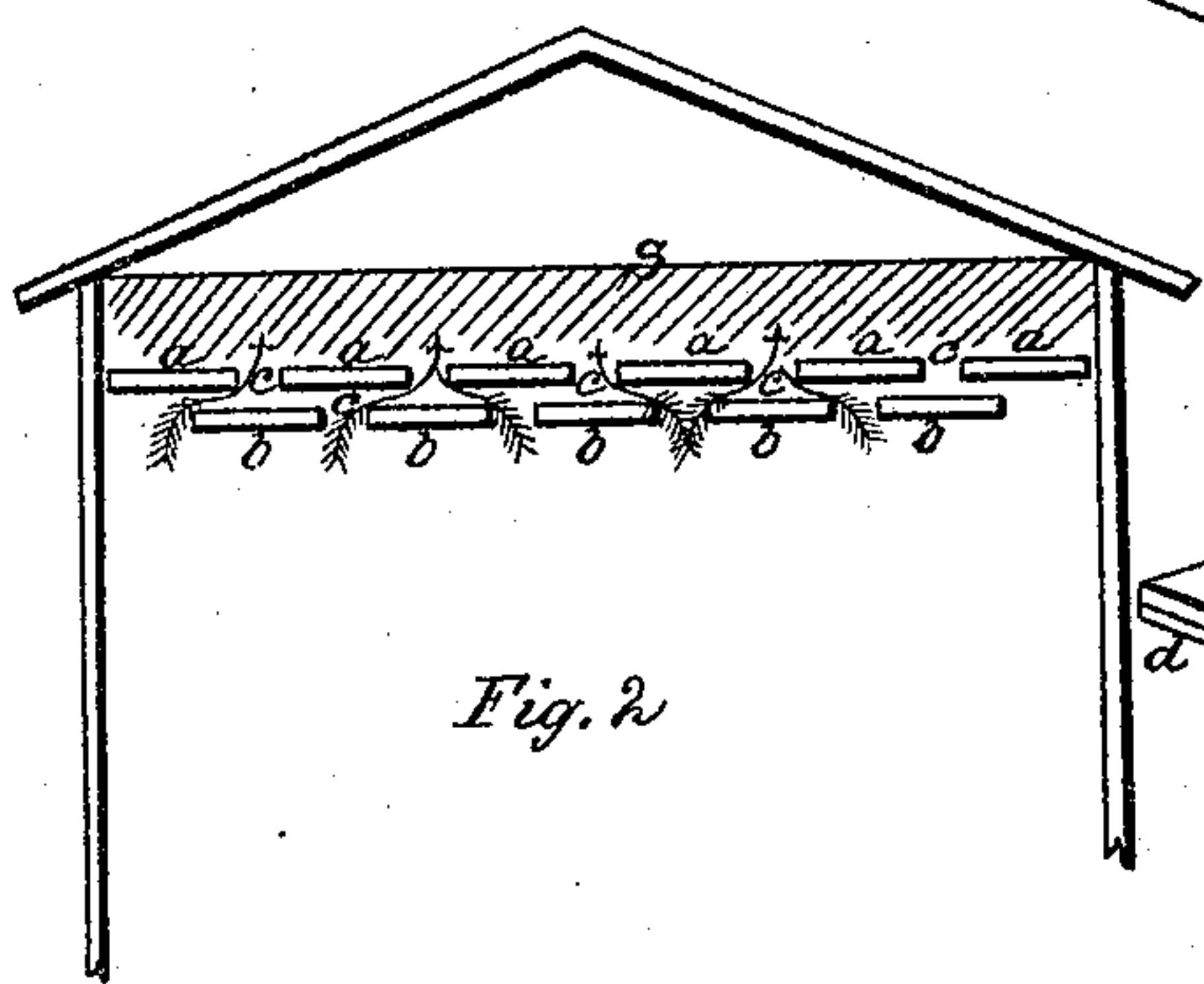
*H.G. Bulkley,  
Drying Kiln,*

*N<sup>o</sup> 52,524,*

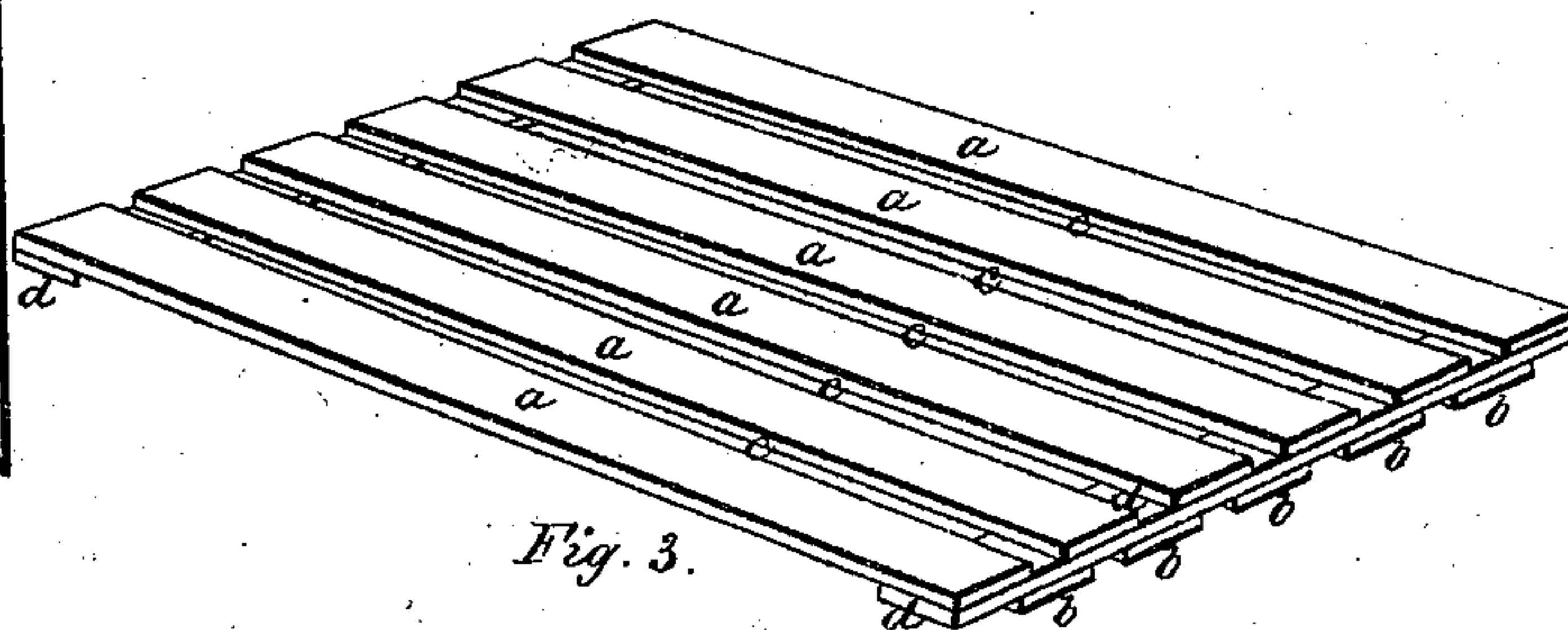
*Patented Feb. 13, 1866.*



*Fig. 1*



*Fig. 2*



*Fig. 3.*

*Witnesses  
C. H. Buelter  
D. C. Holden*

*Inventor  
Henry G. Bulkley*

# UNITED STATES PATENT OFFICE.

HENRY G. BULKLEY, OF KALAMAZOO, MICHIGAN.

## DRYING-KILN.

Specification forming part of Letters Patent No. 52,524, dated February 13, 1866.

*To all whom it may concern:*

Be it known that I, HENRY G. BULKLEY, of Kalamazoo, county of Kalamazoo, and State of Michigan, have invented a new and useful Improvement in Drying-Kilns; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings.

Figure 1 is a perspective view of a dry-kiln without a roof. Fig. 2 is an end view of the roof of the drier with an end view of the sawdust top or ceiling. Fig. 3 shows an arrangement of the boards on which the sawdust rests.

