(No Model.) 3 Sheets—Sheet 1.

M. D. HALSEY.

Grain Drier.

No. 236,677. Patented Jan. 18, 1881.

Fig. 1.

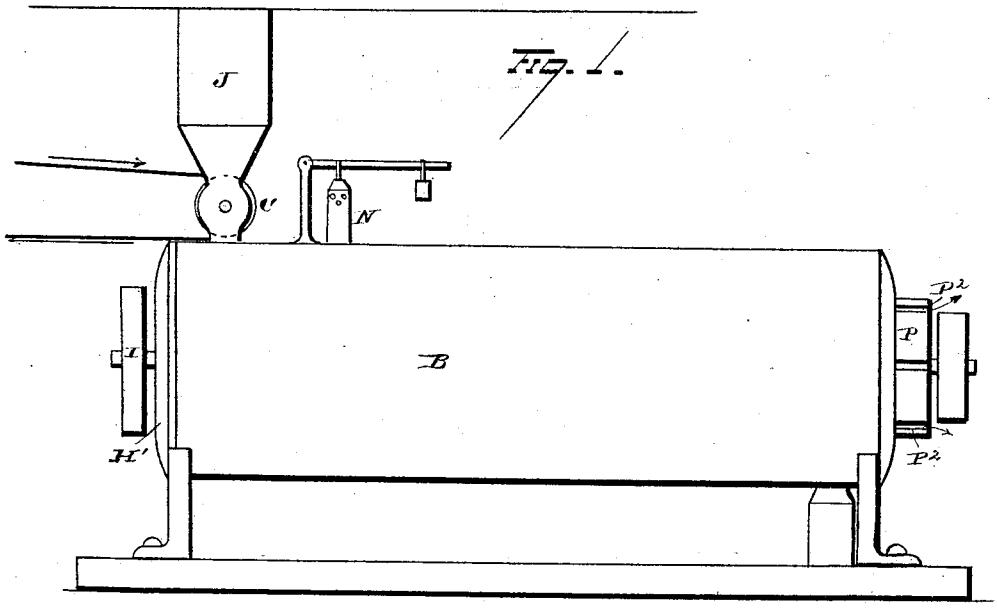
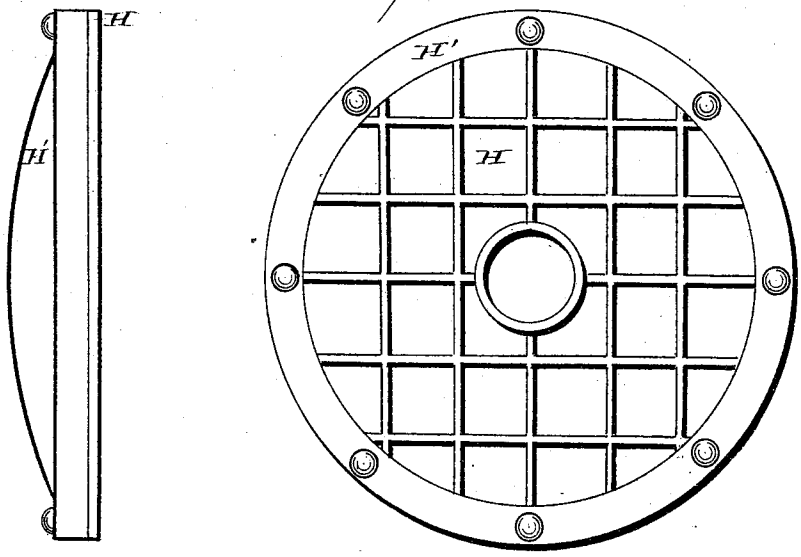


Fig. 5.



WITNESSES

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(No Model.) 3 Sheets—Sheet 2.

