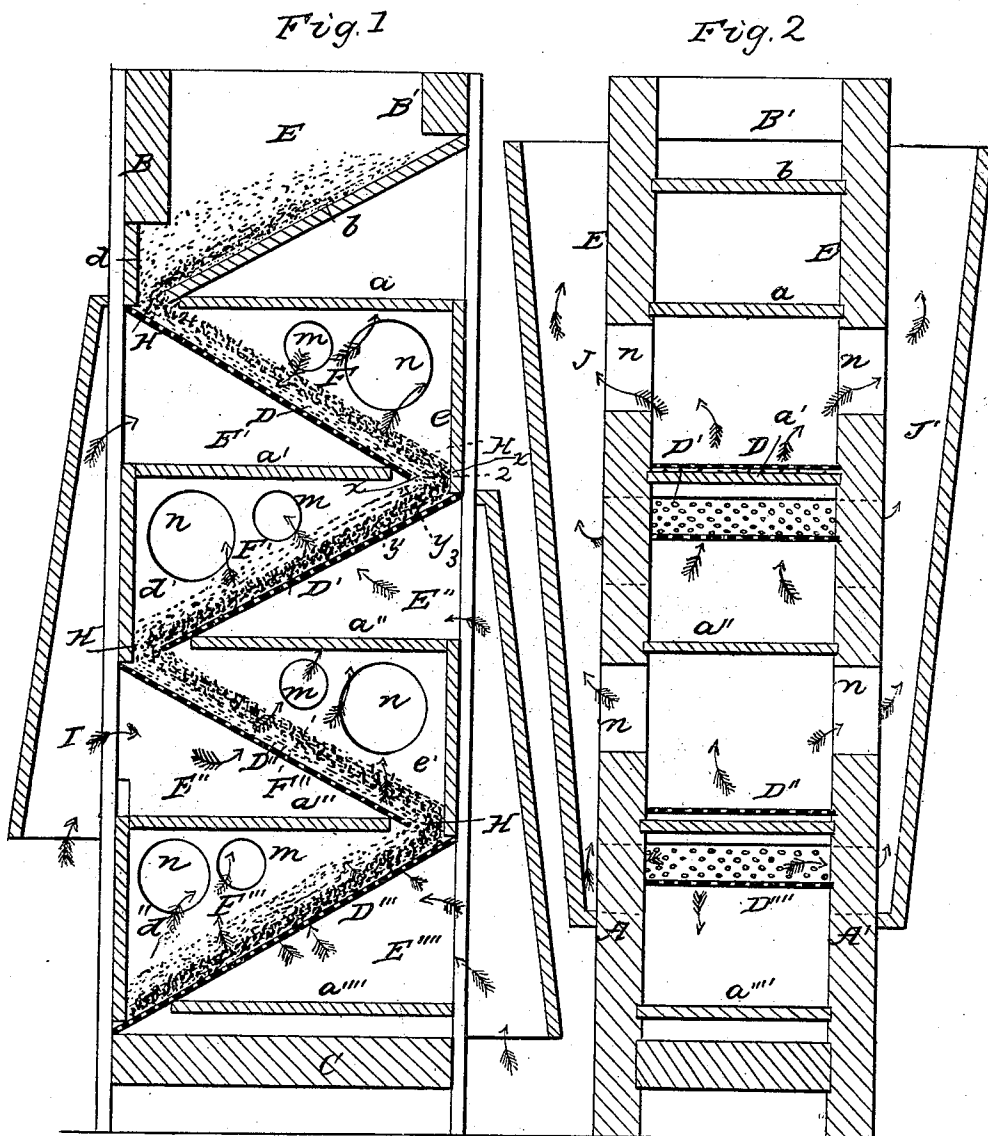


H. H. BEACH.
Grain Drier.

2 Sheets—Sheet 1.

No. 38,723.

Patented June 2, 1863.



witnesses

Charles C. Foster.

W. Albert Hall.

Inventor
Henry Houson,
Att. for H. H. Beach

H. H. BEACH.

2 Sheets—Sheet 2.

Grain Drier.

