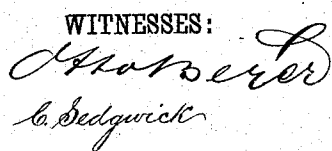


W. H. APPLGATE.
GRAIN DRIER.

Patented Feb. 5, 1884.



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UNITED STATES PATENT OFFICE.

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GRAIN-DRIER.

SPECIFICATION forming part of Letters Patent No. 293,132, dated February 5, 1884.

Application filed June 14, 1883. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM H. APPELEGATE, of Atlantic, in the county of Cass and State of Iowa, have invented a new and Improved Grain-Drier, of which the following is a full, clear, and exact description.

The object of my invention is to provide a grain-drying apparatus of simple construction, which will work effectively and continuously in evenly drying grain preparatory to its storage or transportation.

The invention includes special constructions of the grain-passages and the valves for discharge of the dried grain, and of the heating apparatus, provision being also made for the escape of the moisture from the grain, and for the passage of air to be heated from below, to ascend about the heating-pipes and grain-passages, and for the escape of any dust or grain which may crowd through the wire-screen sides of said passages, for maintaining a free air-inlet and promoting the perfect action of the apparatus as a whole, all as hereinafter fully described and claimed.

Reference is to be had to the accompanying drawings, forming part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a sectional side elevation of my improved grain-drier, on the line *yy*, Fig. 2. Fig. 2 is a longitudinal sectional elevation on line *xx*, Fig. 1. Fig. 3 is a bottom view; and Fig. 4 is a sectional elevation, in part, of the heating apparatus on line *zz*, Fig. 1.

I have here shown an example of my grain-drying apparatus as constructed with two vertically-arranged grain-passages; but the number of passages, as also their length and width, may vary with the required capacity.

a represents the side and end walls of any suitable inclosing case or chamber, which walls may consist of metal-lined wood or brick, as desired, and depending on the capacity of the drier.

Within and free from walls *a*, I position the grain-passages *b*, which I fix at their tops preferably to the lower end of the feed-hopper *c*, by their end bars, *b'*, the hopper-bottom being fitted with wood or metal plates or strips *c'*, inclining downward to the open mouths or tops of passages *b*, as in Fig. 2, the bottoms

of the passages *b* being stayed in position by the casings of the grain-discharge valves, to be hereinafter described, and so that the passages *b* will be held firmly and parallel with each other. I make the passages *b* with sides *d*, of wire, of suitable mesh to retain the grain, the sides being spaced about an inch apart, so as to hold the grain in a thin layer, and the rough character of the sides *d*, of open-mesh wires disposed vertically and horizontally, tends to retard the downward flow of the grain and prevents a tight packing of the grain in the passages, keeping it much looser than would be possible with plain smooth walls of the passages, and so that the heat may have free access to all the kernels of grain for better drying effect thereon.

To prevent a bulging out or collapsing of the side walls, *d*, so as to maintain an even thickness of the grain-passages for uniform drying effect, I propose to stay the sides by rivets passed through the passages and headed at each end, or by the more desirable arrangement of wires *e*, which I pass through the passages and down along their outer and opposite sides, using, preferably, a continuous wire, *e*, interlacing the passages from top to bottom, and spacing these wires *e* sidewise, about six inches apart, across the entire width of the passages, thereby greatly strengthening the grain-passages and assisting the wire sides in retarding the downward flow of and tending to loosen the grain.

For effective readily-controllable valves, through which to discharge the dried grain from passages *b*, I provide slide-valves *f*, which work in slots cut or cast along the inner lower sides of the valve-casing *g*, which I make, preferably, in two parts, with a central joint, *h*, along the bottom, so that the two side parts of the casing can readily be slipped over the lower ends of the passages *b*, and bolted or otherwise firmly secured thereto; and I flare the sides of casings *g* outward toward the bottom to admit of using wide valves *f*, having large apertures *i*, which may be brought to coincide with the apertures *j* of the bottoms of the casings *g*, for discharge of the grain quickly when required, and by making the valve-casings *g* in two parts divided at *h* along the center of apertures *j*, I provide for casting the casings

without cores, and cheaply, and so as to require little or no finish prior to adjustment on the passages *b*. I arrange the lower side edges of the casings *g* about one-half inch apart, as at *k*, to form inlets thereat for the air to be heated, and also to permit free discharge at the base of the drier, through passages *k*, for any dust or fine grain which may escape through the wire-mesh sides of grain-passages *b*, thereby maintaining a free air-inlet, and preventing a choking up of the apparatus, which might otherwise occur. The valve-casings *g* may be secured to the casing *a* at the back end, and should be otherwise supported between the discharge-apertures *j* at the bottom by suitable cross-bars fixed to or built in the casing *a*, for sustaining the loaded grain-passages *b*, and relieving them of unnecessary strain.