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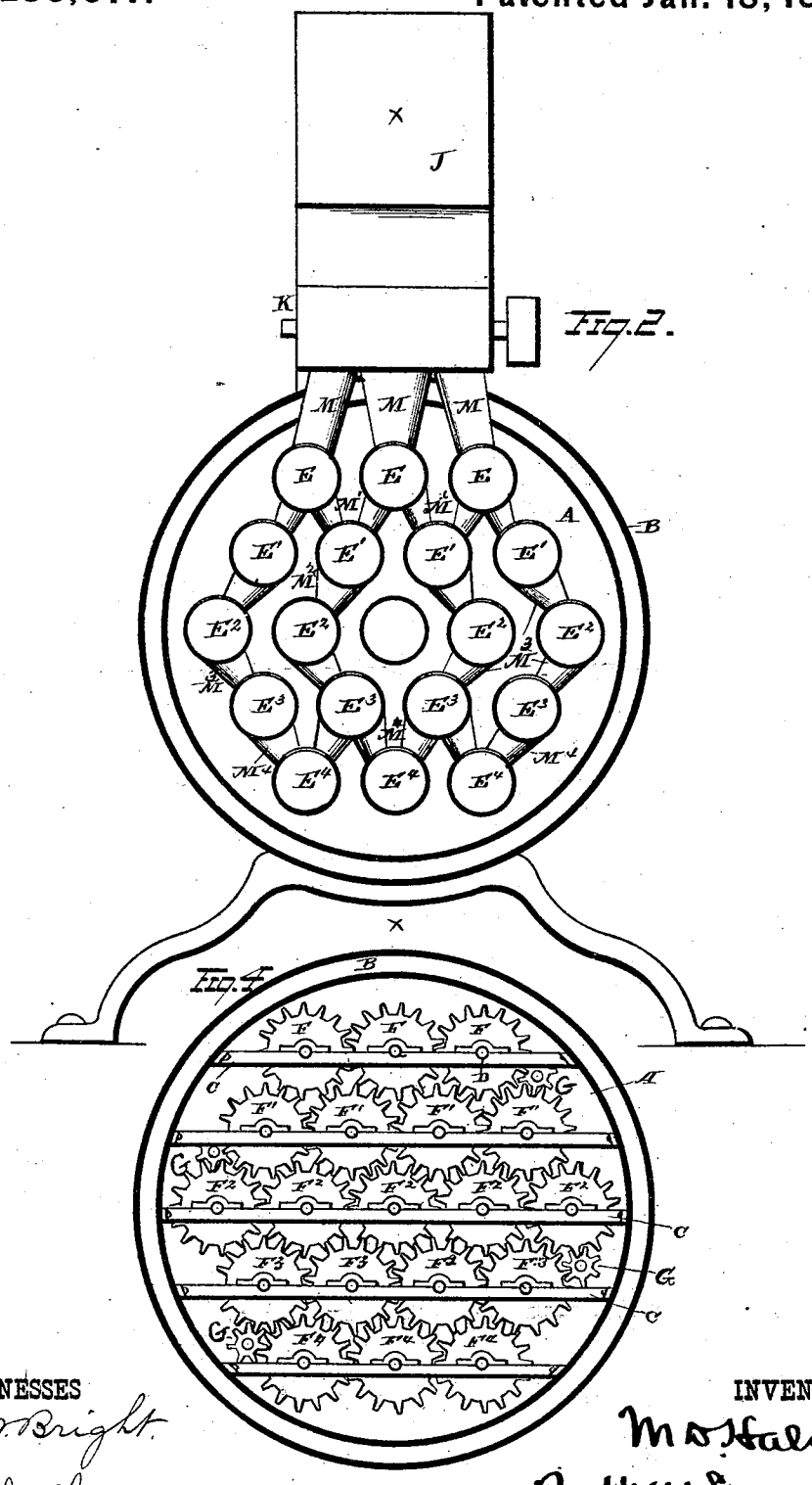

Fig. 2.

Fig. 4.

WITNESSES

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(No Model.)

