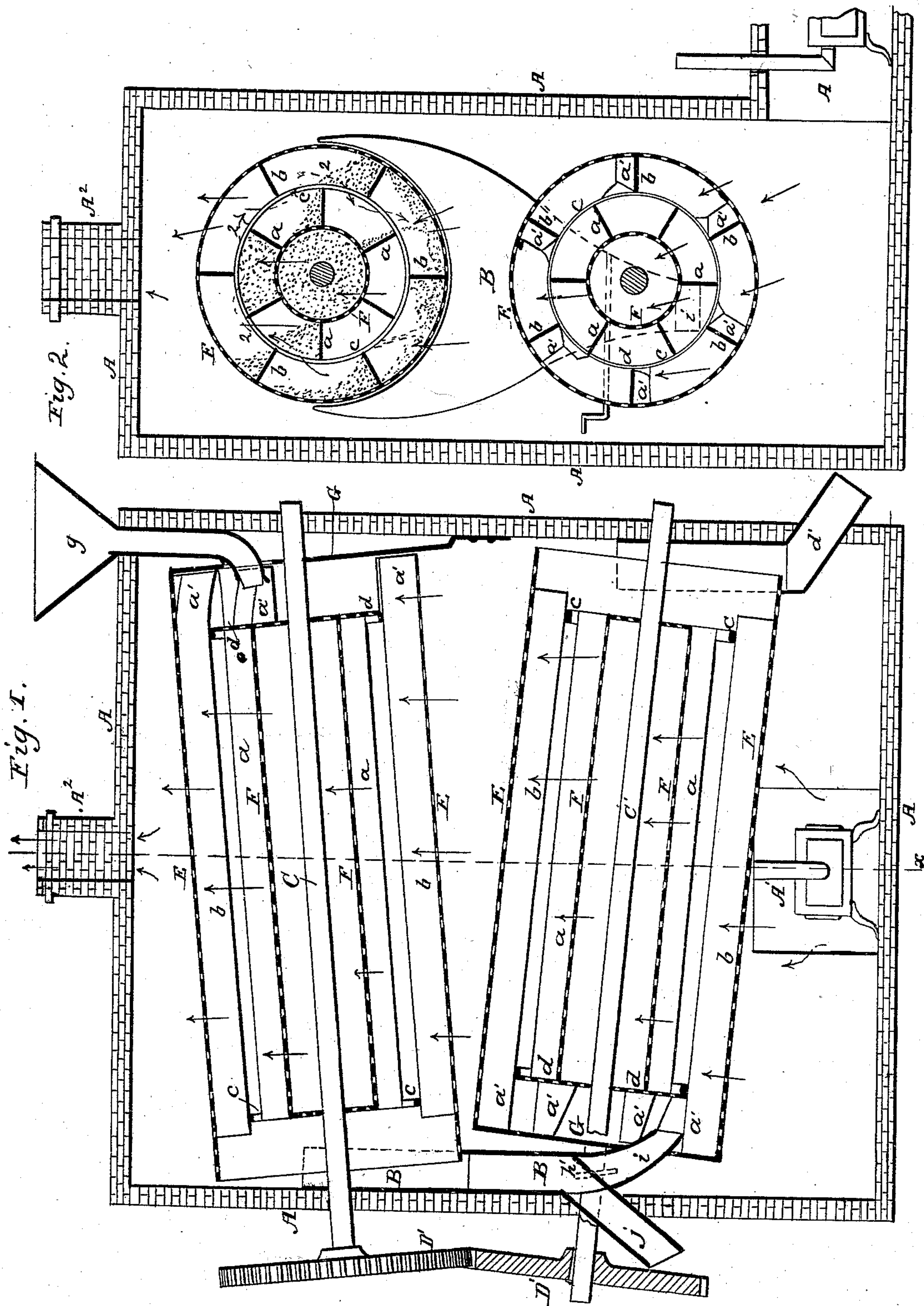


DOLE & FRASER.

Grain Drier.

No. 39,722.

Patented Sept. 1, 1863.



UNITED STATES PATENT OFFICE.

WILLIAM H. DOLE AND D. R. FRASER, OF CHICAGO, ILLINOIS.

IMPROVEMENT IN GRAIN-DRIERS.

Specification forming part of Letters Patent No. 39,722, dated September 1, 1863.

To all whom it may concern:

Be it known that we, WILLIAM H. DOLE and D. R. FRASER, of Chicago, in the county of Cook and State of Illinois, have invented a new and Improved Apparatus for Drying Grain; and we do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, making a part of this specification, in which—

Figure 1 is a vertical sectional elevation of my improved grain-drying apparatus. Fig. 2 is a vertical transverse section through Fig. 1, taken in the plane indicated by the red line *x x*, marked thereon.

Similar letters of reference indicate corresponding parts in both figures.

This invention has for its object the drying of grain by means of artificial heat in a more perfect, rapid, and thorough manner than hitherto, and by means of an apparatus which is so constructed that the grain, in passing through it, or through a portion of it, is subjected to currents of heated air, and at the same time to a stirring, turning, and reciprocating motion, and kept in constant agitation and transition, as will be hereinafter fully described.

It also has for its object the construction of an apparatus which is adapted to the drying of very moist or only slightly moist grain, the former of which will require a longer subjection to heated air and agitation than the latter, as will be hereinafter described.

To enable others skilled in the art to make and use our invention, we will describe its construction and operation.

