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G. H. CORMACK.

Drying-Kiln.

No. 219,918. Patented Sept. 23, 1879.

Fig. 1

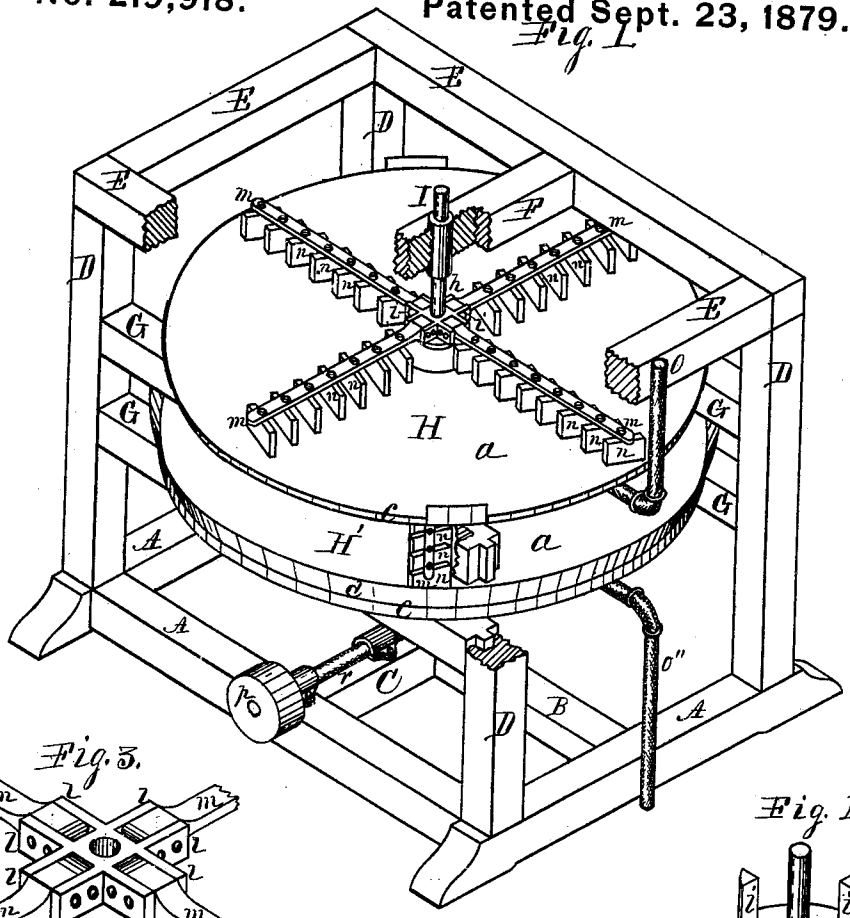


Fig. 3.

Fig. 4.

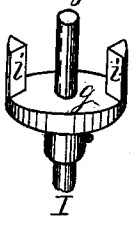
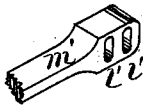
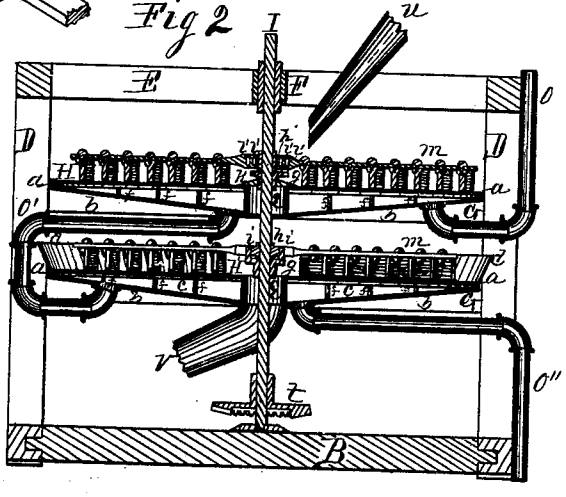


