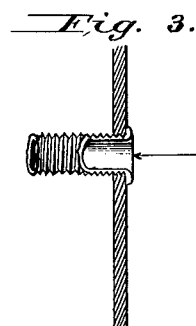
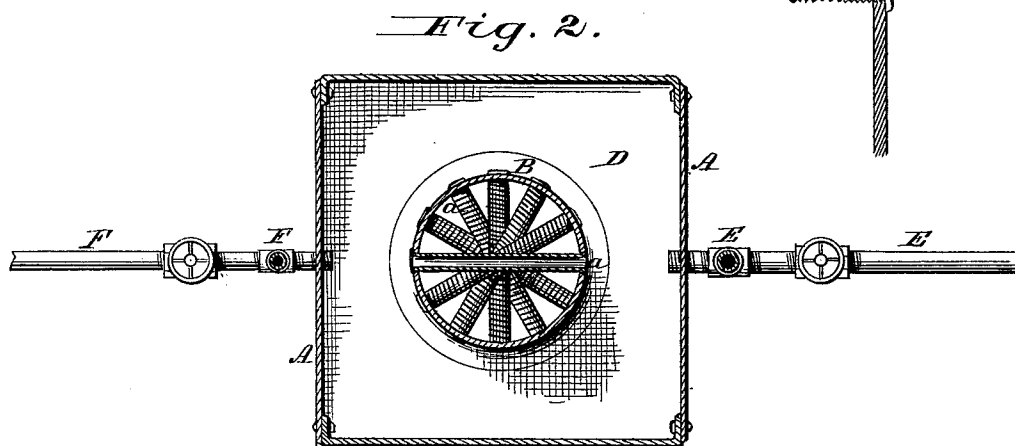
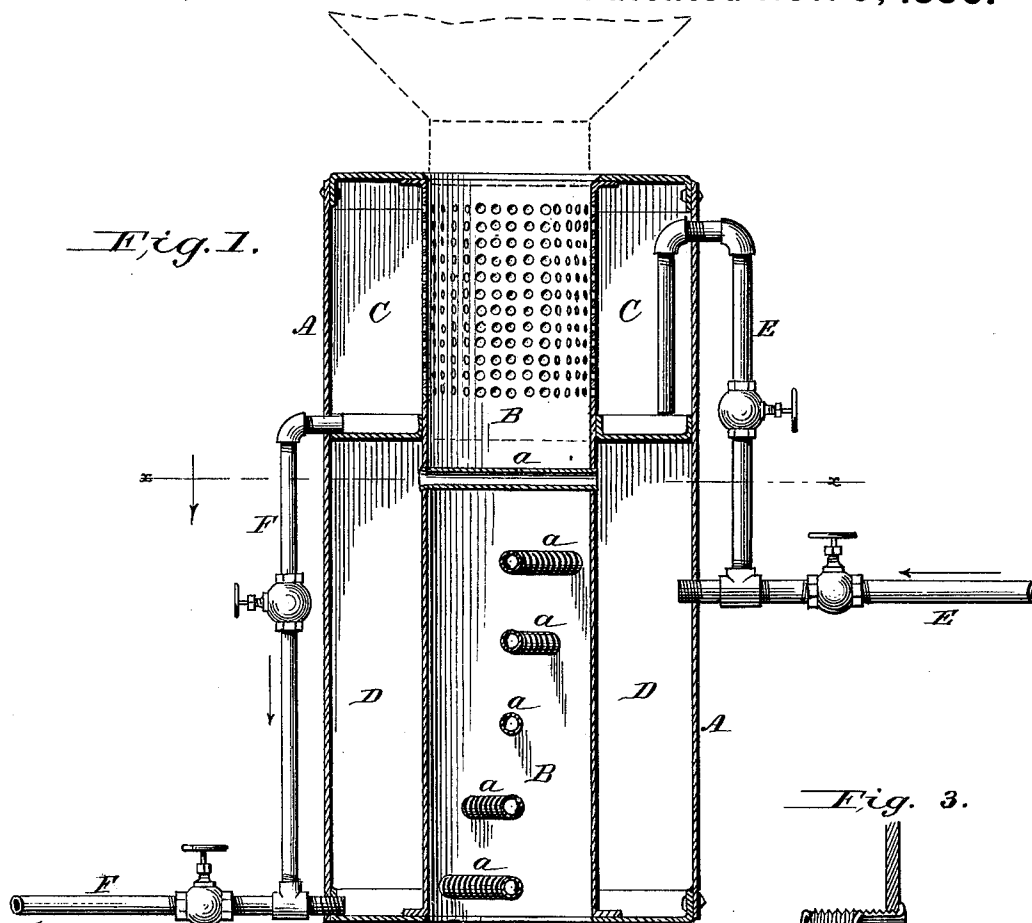


(No Model.)