In Fig. 3, *b b* represent boards placed upon the joists of the ceiling, and having their edges left apart. *d d* represent strips placed across the boards *b b*, and *a a* represent the upper layer of boards, placed on the strips *d d* and covering the spaces left between the boards *b b*, to prevent the sawdust from falling through the spaces between the boards *b b* into the drying-room. *c c* represent the spaces between the upper and lower tier of boards, where the steam from the drying-room comes in contact with the sawdust.

*S* represents the sawdust placed on the top of the boards *a a*. The arrows show the direction the steam takes in passing out of the drying-room through the sawdust.

In order that others skilled in the art may be able to make and use my invention, I will proceed to describe the construction and operation of it and the principle on which it is based.

I erect a building of the size required, but for illustration let it be seventeen feet long, thirteen feet wide, with walls fifteen feet high. At the top I put in supports, and on these joists or other supports I lay boards, leaving their edges, say, six inches apart. Across these boards and over the supports I place strips—say one-half an inch thick by one and one-half inch wide. I place boards over the spaces and on the strips wide enough to lap over the spaces an inch or more. I then cover the whole top with sawdust, or its equivalent, evenly two to four inches deep. This enables the steam in the drying-room below to come constantly in contact with the sawdust, so that all surplus steam is readily taken off into the open air. As some substances will bear a more rapid desiccation than others, the thick-

ness of the sawdust or other trap for the steam will at all times act as a regulator.

In case I wish to erect a fire-proof kiln I use iron supports for the top, and instead of boards I use perforated iron or perforated tile. I do not confine myself to any particular substance used or special mode of construction, provided the end hereinafter described is attained.

Thorough and practical tests which I have made have developed the seeming paradox that a steam atmosphere of proper density and under proper control is a much more rapid, safe, efficient, and economical mode of seasoning and kiln-drying substances than common atmospheric air.

In order to make dry steam by the former methods, the most general one was to confine the steam in a boiler of great strength and superheat or surcharge it under high tension. This is an expensive and dangerous mode. A new way has been devised by which steam is surcharged in particles at a pressure slightly exceeding that of the atmosphere by placing the heaters within the steam-chamber and so arranging them that as often as the surcharged steam rises and imparts its heat it returns by its own gravity to the heaters, to be again superheated. Thus in the same chamber there are particles ascending and descending, the surcharged particles rising and imparting their surplus heat and then falling back toward the heaters.

To surcharge particles of steam with heat by the new method it is desirable to have a chamber in which only so much steam shall be retained as will be sufficient to expel and exclude the air, and the chamber should be so arranged that all surplus steam will pass out. If too much steam is retained, it causes such pressure as to prevent the free circulation of the particles of steam in converting heat, while if too little steam is retained it allows the admission of the air. One advantage in the use of steam over air is that it carries heat at least three hundred times as fast as air.

After a thorough investigation by many practical tests I have developed the fact that sawdust, tan-bark, or their equivalents, when properly arranged over the top of rooms for kiln-drying, are a complete success in securing the right kind of a steam atmosphere, since by using them in different thicknesses a more or



less dense steam atmosphere can be retained, so as to adapt it to the different substances to be dried. Some substances require more protection while drying than others, and as the steam is a constant protector against charring, the sawdust top, when properly arranged, acts as a self-regulator, allowing all surplus steam made from the sap or water in the substances dried or otherwise to escape, and retaining a sufficient amount to act as an ameliorator on the substances while being dried. Besides, the sawdust top is a non-conductor of heat, and renders the kiln safer from danger by fire, as it retains a steam atmosphere at all times and excludes the air, which is the supporter of combustion.

It is a fact not generally known that a much higher degree of heat can be used and a more rapid desiccation performed by using steam as

a means of conveying heat instead of common air, and still the substances will be less discolored or charred, and the aroma of delicate substances will be far better preserved.

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

The use of a sawdust top, or its equivalent, and of such varied thickness as to retain so much steam generated from the drying substance or otherwise as shall expel the air, convert the heat, and protect the substances from scorching, and allow all surplus steam to pass out through the sawdust with small waste of heat and with the slightest pressure, substantially as specified.

HENRY G. BULKLEY.

Witnesses:

L. E. HOLDEN,  
JUSTICE J. HOLDEN.