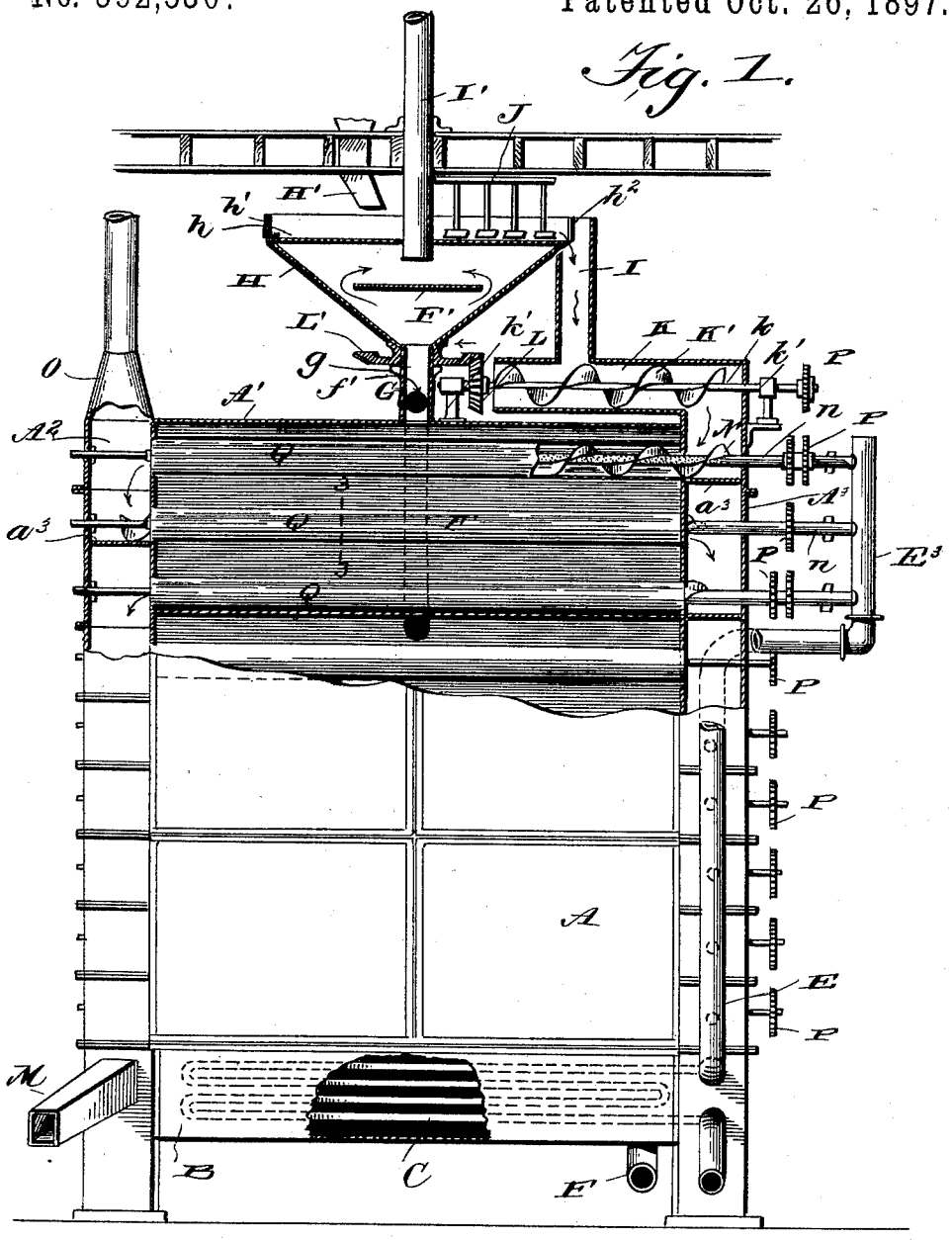
(No Model.) 2 Sheets—Sheet 1.

J. KURTZWORTH.

GRAIN DRIER.

No. 592,530. Patented Oct. 26, 1897.

Fig. 1.



Witnesses:
L. C. Mills
E. H. Bond

Inventor:
John Kurtzworth,
by E. B. Stocking
Atty.

(No Model.) 2 Sheets—Sheet 2.

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Fig. 2.