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Fig. 1

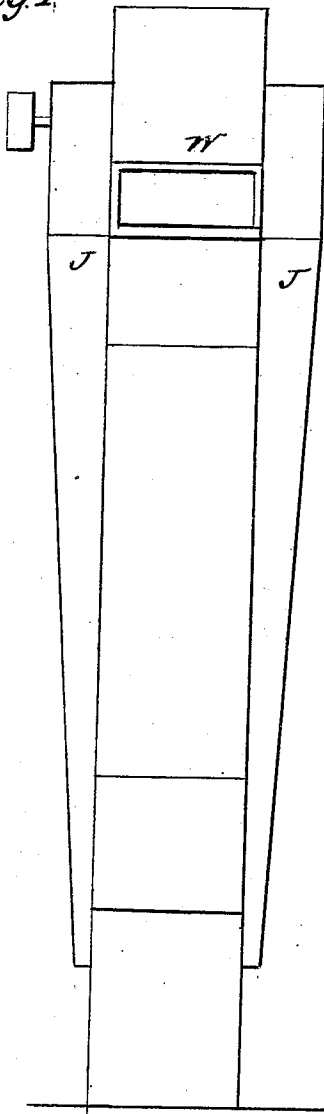
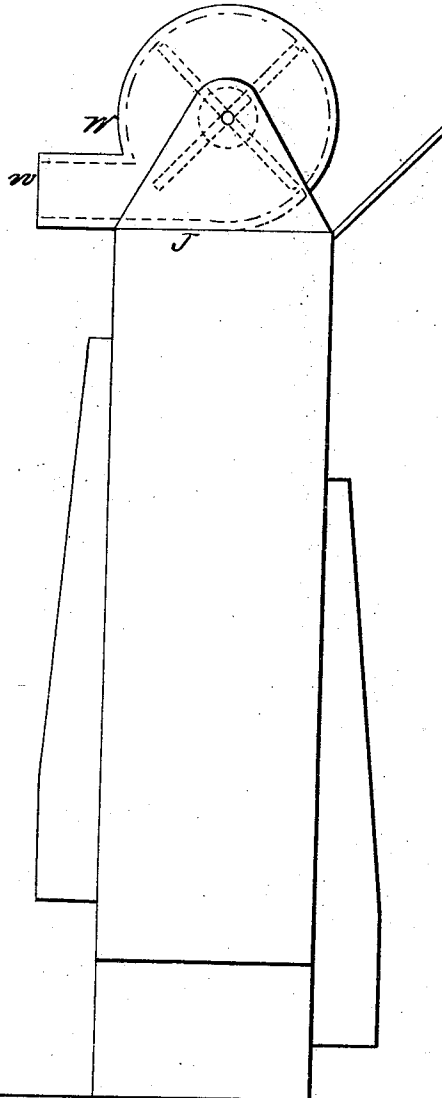


Fig. 2



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UNITED STATES PATENT OFFICE.

HENRY H. BEACH, OF PHILADELPHIA, PENNSYLVANIA.

IMPROVEMENT IN GRAIN-DRIERS.

Specification forming part of Letters Patent No. 38,723, dated June 2, 1863.

To all whom it may concern:

Be it known that I, H. H. BEACH, of Philadelphia, Pennsylvania, have invented certain Apparatus for Drying and Cooling Grain; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

My invention consists of certain apparatus, fully described hereinafter, for drying grain and for cooling the grain after it has been dried.

In order to enable others familiar with the drying and cooling of grain to make and use my invention, I will now proceed to describe its construction and operation.

On reference to the accompanying drawings, which form a part of this specification, Figure 1, Drawing No. 1, is a vertical section of my improved grain-drying apparatus, and Fig. 2, Drawing No. 1, a transverse vertical section; Fig. 1, Drawing No. 2, an edge view of the apparatus with exhaust-fan applied to the same, and Fig. 2, Drawing No. 2, a front view of Fig. 1.

A and A' are two substantial frames, of iron, connected together at the top by the cross-pieces B and B', at the bottom by the base-piece C, and at intermediate points by any suitable bolts, stays, and other fastenings which may be deemed proper for rendering the entire structure secure.