F. A. HOFFMANN.
Grain Steamer and Drier.

No. 234,281.

Patented Nov. 9, 1880.



Attest:
H. L. Pennie,
Floyd Norris.

Inventor.
Frederick A. Hoffmann
By *Johnson and Johnson*
Atty's

UNITED STATES PATENT OFFICE.

FREDRICK A. HOFFMANN, OF BALDWIN CITY, KANSAS, ASSIGNOR OF
ONE-HALF TO JOHN STICKNEY, OF SAME PLACE.

GRAIN STEAMER AND DRIER.

SPECIFICATION forming part of Letters Patent No. 234,281, dated November 9, 1880.

Application filed June 22, 1880. (No model.)

To all whom it may concern:

Be it known that I, FREDRICK AGUST HOFFMANN, a citizen of the United States, residing at Baldwin City, in the county of Douglas and State of Kansas, have invented new and useful Improvements in Grain Steamers and Driers, of which the following is a specification.

My invention relates to improvements upon the grain steamer and drier for which Letters Patent were granted to me July 2, 1878, and in which the grain conducting and drying pipe is formed of perforated and imperforate sections, each passing through a separate steam-chamber, the object being to first steam and then to dry the grain just before it passes into the eye of the grinding-stones, and thereby draw the moisture from the inside of the kernels, or sweating the grain for the purpose of toughening the bran-skins, and thus cause it to be separated from the flour-producing substance in comparatively larger and thinner flakes than is possible in grinding very dry and hard grain, the bran from which crumbles and chips up to a great extent as it is being ground, and renders the middlings difficult to bolt and to separate the flour; but by steaming and then subjecting the grain to a high degree of heat middlings are produced in a dry condition that bolt more freely, while the flour is whiter and increased in quantity. To accomplish this result, especially on some grades of wheat, it requires a high degree of heat, to obtain which the pressure of the steam upon the grain-conducting pipe should be about the same as that in the boiler. Under such pressure the grain-conducting pipe must be braced to prevent its being collapsed, and for this purpose I arrange in spiral form a series of cross-tubes within the imperforate section of the conducting-tube and opening into the steam-chamber, so that, while thus bracing this section of said pipe at every point within the chamber and forming a through-communication therewith, the spiral disposition of these cross-tubes breaks the current of grain and gives it a direct contact with every part of the walls of the pipe which effects the principal part of the heating. The cross-tubes are screw-threaded, and are screwed into the con-

duit and riveted down, and are therefore disconnected from each other, and serve to mix the grain and increase the heating area.

Referring to the accompanying drawings, Figure 1 represents a vertical section of a grain steamer and drier embracing my improvements; Fig. 2, a horizontal section of the same on the line *xx* of Fig. 1, and Fig. 3 a sectional detail of one of the screw stay-tubes.

A box of sheet metal forms a casing, A, through which the grain-conduit B passes vertically, being open at both ends, connected with the hopper, and delivering the grain into the eye of the grinding-burrs. The box is divided into an upper chamber, C, and a lower chamber, D, which communicate with the boiler by the pipes E E, while the water of condensation is drawn off by the drain-pipes F F, which are provided with cocks for such purpose. That part of the grain-conduit B which passes through the upper chamber, C, is perforated down to a short distance from the partition, leaving a solid part a few inches above said partition, so as to prevent the water of condensation from running into and down the grain-conduit. The steam-supply pipe opens into this chamber by a downward bend or guard, so as to discharge the steam directly upon the partition, so that only dry steam is allowed to pass through the perforations and into the grain to give the proper steaming action thereon.