Fig 2





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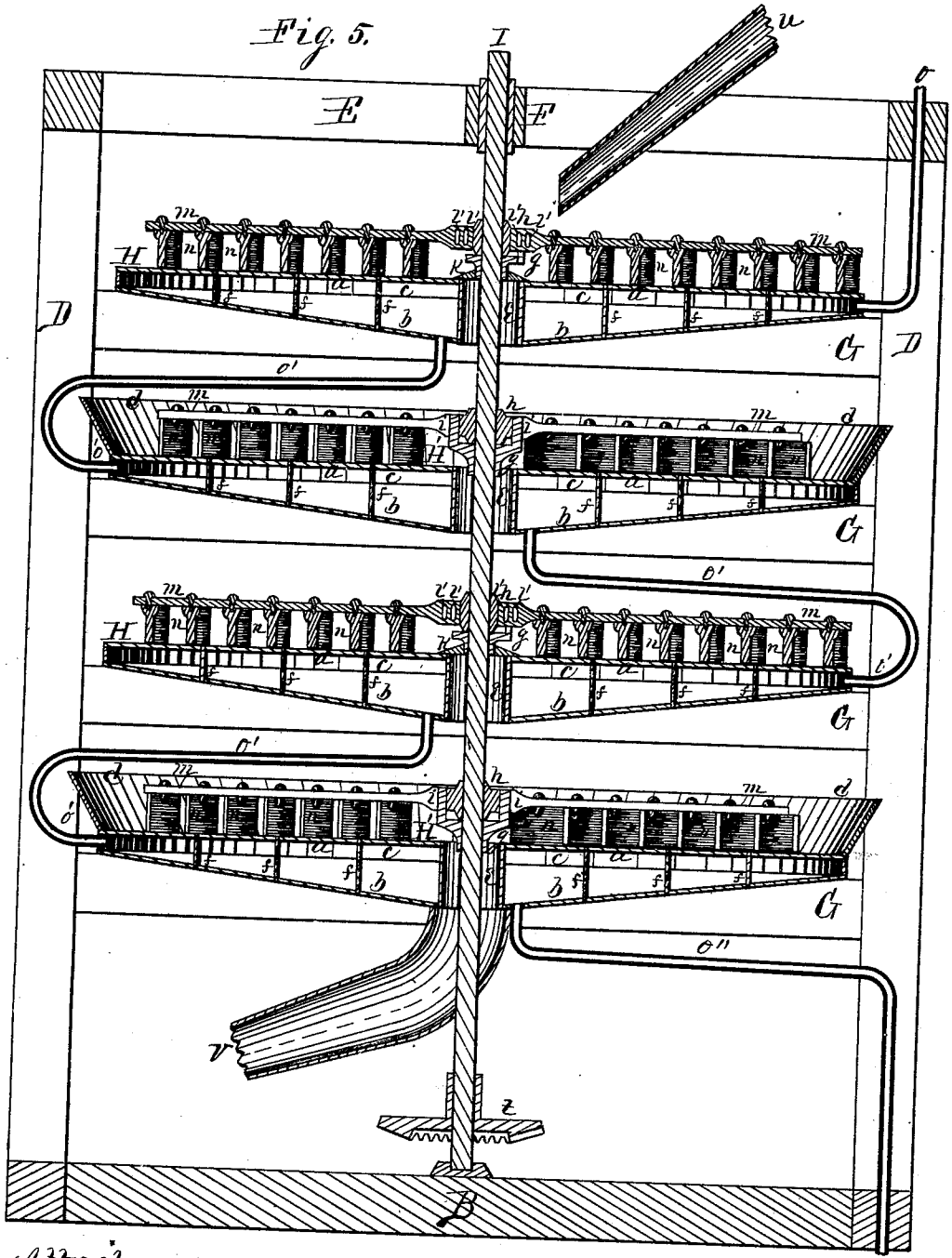
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Fig. 5.



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UNITED STATES PATENT OFFICE.

GEORGE H. CORMACK, OF ROCKFORD, ILLINOIS, ASSIGNOR TO A. M. JOHNSTON & CO., OF SAME PLACE.

IMPROVEMENT IN DRYING-KILNS.

Specification forming part of Letters Patent No. **219,918**, dated September 23, 1879; application filed August 24, 1878.

To all whom it may concern:

Be it known that I, GEORGE H. CORMACK, of the city of Rockford, in the county of Winnebago and State of Illinois, have invented a new and useful Improvement in Drying-Kilns, of which the following is a specification.

This invention relates to that class of drying-kilns designed for drying grain, malt, meal, and similar articles.

The object of this invention is to produce a kiln in which steam, hot water, or heated air may be employed to heat the kiln for drying purposes.

To this end I have designed and constructed the drier represented in the accompanying drawings, in which—

Figure 1 is an isometrical representation of a drying-kiln embodying my invention, of which Fig. 2 is a central vertical section. Fig. 3 is an isometrical view of the spider to which rake-arms are attached; and Fig. 4 is an isometrical view of the clutch fixed to the shaft, and which engages the spider carrying the rake-arms. Fig. 5 is a vertical section of my improved kiln enlarged, and in which are shown some slight differences in construction.

In the figures my improved drying-kiln is represented supported in a wooden frame of rectangular form, in which A represents the sills, framed into each other, forming three sides of the ground plan of the frame, the end sills of which are connected by a central sill, B, and a short sill, C, connects them about the center of their length. Into these sills are framed the corner-posts D, the upper ends of which are connected by a rectangular frame formed of the beams E, the side beams of which are connected by a central cross-beam, F. The posts of this frame are connected on the sides of the frame by beams G, on which the drying-pans of the kiln are supported.

H and H′ represent drying-pans constructed of plate-iron, and are circular in plan, and are composed of a horizontal upper plate, *a*, and a dished under plate, *b*, lowest in its center, placed a proper distance from each other, and connected on their outer edges by a vertical rim, *c*. These parts may be joined in any manner to produce a pan having a steam-tight chamber. These pans are provided with a center opening, as at *e*; and each alternate pan, as at H′, is provided with an outward and upward inclined rim, *d*. The plates *a* and *b* of these pans are supported to resist the steam-pressure by sufficient stay-bolts *f*, connecting the plates at proper intervals. These pans are supported in the frame, one above the other, at proper intervals, on the side beams, G, of the frame.