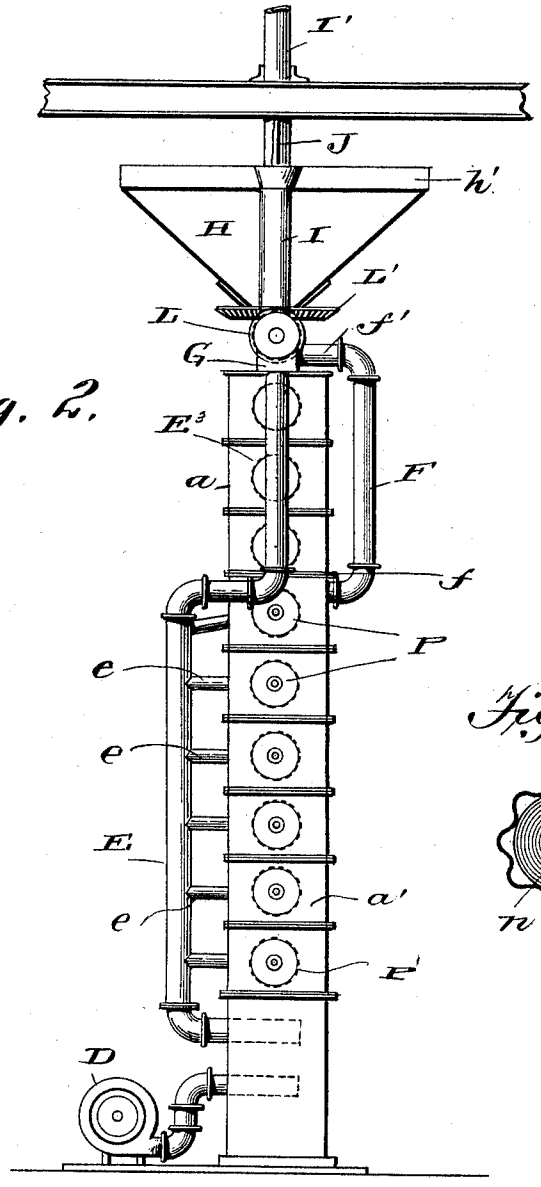
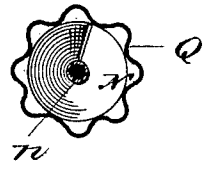


Fig. 3.



Witnesses:
L. C. Hills
E. A. Bond.

Inventor:
John Kurtzworth,
by E. B. Sterling Atty.

UNITED STATES PATENT OFFICE.

JOHN KURTZWORTH, OF NEW YORK, N. Y.

GRAIN-DRIER.

SPECIFICATION forming part of Letters Patent No. 592,530, dated October 26, 1897.

Application filed November 27, 1896. Serial No. 613,619. (No model.)

To all whom it may concern:

Be it known that I, JOHN KURTZWORTH, a citizen of the United States, residing at New York, in the county of New York, State of New York, have invented certain new and useful Improvements in Grain-Driers, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to certain new and useful improvements in grain-driers of that class in which the grain is carried in alternately opposite directions by means of spiral conveyers and subjected to the action of heat in its passage.

It has for its object, among others, to provide a simple and cheap construction of drier of this character which shall occupy minimum space, it being in the form of a shallow rectangular case, to which connections may be made and by means of which a large amount of grain can be handled and dried more thoroughly and evenly in a short space of time.

A receptacle is mounted upon the drier, and means are provided for revolving the same and stirring or mixing the grain as it is fed to the receptacle, the exhaust-steam being utilized for heating this revolving receptacle. From this receptacle the grain is conveyed to the uppermost of the series of spiral conveyers, some of the conveyers being connected with a source of hot air and the shafts thereof being made hollow and perforated, so that the hot air is forced through the same and brought into direct contact with the grain as it is conveyed through the tubes of such conveyers. The grain moves alternately in opposite directions until it is finally discharged at the lower end of the casing.

The tubes and conveyers are surrounded by a jacket for containing hot air, and exhaust-steam from any suitable source is utilized for heating this air.

The conveyers may be revolved by any suitable means.

Other objects and advantages of the invention will hereinafter appear in the following description, and the novel features thereof will be particularly pointed out in the appended claims.

The invention is clearly illustrated in the accompanying drawings, which, with the letters of reference marked thereon, form a part of this specification, and in which—

Figure 1 is a front elevation with parts in vertical section and portions broken away, showing my improved drier. Fig. 2 is an end elevation of the same, and Fig. 3 is a detail of one of the casings and the conveyer therein.

Like letters of reference indicate like parts in all of the views.

Referring now to the details of the drawings by letter, A designates the casing or jacket, which may be of any suitable material and dimensions. A′ is the top thereof, and beneath the bottom is a chamber B, within which is arranged a coil of pipe C, connected with a blower D, by which air is forced into said coil, which latter connects with the hot-air conduit E, as shown.

