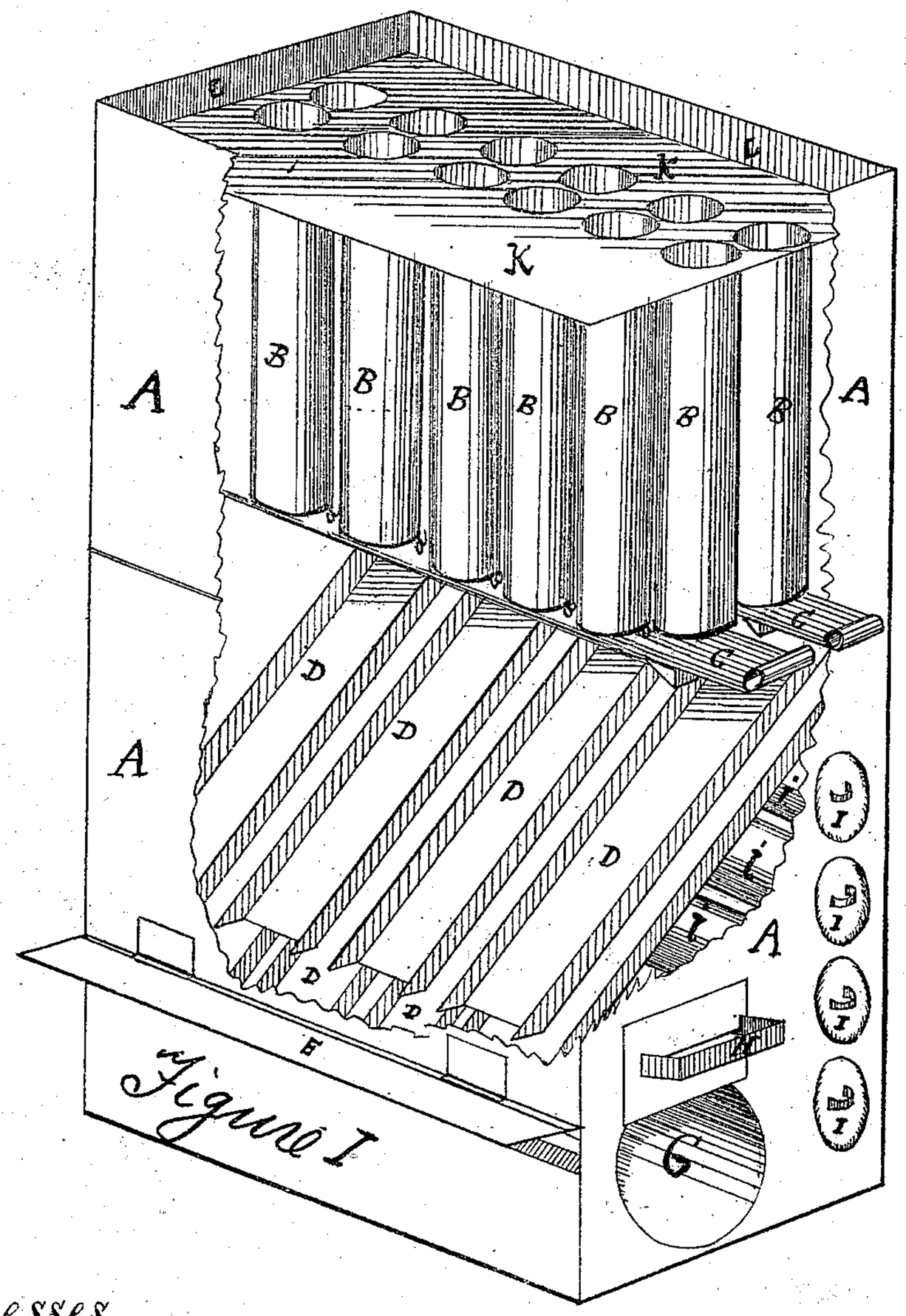
H. G. BULKLEY.

Grain-Drier.

No. 130,564. Patented Aug. 20, 1872.



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UNITED STATES PATENT OFFICE.

HENRY G. BULKLEY, OF NEW YORK, N. Y.

IMPROVEMENT IN GRAIN-DRIERS.

Specification forming part of Letters Patent No. **130,564**, dated August 20, 1872.

SPECIFICATION.

I, HENRY G. BULKLEY, of the city, county, and State of New York, have invented certain Improvements in Drying-Kilns for Grain, Malt, Spices, Salt, &c., of which the following is a specification:

The Nature and Object of my Invention.

The invention relates to improvements in driers; and consists in the combination, with a drier of fire-proof material, of hopper, fire-proof tubes, slides, and chutes, under the arrangement shown and described, so that the grain shall pass from the hopper, through the tubes, which are surrounded by a steam atmosphere surcharged with heat, and be discharged when sufficiently dry for removing.

The object of my invention is to afford a safe, rapid, and cheap means of drying, cooling, and curing, to arrest or prevent fermentation in grain and other substances, in order to add to their value for shipment or use. This includes corn in the ear and all substances that need to be seasoned or dried, and which can be passed through tubes thus arranged and heated, whether large or small. This arrangement can be readily attached or built adjacent to the ordinary bins in use, and will dry grain, &c., while passing by their own weight through the bin to the elevator.

Description of Drawing.

Figure 1 is a perspective view, having a part of the front and end well torn away.