Between the two frames A and A' are arranged the horizontal plates *a*, *a'*, *a''*, *a'''*, and *a''''*, the vertical plates *d*, *d'*, and *d''*, (the last being arranged to slide vertically in grooves,) and the plates *e* and *e'*. An inclined plate, *b*, extends from the under side of the cross-piece B' and rests on the end of the plate *a*, which it overlaps to the limited extent illustrated in the drawings, and from the lower edge of the plate *d* extends an inclined perforated plate, D, the lower end of which overhangs the end of the plate *a'*. The lower end of a second perforated plate, D', in like manner overhangs the end of the horizontal plate *a''*, its upper end terminating at the under edge of the plate *e*. A third plate, D'', of a similar character, commencing at the under edge of the plate *d'*, and terminating a short distance beyond the end of the horizontal plate *a'''*, while a fourth

perforated plate, D''', extends from the front edge of the base C to the under side of the vertical board *e'*. It will be seen that the interior of the structure is thus separated into a series of compartments or chambers, which may be designated as follows: The compartment E, which may be termed the "receiving-chamber," as it is the first to receive the grain to be dried; the four angular compartments E', E'', E''', and E'''' which I term the "hot-air chambers," and the four angular compartments F, F', F'', and F''', which I term the "exhaust-chambers." The angular hot-air chamber E' is bounded on one side by the inclined perforated plate D, at another side by the horizontal plate *a'*, the other side being entirely or partially open for the free admission of hot air. The other hot-air chambers are similarly bounded and arranged. The exhaust-chamber F is bounded on one side by the horizontal plate *a*, on another side by the vertical plate *e*, and on the bottom by the inclined perforated plate D, the remaining exhaust-chambers being similarly bounded and arranged. The whole of the exhaust-chambers communicate with each other and with the receiving-chamber E. It should be understood, however, that at H, where these compartments communicate, the distance between the points *x x* on a horizontal line, 2, drawn from the end of the inclined plate, should be equal or nearly equal to the distance between the points *y y* on a line, 3, drawn from the same point at right angles to the inclined plate D', and this rule should be carefully observed throughout. To one edge of the structure is secured a duct or pipe, I, for receiving the hot air and directing it to the chambers E' and E''', a similar duct or pipe, I', being secured to the opposite edge of the structure for directing the hot air to the compartments E'' and E'''''. Each of the exhaust-chambers communicates through openings *m* and *n* in the opposite side frames, A and A', with the exhaust-pipes J and J', one of which is secured to each of the said side frames.

In using my improved grain-drier the sliding plate *d''* is, in the first instance, depressed so that there may be no opening for the escape of the grain. A hot blast is then forced into the ducts I and I', after which the appa-

ratus is in a condition for receiving the grain which is discharged from a suitable elevated hopper into the receiving-chamber E. The damp grain will, in the first instance, descend with rapidity in thin strata down the inclined perforated plates until its further progress is arrested by the sliding plate d'' . It will then begin to accumulate so as to present a stratum of uniform depth on the lower perforated plate, D''' , and as the grain above this plate continues to descend, the depth of the grain will increase on the several inclined plates, (but will not exceed a given depth,) until a stratum of uniform depth remains on the whole of the plates. No matter what amount of grain may be admitted to the receiving-chamber, the depth of the stratum of grain on the several plates will not be increased, and this depth will be determined by the distance between the points $x x$, above alluded to as being equal or nearly equal to the distance between the points $y y$. In the meantime, as the grain is descending and accumulating, so as to assume a uniform depth, it is subjected to the action of the hot blast which passes through the ducts I and I' into the several hot-air chambers, thence through the perforations of the inclined plates, and through the strata of grain, and, after imparting its heat to the same and absorbing its moisture, passes off through the openings m and n of the several exhaust-chambers, and through the channels J and J' to the external atmosphere. After the strata of grain on the several inclined plates have become stationary, owing to the desired depth having been attained, the sliding plate d'' is elevated. At the same time a constant supply of grain is admitted to the receiving-chamber, and the forcing of the hot blast into the ducts I and I' is continued. The grain being now permitted to escape through the opening below, and a continuous supply being admitted at the top of the apparatus, will take its zigzag course down the inclined plates at a uniform speed and at unvarying depth throughout, while the hot blast penetrates the strata of grain and deprives it of its moisture.