I is a vertical shaft passed upward through the center of the pans, and is supported in a step-bearing at its lower end on the lengthwise center sill, B. Its upper end is supported in a journal-bearing in the center cross-beam, F, in top frame.

g is a clutch, of the form represented enlarged at Fig. 4, and is fixed to the vertical shaft at or near the upper side of the pans. This clutch is adapted to receive the spider *h* (shown enlarged at Fig. 3) in such a manner that the upward-projecting arms *i* of the clutch shall engage the angles of the spider *h*, to cause it to revolve with the shaft, and to permit the spider to move up and down on the clutch. The pan H is provided with a central collar, *k*, to close the center opening on the upper side of the pan.

The spider *h* is provided with radial arms *l*, slotted to receive the inner ends of the rake-arms *m*, which are connected therewith in such a manner that the rake-arms are capable of a limited independent vertical movement. This is accomplished by means of the vertical slots *l′* in the inner ends of the rake-arms, which receive the pins or bolts that pass through the radial slotted arms of the spider and connect the rake-arms therewith. These slots are shown enlarged at *l′* in the detached rake-arm *m′*.

The rake-arms *m* radiate from the spider, and are provided with vertical conveyer-teeth *n*, inclined to the lengthwise axis of the rake-arms at such an angle that the rakes employed on the pan H, in their revolutions, will carry the grain from the center outward over the pan, and those on the pan H′ will carry the grain from its outer edge inward over the pan to its center.

o represents an induction steam-pipe, which connects with the dished under plate, *b*, of the pan H, near its outer edge; and *o'* is an outlet-pipe, one end of which is connected with the under dished plate, *b*, of the pan H, near its center, and its other end is connected to the under dished plate, *b*, of the pan H', near its outer edge, and becomes the induction-pipe to this pan.

o'' is an outlet or discharge pipe connected to the under dished plate, *b*, of the pan H', near its center. *p* represents a belt-pulley fixed to the shaft *r*, which is supported to revolve in bearings fixed to the short sill C. Its inner end is fitted with a bevel-toothed pinion, the teeth of which engage the teeth of a bevel-toothed wheel, *t*, fixed to the lower portion of the vertical shaft I.

u represents an induction-spout, through which the grain to be dried is conducted to the center of the upper pan, and *v* represents a discharge-spout, through which the grain is conducted in its flow from the drying-pans.

At Fig. 5 I have represented my improved drying-kiln enlarged, in which the number of pans are increased and in which the steam-induction pipes are connected with the vertical rim of the pans.

From the foregoing it will be seen that if steam be admitted through the induction-pipe it will pass through the several pans by means of the connecting-pipes, and may be permitted to escape through the outlet-pipe; and by means of the dished form of the under plate, *b*, of the pans and the pipes connected therewith, substantially as described and shown, the water of condensation will be carried, by the action of gravity, through the several pans and be collected in the outlet, and discharged by an ordinary steam-trap, by means of which the water may be returned to the tank from which the boiler is supplied.

In use, steam having been admitted to the pans, and the machine put in motion by a suitable belt-connection of the pulley *p* with the prime mover, motion will be imparted to the rakes, and grain admitted through the induction-spout to the center of the upper pan will be moved over the heated upper surface of the pan and carried over its outer edge by the action of the inclined teeth of the rakes, from which it will drop into the outer edge of the pan next below, in contact with the revolving rakes, the inclined teeth of which will carry it to the center opening of the pan, through which it will be discharged from the pan. This operation may continue through a series of pans to any practical extent sufficient to properly dry the grain or other articles to be dried, and will then be received in the discharge-spout *v*, to be conducted from the drier. If, in this operation, the grain or other article to be dried should accumulate on the pans or its quantity should diminish, the spider to which the rake-arms are attached will rise or fall on the clutch to meet the requirements; and should the article to be dried become unequally distributed on any of the pans, or on any portion of any of them, the possible independent vertical movement of the rake-arms will permit them to adapt themselves to the inequalities.

To increase the effectiveness of my improved dry-kiln, I propose to surround the pan with a suitable casing in any proper manner, and to admit but sufficient air to produce a sufficient circulation to carry off the moisture arising from the drying grain.

I have represented and described the pans of my improved drier constructed with an outer vertical rim; but my improved pan may be constructed without this rim and still retain the dishing form of the under plate. This may be accomplished by slightly crimping, curving, or raising the plates near their outer edge.

In the foregoing I have described my improved drying-kiln in connection with steam to heat the pans; but for this purpose hot water or heated air may be employed.

I claim as my invention—

In a drying-kiln employing heated pans, the combination, with the vertical shaft, of the fixed clutch and the spider, capable of an up-and-down movement on the clutch, and carrying rake-arms provided with inclined conveyer-teeth, as and for the purpose set forth.

GEORGE H. CORMACK.

Witnesses:
A. O. BEHEL,
H. D. FROST.