

UNITED STATES PATENT OFFICE.

ALFRED ROBERT, OF PARIS, FRANCE.

IMPROVEMENT IN GRAIN-DRIERS.

Specification forming part of Letters Patent No. 115,240, dated May 23, 1871; antedated May 19, 1871.

To all whom it may concern:

Be it known that I, ALFRED ROBERT, engineer, of Paris, in the Empire of France, have invented an Improved Apparatus for Drying Grain and other Substances, of which the following is a specification.

My invention consists of a drying apparatus in which the grain or other substance to be treated is caused to pass by its own gravity through a perforated box or casing in contact with heated tubes and with a perforated ventilating shaft or pipe, in which an upward draft is produced for the purpose of causing the air to pass transversely across the grain, and carrying off the aqueous vapors arising from the heated grain, all as fully explained hereinafter.

In the accompanying drawings, Figure 1 is a side elevation of my improved apparatus for drying grain and other substances; Fig. 2, a sectional elevation of the same; Fig. 3, a plan view, and Fig. 4 a sectional plan on the line 1 2, Fig. 2.

The apparatus, as represented in the drawings, is intended principally for drying grain; and it consists, mainly, of an upright cylindrical casing, A, containing a great number of small tubes, B, and central tube, D, of large diameter, the whole being supported upon a suitable frame, *x*. The casing A may be made in several parts, to facilitate its erection and removal. Its sides consist of perforated sheet metal or wire-gauze, and its tapering or funnel-shaped ends C and C' are made in the present instance of cast-iron and in one piece, with the boxes or chambers E and E' beneath and above the said casing. The central tube, D, is also perforated with a number of small holes within the casing, is closed at its lower end by a detachable cap, *a*, and communicates at its upper end with a flue or chimney, F, within which an upward draft is produced, either by a fan or otherwise, as hereinafter explained. The said tube is supported by lugs *b b*, near its upper end, which rest upon set-screws *d* of the casing. These set-screws also serve to maintain the tube in a proper central position, so that there may be an annular space, H, between the same and the casing at the top of the latter; and set-screws *d'* at the bottom of the casing perform a similar

duty in preserving an annular space, H'. This latter space communicates with a spout, J, at the bottom of the casing, at the entrance of which is arranged a register or valve, K.

The vertical tubes B, before referred to as occupying a great portion of the interior of the casing A, extend through the top and bottom of the latter, and communicate with both of the chambers E and E'. The chamber E has an outlet-pipe, *g*, for the hot water, steam, hot air, or gas which is to be passed through the tubes B, and the upper chamber, E', communicates through a pipe, *g'*, with the outlet flue or chimney F.

As the apparatus is in the present instance intended more especially for the use of steam in the drying-tubes B, pipes L, L', and L'', communicating with the chambers E and E' and with the chimney F, are provided to carry off the water of condensation.

In using this apparatus the space between the central tube, D, and exterior wall of the casing, and surrounding the drying-tubes B, is filled with the mass of grain to be dried, which is introduced through the annular passage H, passes slowly downward, and is discharged through the annular passage H' and spout J. Plates or spreaders O, secured to the exterior of the tube D, equalize the downward passage of the grain, preventing that portion of the mass toward the center from descending more rapidly than that toward the exterior of the casing. The funnel-shaped lower end, C', of the casing also facilitates the downward flow of the grain, and the rapidity of the flow can be regulated, as desired, by an adjustment of the valve X. While the mass of grain is thus passing downward through the casing a volume of steam—the escape-steam of a non-condensing engine, for instance—is introduced into the lower chamber, E, and is suffered to pass upward through the tubes B, which are surrounded by the mass of grain, into the upper chamber, E'. From the latter the steam will pass through the pipe *g'* into the chimney F, will force the air out of the latter, and, by producing a partial vacuum, will induce an upward circulation of air through the tube D. As the latter is closed at the bottom, this air must pass through the perforated sides of the casing and through

the mass of grain in a horizontal course before it can enter the tube. In consequence of the great number of tubes B and the extended heating-surface thus presented, heat will be transmitted rapidly and uniformly throughout the mass of grain, and the current of air in traversing this mass to enter the tube D will carry with it the aqueous vapors as they are formed, so that the result must necessarily be a rapid and thorough drying of the grain. The absorbent power of the air can also be increased, if desired, by either heating or drying it, or both.

Instead of creating a draft in the chimney F by discharging the steam, heated air, or gas from the tubes B, into the same, as before described, a fan may be employed, or volumes of heated air or steam under pressure be forced into and up through the chimney.

It will be evident that the apparatus, although designed especially for drying grain, will be useful, either arranged as above described or on being slightly modified for drying a variety of substances.

Among the advantages of my invention may be mentioned the following: The apparatus effects its object rapidly without too greatly heating the grain or other substance; it re-

quires no watching, manipulation, or motive power; it can be erected at little expense in any locality, and may be adapted to any system of heating.

I claim—

1. A drying apparatus consisting mainly of a perforated or gauze casing A, containing a number of heating-tubes, B, and a perforated or gauze ventilating-pipe, D, the whole being constructed, arranged, and operating so that the air shall traverse the body of grain transversely, substantially as described.

2. The combination, substantially as herein set forth, of chambers E and E' with the heating-tubes B.

3. The combination and arrangement, substantially as herein described, of the heating-tubes B, chamber E', pipe g', flue F, and ventilating-tube D.

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

ALFRED ROBERT.

Witnesses:

EMILE RICHARD,

ADOLPHE BESSON,

United States Consulate General.