3 Sheets—Sheet 3.

M. D. HALSEY.

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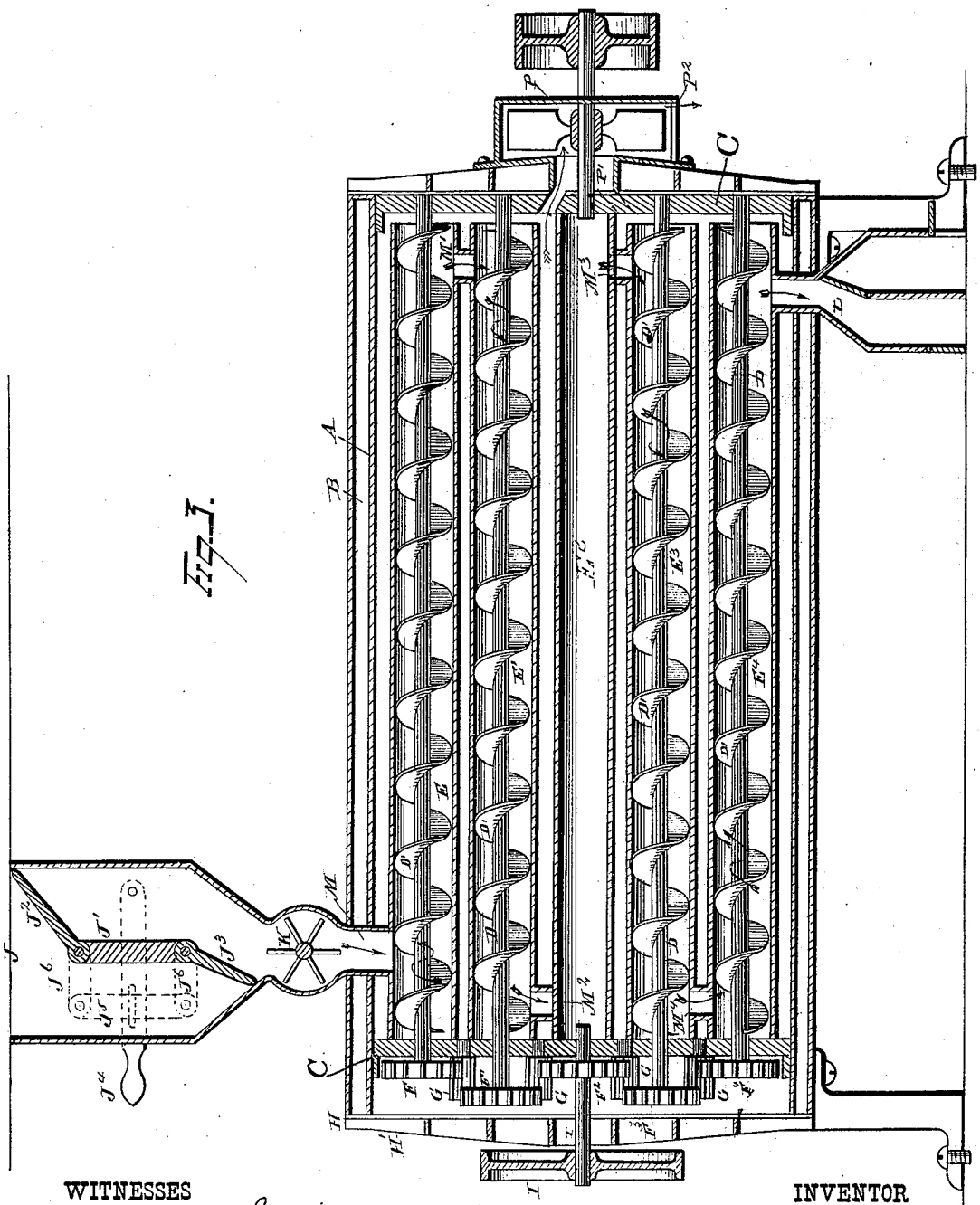

Fig. 1.

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UNITED STATES PATENT OFFICE.

MENZO D. HALSEY, OF ADRIAN, MICHIGAN.

GRAIN-DRIER.

SPECIFICATION forming part of Letters Patent No. 236,677, dated January 18, 1881.

Application filed May 17, 1880. (No model.)

To all whom it may concern:

Be it known that I, MENZO D. HALSEY, of Adrian, county of Lenawee, State of Michigan, have invented a new and useful Improvement in Grain-Driers; and I declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it pertains to make and use it, reference being had to the accompanying drawings, which form a part of this specification.

My invention consists in the combination of devices and appliances hereinafter set forth and claimed.

In the drawings, Figure 1 is an elevation of a grain-drier embodying the principles of my invention; Fig. 2, a cross-section of same; Fig. 3, a longitudinal section on the line *x x* of Fig. 2; Fig. 4, an end view with the head removed so as to show the arrangement of the gearing; Fig. 5, a view of one of the heads or end pieces, showing the sustaining-frame outside for supporting the plate which closes the end of the drying-chamber.

The object of my invention is to make a drier for drying grain in its natural state or after it has been steam-cooked, the essential elements being a chamber surrounded by a steam-jacket, and with or without an interior steam pipe or pipes, the interior being air-tight, and a partial vacuum maintained by an air-exhaust fan or other exhaust mechanism. The grain to be dried is caused to pass through a suitable hopper, thence into a series of troughs having spiral conveyers, which lead it slowly to the other end of the chamber, and then discharge it into a series of troughs beneath, having similar spiral conveyers, which continually agitate it and carry it to the first end again, when it falls into a series of similar troughs below, and so on through several series of troughs until it is finally discharged beneath in a sufficiently dry state.

I will now describe my device in detail.

A is a drying-chamber, preferably in cylindrical form, and incased in a steam-jacket, B.

C are frames, in which are journaled the ends of the shafts D, which bear spiral conveyers D′.

E E′ E², &c., are several series of troughs, in which the spiral conveyers are located.