In the accompanying drawings, A represents the building in which the grain-drying apparatus is erected. This building is provided with an air-heating apartment, A', containing a suitable furnace or stove for keeping up a constant and uniform degree of heat in the drying-chamber during the drying operation; and, as this apartment A' is located at the bottom of the building, and communicates with the interior thereof, the heated air ascends through the drying-chamber and escapes through the chimney A².

Within the building A are arranged—one below the other—a number of inclined perforated sheet-metal cylinders, which communicate with each other (at one end of each) by

means of spouts B, which convey the grain from the lower end of one cylinder to the uppermost end of its succeeding cylinder, through the entire series, whatever number of cylinders may be employed. These grain-drying cylinders are mounted upon axles C C', which pass through their axes, and have their bearings in the ends of the building A, as shown in Fig. 2, receiving on their ends spur-wheels D D', so that rotary motion communicated to one cylinder will be transmitted to all the rest. The construction of these cylinders is such that the grain is kept in constant transition and subjected to the influence of the heated air which is passing through the drying-chamber. Not only does the heated air penetrate the outer cylinders, E, but it also circulates through the core or interior cylinder, F, which is made of perforated sheet metal or wire-gauze. The outer cylinder, E, is somewhat larger than cylinder F, forming between the two cylinders a space which is concentric with the axis of shaft C. This annular space is provided with two sets of radial flanges, *a b'*, six, or more or less, of each, the former, *a*, of which are secured edgewise along the outside of perforated cylinder F, and the latter are secured between the intervals of flanges *a* to the outer cylinder, E, or to a ring, *c*, and perforated head *d*, as shown in Figs. 1 and 2. The ends of the outer cylinder are left open—one end partially and the other entirely so—but the ends of the inner cylinder are covered with perforated plates to prevent any grain from entering, but to allow a free circulation of heated air through them and into the interior of this inner cylinder. Both cylinders are fixed to and turn with their shaft C, and, as the grain is moving toward the lowermost ends of these cylinders, they being slightly inclined, as above described, it is tossed from the inner to the outer cylinders, and from the spaces between the flanges of one cylinder to the spaces between the flanges of the other cylinder without being obstructed in its downward movement, and while this operation goes on the heated air rising from the furnace-chamber A' circulates throughout every part of both cylinders, dries the grain, and carries off the moisture through chimney A² in the top of the building. The large and small cylinders E F being furnished with the same number of flanges or "buckets" *a b*, the spaces between

the flanges *a* are necessarily smaller than the spaces between *b*. This has the effect of compressing or bringing the mass of grain into a contracted space and then discharging it into a greatly-enlarged space so that in the latter the grain is spread over the interior drying-surface of the outer cylinder at one instant, and tossed into the contracted space of the inner cylinder the next instant, thus changing from one cylinder to another as it moves downward to escape into the next lower cylinder, which, being constructed like the one just described, subjects the grain to the same turning, tossing, and drying operation, and still another and another cylinder may be used and the grain passed through them, until finally it is discharged from the drying-chamber through a spout, *d'*. (Shown in Fig. 1.) At the elevated ends of each cylinder the flanges or longitudinal strips *b* extend a short distance beyond the end of the interior cylinder, *F*, as shown in Fig. 1, and are bent so as to form scoops *a'*, which lift the grain from the outer cylinder and discharge it into the spaces between the two cylinders, thus commencing operation. The highest ends of the cylinders *E E* are covered by means of guard-plates *G*, which prevent the grain from escaping from these cylinders as it is conveyed from one to the other by means of the spouts *B* above described.

In the accompanying drawings we have represented two inclined outer cylinders only, but in practice it may be found necessary to use quite a number, all of which will be constructed and arranged substantially as the two herein described. In these cylinders, represented in Figs. 1 and 2, the grain which is to be dried is put into the hopper *g* at the top of the apparatus, and conducted thence into the upper end of the first drier, and through this drier into a spout, *B*, which is provided with two branches, either of which can be used by adjusting the valve *h*, Fig. 1. One of these branches, *i*, communicates with the upper end of the lowermost cylinder, while the other, *j*, conducts the grain out of the drying-chamber, and by adjusting the valve *h* the grain can be discharged from the apparatus after being sub-

jected to one drying-cylinder. The advantage of this valved double discharging-spout is that grain which is not very moist, and which requires but little drying, can be conducted off after the first operation without the unnecessary loss of time of passing it through the entire machine. If three drying-cylinders be used, the middle one may also have a double discharging-spout applied to it, which can be used for grain which requires to be subjected to the heating influence longer and to be passed through two driers; but for very wet grain the valves can be so arranged as to conduct it through all the driers.

It will be seen that the grain in its movements through the machine undulates or vibrates through a space between the inner and outer cylinders in the manner indicated by the dotted black arrows 2 2. Also, that the length of time that it remains and moves in this manner within the drying cylinder can be regulated by having the cylinders of a greater or less length.

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

1. The inner and outer cylinders, *E* and *F*, in combination with the radial flanges *a* and *b*, arranged within the space between said cylinders, and operating substantially as herein described.

2. A drying-cylinder so constructed that while the grain is kept near its circumference the grain is tossed back and forth outside of the center of the machine toward and from the center in a waved line, as indicated by the arrows 2 2, and at the same time subjected to heated air, substantially as described.

3. The combination of the scoop-extensions *a' a'* and flat flanges *b b*, the scoop portions working in the chamber between the ends of the cylinders *E F*, substantially in the manner and for the purpose described.

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Witnesses:

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