To work the valves *f*, I connect them by rods *l* with straps of eccentrics *m*, fitted opposite the ends of the valves on a shaft, *n*, to be turned by any suitable wheel or crank, *o*, either slower or faster, to discharge the grain faster or slower, according to the time required in drying it; and the eccentrics *m* will preferably be set to work all the valves *f* of a drier simultaneously.

My improved heater for drying the grain in the passages *b* consists of a series of vertically-ranging hollow bars or pipes, *p*, connected by suitable nipples, *q*, with a lower transverse steam or other heat-conveying pipe, *r*, which is supported suitably in the side walls of case *a*, and has the heat-supply and exhaust pipes *r'*, *r''* at opposite ends, the heads of pipes *p* being connected by the transverse support and stay *p'*, about parallel with pipe *r*, which stay *p'* may either be solid or have interior passages connecting pipes *p* with each other, said pipes *p* being located in front of and in line with the center of the spaces between the grain-passages *b*, so that the U-pipes *s*, ranging horizontally through the drier, will be held by their connecting-nipples *t*, along the sides *d* of grain-passages *b*, said pipes *s* being supported at their backs or bends *s'* in any suitable sockets, *s''*, sustaining them vertically and against lateral movement, so that the entire system of pipes *s* will be rigidly positioned across the drier, and at even distances (say one-half inch) from the sides *d* of the grain-passages *b*, for uniform radiation of the heat to the grain in the passages.

I have here shown two U-pipes *s* connecting with each vertical pipe *p*; but the number of such pipes *s* may vary with the capacity of the drier—say from two to ten pairs—as required. With a heater thus constructed a rapid even circulation of heat through all the pipes *s* may be secured and maintained.

At the front of the drier next the heater I cut an opening for a door, *u*, for access to the heater-pipes, which opening may be fitted with a sheet-metal plate, *V*, to form dead-air spaces for better confining the heat to the interior of the casing, which latter, if built of wood, may also be lined on its inner faces with sheet

metal or any suitable non-conductor of heat, for safety against fire, and for economy of fuel. The head *a* of the casing *a*, or the casing itself, at or near the top, is fitted with apertures or pipes *w*, for discharge of the steam and moisture driven from the grain in drying, and said pipes *w* may be controlled by any suitable dampers, if desired.

In operation, the grain is fed to passages *b* from the hopper *c* as fast as it is discharged by the valves *f* below, which valves are worked by eccentrics *m*, to deliver the dried grain into a suitable hopper or pit, to be conveyed or elevated therefrom by any approved apparatus for transportation or storage. As the loose grain flows down through the thin passages *b* it is acted upon by the air let in at passages *k* and rising about and heated by the pipes *s*, which hot air reaches every kernel of the grain and quickly effects its thorough drying without burning or discoloration, thus leaving the grain in prime condition for market; and the operation of drying may be carried on continuously and with little practice on the part of the operator, thus giving a large capacity to an apparatus of moderate size and insuring a large output at comparatively small expense.

In practice, I may connect one or more suitable valve-controlled pipes to discharge steam into the drier in emergency of fire, to protect the drier or grain therein from injury or destruction from this cause; and I may also make the rods *l* of valves *f* in two parts, connected by screw or other adjustable joints, so as to admit of adjusting the eccentrics and the discharge-orifices to more closely control the outflow of the dried grain from the passages *b*, as will readily be understood.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination, with the grain-passages *b*, having sides *d* of intermeshing wires, of the continuous interlacing wires *e*, forming cross-bars and surface-stays to the sides *d*, substantially as shown and described.

2. The combination, with the grain-passages *b*, of the two-part valve-casings *g*, flared toward the bottom and centrally divided, and the valves *f*, substantially as shown and described.

3. The combination, with the grain-passages *b* and the flared casings *g*, apertured at *j*, of the valves *f*, apertured at *i*, the rods *l*, eccentrics *m*, and operating-shaft *n*, substantially as shown and described.

4. The combination, with the case *a*, grain-passages *b*, having sides *d* of intermeshing wires, valves *f*, heating-pipes *s*, and passages *k*, of the moisture-outlets *w*, substantially as shown and described.

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Witnesses:

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