F F′ F², &c., are several series of gear-wheels corresponding with the spiral conveyers in the different series of troughs. The gear-wheels in each horizontal row mesh with each other, but not with those above and below, because the alternate series of conveyers must run in opposite directions. To effect this I gear each horizontal row with the rows above and below it by loose pinions G, as shown in Fig. 4. So, also, in order to economize space, I arrange the different series of gear-wheels in different vertical planes, as shown at the left in Fig. 3, so that the gear-wheels in any series may pass freely by those in the series above and below it without meshing.

In order that the heads of the chamber may be light and strong, I form them, as shown, with a sheet, H, fastened throughout to a grating or frame, H′, which gives to it the requisite strength and rigidity to withstand any tendency to collapse when the air is exhausted from within.

The gear-wheels are all driven simultaneously by the power-shaft and pulley I, the central gear being rigidly attached to the said shaft. It is, however, apparent that the power may be applied to any one of the said gear wheels or pinions and accomplish the same result.

In order that a state of partial vacuum may be maintained within the drying-chamber, the hopper and discharge-spout have to be practically air-tight. Such a hopper, J, I construct as follows: J′ is a partition dividing it longitudinally. J² and J³ are doors or valves governed by the same operating mechanism—as, for instance, the lever J⁴ and connecting-bar J⁵ uniting the lever-arms J⁶. This hopper may be presumed to extend to the floor above, and it is apparent that when the grain is being supplied, say, to the left-hand chamber the door J² closes against any admission of air from that direction, while the door J³ supports the grain in the left-hand chamber until all that in the right-hand chamber has been discharged. The doors being then shifted, the left-hand chamber is emptied and the right one filled.

In order that the feed may proceed uniformly and without danger of clogging, I employ a rotary force-feed, K, which is suitably geared with the power. The exit or discharge

spout L is constructed in all respects similarly to the hopper, and needs no separate description.

The operation of the device is briefly as follows: The grain to be dried is introduced through the hopper and force-feed into the chamber, and is directed by chutes M into the upper series of open spouts, E. The spiral conveyers seize it as rapidly as it enters and crowd it slowly toward the other end of the chamber, stirring it and exposing all to the action of the heat as it travels onward, and the rarefied condition of the air within causes a rapid evaporation of the moisture from the grain. When the grain has reached the farther end of the spouts F it falls down through chutes M′ into the second series of troughs, E′, and by the contained spiral conveyers is brought again to the end from which it started, falls then through chutes M^2 into the third series of troughs, E^2, and so on until finally it is discharged through the exit L. In this continuous and uninterrupted passage through the open troughs under the influence of the heat and vacuum, and all the while being turned and agitated by the spiral conveyers, the grain becomes thoroughly dried. Moreover, the hopper and discharge-spout, operating by the action of the machinery, maintains a constant and uninterrupted flow of grain through the apparatus as long as it may be kept at work. A safety-valve, N, may be connected with the steam-jacket and loaded to correspond with any required pressure of steam.

The vacuum, as stated, may be produced by any suitable means. I propose to employ for this purpose a steam-jet or an exhaust-fan, and if the latter it may be located at any suitable point—as, for instance, at P, so as to draw air into its eye at P′ and discharge it through one or more openings, P^2, at the periphery.

I am aware that it is not new with me to provide a grain-drier of such construction that air may be exhausted from the interior thereof; and, further, I am aware that it is old to provide a series of troughs and spiral conveyers for feeding the grain backward and forward through the series of troughs, and hence I would have it understood that I make no broad claim to such subjects-matter.

What I claim is—

1. In a grain-drier, the combination, with a steam-jacketed cylinder and a device for exhausting air from the cylinder, of a series of troughs communicating with a feed and discharge opening, each trough being in open communication with the interior of the cylinder and provided with a spiral conveyer, the latter constructed and arranged, substantially as described, to feed the grain back and forth through the troughs from the top to the bottom of the series, substantially as set forth.

2. In a grain-drier, the combination, with a steam-jacketed cylinder, a series of troughs, each provided with a spiral conveyer, located within the cylinder, and gear-wheels for revolving the spiral conveyers, of a head, H′, attached to one end of the cylinder and located outside of said gear-wheels, substantially as set forth.

3. In a grain-drier, the combination, with a steam-jacketed cylinder, a series of troughs located within the cylinder, and a spiral conveyer located in each one of the troughs, of heads C C for supporting the opposite ends of the shafts of the spiral conveyers, and heads H′, provided with gratings H, located outside of the heads C C, substantially as set forth.

In testimony whereof I sign this specification in the presence of two witnesses.

MENZO D. HALSEY.

Witnesses:

WM. M. PORTER,

SAMUEL E. THOMAS.