There are in the operation of my grain-drying apparatus several peculiarly advantageous features, to the attainment of which my attention has been especially directed. The first is that of causing the grain to traverse a zigzag passage in a stratum of uniform thickness and at a uniform speed without the aid of mechanical appliances such as the shaker-frames heretofore used in grain-drying apparatus. The manner in which I accomplish this important result, by regulating the size of the opening through which the grain passes from the lower end of one perforated plate to the upper end of the other, has been fully explained above. The second important feature is that of drying the grain uniformly throughout. The manner in which this end is attained will be best understood by reference

to Fig. 1, Drawing No. 1, in which the grain on the several plates is represented by two different colors as consisting of two strata, one being colored yellow, the other red. It should be understood, however, that the grain passes down the inclined plates in an undisturbed mass, each kernel remaining in the same or nearly the same position in respect to the others from first to last. Of the grain on the plate D, the yellow stratum is the lowest, and is consequently subjected to the greatest heat, but on passing from the plate D to the plate D' the red stratum, which had previously been uppermost and less exposed to the heat, is now the lowest and most exposed to the heat, and thus the strata of grain continue to change positions in respect to the perforated plates until the grain finally escapes in a uniformly-dried condition at the lower end of the structure. This uniform change of the position or the grain on the plates could not be accomplished if they were agitated as in other grain drying apparatus. It is only by permitting the plates to remain quiescent, and the grain to find its own way down the surface, that the uniformity of the strata can be preserved and the change in their position in respect to the different plates continued.

A third important feature of my invention is the immediate discharge of the heated air after it has performed its duty of drying a given amount of grain, and after it has been charged with moisture and unfit for drying purposes.

In some of the grain-drying devices the heated air is maintained in intimate contact with the grain after the former has absorbed and become charged with the moisture of the latter, a practice the evil of which it would be unnecessary to explain.

It will be seen on reference to Fig. 1 that whatever heated air has passed from one of the air-chambers through the grain into what I have termed the "exhaust-chamber" is considered to have accomplished its duty after having imparted its heat to the stratum of grain intervening between the said chambers, and is at once carried off through openings m and n and passages J and J' to the external atmosphere. In order to facilitate the escape of this air as quickly as possible, I propose in some instances to make use of an ordinary blowing-fan, as shown in Figs. 3 and 4, Drawing No. 2, in which W is the fan and w the discharge-opening of the same, the two exhaust-pipes J and J' communicating with the central opening of the fan, one on one side and the other on the opposite side of the same.

It will be evident that a hot blast may be admitted to the hot-air chambers and discharged from the exhaust-chambers by openings and channels arranged in a manner differing from that described, that the number of inclined perforated plates may be increased by erecting a structure of greater height, and that the arrangement of many of the parts may be

modified without departing from the main features and principles of my invention.

Although I prefer to use the perforated plates and to permit the hot blast to pass through the same, they may be plain and heated by hot air or otherwise, the grain being dried by contact with the surface of the plates.

For cooling the grain after it has been dried I use an apparatus precisely similar to that above described, a cold blast instead of a hot blast being introduced into the chambers E', E'', E''', and E''''.

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

1. A series of inclined planes, which the grain is caused to traverse in strata of uniform, or nearly, thickness, and on which the grain is caused to change its position by regulating the openings which form the communi-

cation between the planes, substantially as described, the planes being heated or perforated for the passage through them of a hot blast.

2. In combination with the said inclined planes, arranged as set forth, the sliding plate *d''*, or its equivalent, for the purpose specified.

3. The structure, separated into the within-described hot-air compartments and exhaust-compartments by the horizontal plates and inclined planes herein set forth, for the purpose specified.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

HENRY H. BEACH.

Witnesses:

HENRY HOWSON,
JOHN WHITE.