A A are the outside walls, made of fire-proof materials. B B are the tubes through which the grain, &c., passes, and in which they are dried, and may be of any fire-proof material. C C are slides at the lower end of the tubes for regulating the discharge of the grain, &c. D D are chutes for discharging the grain, &c., from the tubes to the outside of the drier. E is a door closing the lower end of the chutes D D. K K L L is the hopper on top of the drier, into which the grain is poured. H is a pan for making steam. G is the furnace or heater. J J are smoke-pipes connected by T's and extending through the wall A. I I are stoppers for cleaning the smoke-pipes. *a a* are spaces between the pipes.

Operation.

Elevators or store-houses are usually constructed with bins sufficiently elevated for cars to run under the bins to be filled. Taking advantage of this fact, I construct the drier either directly under the bin or so adjacent to it that the grain will run from the bin into the drier; and as fast as the grain is dried it can be passed from the drier into the elevator and deposited in the bins for storage or shipment. It can also be so constructed that the grain-tubes shall be in the bottom of the bin, while the heat is brought to them in pipes from the furnace located at a distance.

Construction.

In order to accomplish the double purpose of making the fire-room entirely free from danger by fire to the building as well as to make a rapid and efficient heat, I inclose the room or space below the grain-bin with a brick wall. In this fire-room is placed a good stove or heater, with the fire-door opening out so as to supply the fuel from the outside. The smoke and refuse heat are taken out at the back end of the stove, and are then made to traverse the fire-chamber several times its length in order to save the heat from wasting into the chimney, and also to add efficiency to the heat to be used in drying. If the heat and smoke are passed through a sufficient length of pipe it will not only save a greater portion of the heat from waste, but will make it impossible for any sparks to leave the fire-room. For convenience of cleaning the smoke-pipes without removing them from the fire-room or taking them apart, the ends of the smoke-pipe are allowed to pass through the outer wall at one or both ends of the fire-room, and have their ends closed on the outside by stoppers, while the smoke connects on the inside from one pipe to another by means of a T or connecting-pipe. The length of the smoke-pipe to be used will depend upon the draft to the chimney, since the better the draft the longer should the smoke-pipe be, in order to utilize all the heat. The smoke-pipes should be large—not less than twelve inches in diameter. The grain-bin should be arranged with separate passages for the heat and grain or other substance, so that the heat may circulate freely in all parts of the bin and the grain, &c., may be drawn out at just such a stage in its drying as shall be found most desirable. To explain, in some cases it may be desirable to season or cure grain or other sub-

stances without making them quite dry, as, for instance, it may be desirable to check the heating or fermenting propensity of the grain just sufficiently to be able to get it to market, and yet not lose so much of its weight in the sale as would be done if made entirely dry. In another case the grain may be intended for shipment on a long voyage, and should be made quite dry. The entire kiln can be made fireproof in the following manner, to wit: Lay across the bottom of the bin some old railroad or other iron bars, on which to rest the tubes through which the grain is to pass while being dried in the bins. If common drain-tile be set one above the other in tiers and the entire bin be filled with such tile set in tiers, then the bin will be constituted of these grain passages. By passing the grain through the inside of these drain-tiles, the heat from the furnace or fire-room will ascend in the spaces between the tiers of drain-tile, as shown by *a a*. To give additional levity to the heat, as well as to avoid injury to the grain or other substances by overheated air, I place a pan of water or other suitable generator, for making just so much steam as is necessary to expel the air from the fire-room and grain-bin, and then use this steam atmosphere for the convection of the heat in the kiln in place of an air atmosphere. In some cases the substances to be dried may have such a surplus of moisture as to make nearly or quite as much steam as will be needed for expelling the air from the kiln. In the case of substances where there is a great excess of moisture to be generated into steam while being dried, provision must be made for passing out of the kiln of all surplus steam, while a steam atmosphere must at all times be retained for the safety of the drying substance from scorching, as well as for the rapid convection of the heat, and at the same time to save the heat in the kiln, by the well-known ability of steam to hold heat as latent. This steam atmosphere, to which heat is constantly being applied, is rapid in its movement and peculiarly efficient in penetrating the substances to be dried, so as to dry the center as as well as outside portions.

It is sometimes supposed that seasoning and drying are the same; but substances may be seasoned and not dried, or dried and not seasoned. By this steam method both seasoning and drying may be performed at the same time, while the drying may be arrested as soon as the seasoning or curing has been effected.

By placing a thermometer in the kiln the heat can be so regulated as to secure the proper seasoning and drying of the various substances; and by simply drawing a slide at the bottom of each tier of tubes in the drying-bin so much of the grain may be discharged at once as may have been made sufficiently dry for removing.

As rapidly as the dried grain is removed from the bottom of the drying-pipes they are again filled from the top, which causes the drying to be perpetual. By this process the grain is removed from the kiln with no other power than its own gravity and at any desirable stage of its drying, by simply drawing a slide, C C, and allow the grain to run as long as it is sufficiently dry; and then, by closing the slides, the remainder of the grain in the tube is retained until it is also sufficiently dried. The tubes or passages through the drier may be made of any desirable size, to accommodate the passage of different substances, such as grain, corn on the ear, &c. The size or capacity of this drier may be increased at pleasure, and to any desirable extent, by simply multiplying the number and height of the tubes and by increasing in an equal ratio its power for generating heat.

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

In a drier of fire-proof material, the combination with the furnace G J of the hopper K L, fire-proof tubes B exposed to heat as described, slides C, and chutes D, all substantially as set forth.

HENRY G. BULKLEY.

Witnesses:
L. E. HOLDEN,
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