That part of the grain-conduit which passes through the lower steam-chamber forms the drier, and it is to this part that my present improvements relate. Within and across this section are tubes *a*, arranged in a manner to form a spiral extending twice or three times around in the length of such part. They are screw-threaded from end to end, and are screwed into corresponding screw-openings in the conduit and riveted down at each end, like a boiler-flue. This construction not only braces every part of the conduit against the pressure of the steam in said chamber, but the grain falls directly upon said cross-tubes, and is thereby deflected alike against every part of the interior of the conduit, and is thereby subjected to the full heating capacity of the conduit.

Each cross-tube forms a separate heater for the interior of the conduit, as each tube opens at both ends into the steam-chamber, thereby obtaining communication through these cross-tubes with the steam-chamber and the benefit of the action of live steam on the outer surface of the conduit and within the grain-passage by the separate open tubes, thus greatly increasing the drying-surface and rendering the drying action more uniform. By this construction the cross-tubes force the descending grain at every point in such descent against a surface heated by live steam, while the deflecting-surface forms a spiral interior heated way, thus obtaining the full benefit of the drying action of the steam upon the grain as it passes to the burrs. In this way the grain-conduit stands, as it were, a solid column within a chamber under high pressure of steam, and it is only by the bracing function of the hollow screws upon such conduit that it can be used under such pressure and to obtain the desired results. The conduit has a steam-tight connection with the top and bottom of the steam-box.

In the described arrangement of the hollow stay-tubes it is important to notice that the grain is constantly shifted from the center to the sides of the conduit, and the grain actually descends in continuous shifting contact with heated surfaces, thereby causing every kernel to be dried alike. As a comparatively large volume of live steam fills the drying-chamber, it necessarily condenses slowly, and hence it requires less steam to produce the required heat.

I am aware that prior to my invention grain steamers and driers have been made with a zigzag grain-conduit, through which a continuous steam-pipe is passed alternately from side to side, and which gives the only direct heating and drying surface to the passing grain, and in which the form of the conduit serves to guide the grain against the interior part of the steam-pipe; but it is evident that a steam-pipe leading from the boiler and passing alternately into, across, and outside of a grain-conduit of zigzag form is very different from the improvement herein described, and that the advantages of such improvement are important not only in results, but in the effectiveness of the device.

I am also aware that such steamers and driers have been made with a steam-chamber divided into upper and lower sections, and in which the upper section is perforated and communicates with an interior grain-conduit to form the steaming-chamber for the grain, while the lower imperforate section forms the

drying-chamber for the grain flowing down through said steaming-chamber.

I am also aware that in grain-driers an irregular coiled pipe has been used in a cylindrical grain-conduit, the steam passing through said coil from its upper end, and the grain flowing through said cylinder is caused to strike on the varying circles or spirals of the coils, retarding the flow of the grain and causing it to be turned and acted upon by the heat from the surface of the continuous coil of pipe.

I claim—

1. In a grain steamer and drier, the combination of a grain-conduit formed of an upper perforated and a lower imperforate part or section, and a box having separate and distinct chambers, through which said conduit passes and with the perforated part of which the upper steam-chamber communicates, the said imperforate lower part having the separate cross-tubes passing through the grain-conduit and opening at both ends into the surrounding steam-chamber, substantially as and for the purpose herein set forth.

2. The combination, in a grain steamer and drier, of the casing or box A, forming the upper and lower steam-chambers, with the grain-conduit having the perforated and the imperforate parts corresponding to said chambers, the said imperforate part being provided with screw cross-tubes screwed into said conduit and riveted at their open ends to the outer wall of said conduit, substantially as and for the purpose specified.

3. The combination, in a grain steamer and drier, of the grain-conduit, constructed and adapted for use with separate surrounding-chambers, substantially as described, with the cross-tubes a, arranged in spiral form within the lower part of said conduit, for the purpose described.

4. A grain steamer and drier consisting of the box A, forming the upper and lower chambers, C and D, the grain-conduit B, having perforated and imperforate parts or sections corresponding to said chambers, the separate screw-tubes a, secured to said imperforate part, open at both ends and arranged in spiral form, and the supply and waste pipes E and F, all constructed for use substantially as herein set forth.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

FREDRICK AGUST HOFFMANN.

Witnesses:

M. G. WERNER,
HENRY HARMMEYER.