F is an inlet for the steam, adapted to be connected with any suitable source of live or exhaust steam, and this inlet or pipe F empties into the chamber B, so that the air within the coil in said chamber is heated, and the exhaust-steam, after serving its purpose within this chamber, passes upward through the jacket or casing around the conveyers and their pipes until it arrives at the partition *f*, separating the upper compartment *a* from the lower compartment *a′* of the casing. The exhaust-steam finds its exit from this lower compartment *a′* through the exterior pipe F, which extends upward outside the jacket or case, and its upper end has the horizontal branch *f′*, which empties into the vertical pipe G on the upper end of the upper compartment of the jacket.

H is the rotating receptacle in which the grain receives its preliminary drying. It has the horizontal partition *h* near its upper end, onto which the wet grain is adapted to be deposited, in this instance a spout H′ being shown, through which the grain is adapted to be conveyed onto said partition of the rotating receptacle. The band or vertical flange *h′* remains stationary, while the remaining portions of the receptacle revolve. This band or flange may be supported in any suitable manner and has the outlet-opening h^2 disposed over the conduit I, which leads to the conveyer. The exhaust-steam enters through the horizontal branch *f′* of the pipe F into the interior of this receptacle and is deflected by

the deflector-plate F′, as indicated by the arrows, and thence escapes through the exhaust-outlet pipe I′. By this means the rotating receptacle is kept heated, so that the grain is subjected to the influence of the heat as soon as it enters the rotating receptacle.

J is a mixer or stirrer fixedly supported in any suitable manner, as from the exhaust-outlet pipe I′, over the portion *h* of the receptacle to mix and agitate the grain as the receptacle is revolved and to force it out through the opening h^2 down the pipe I into the casing or conduit K, in which is arranged the initial spiral conveyer K′, the shaft *k* of which is mounted in suitable bearings *k′*, as seen best in Fig. 1, and at its inner end carries the bevel-pinion L, meshing with the bevel-pinion L′, which is fast upon the lower portion of the receptacle, as indicated in Fig. 1, and revolves about the pipe G, resting upon the lugs or brackets or bearings *g* on said pipe, as indicated best in Fig. 1.

At opposite ends of the jacket or case are the compartments A^2 A^3, which are subdivided by the partitions a^3, which are alternately arranged, as seen in Fig. 1, so that the grain as it is carried by the conveyers from one end drops into the compartment below at the opposite end, where it is taken up by a reversely-moving conveyer and conducted to the other end, and thus the grain is caused to traverse from end to end of the drier until it finally emerges from the discharge-spout M, which is at the lower end of the casing and upon the side opposite that to which the grain enters and opposite that at which the initial conveyer K′ is located, all as seen clearly in Fig. 1.

The conveyers N in the upper compartment *a* of the case or jacket have their flights mounted upon hollow perforated shafts *n*, mounted in suitable bearings, and each of these hollow shafts is connected by suitable connections with the branch E^3 of the hot-air conduit E, as seen clearly in Fig. 1, so that the hot air is forced through the perforations and acts upon the grain as it is being carried through the device.

O is an outlet for the moisture from the grain as it is driven off by the hot air and the steam within the casing.

Motion may be given to the various conveyers in any suitable manner from any source of power. (Not shown.) The shafts of these conveyers are shown as extended and provided with sprocket-wheels P, over which a chain or chains may be passed, so as to give the necessary alternately opposite motion to the conveyers.

The pipes or casings Q within which the conveyers revolve may sometimes be corrugated, as shown in Fig. 3, so as to increase the heating-surface thereof, if desired.

The hot-air conduit E is connected by lateral branches *e* with the compartments of the lower compartment of the case at one end thereof, as seen clearly in Fig. 2, and these connections are at right angles to the connections with the extension E^3 of such hot-air conduit.

Modifications in detail may be resorted to without departing from the spirit of the invention or sacrificing any of its advantages.

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

1. In a grain-drier, the combination with the main drying-casing, of a revolving receptacle mounted above the same, means for heating said receptacle, and a conveyer operatively connected to rotate said receptacle and to convey the material being dried from the receptacle to the main drier, substantially as described.

2. In a grain-drier, the combination with the main drying-casing, of a revolving receptacle mounted above the same, means for heating said receptacle, a stationary mixer arranged within the receptacle, and a conveyer operatively connected to rotate said receptacle and to convey the material being dried from the receptacle to the main drier, substantially as described.

3. In a grain-drier, the combination with the main drying-casing, of a revolving receptacle mounted above the same, a steam-pipe entering said casing, a steam-exhaust pipe communicating with the casing and receptacle, and a conveyer operatively connected to rotate said receptacle, substantially as described.

4. In a grain-drier, the combination with the main casing, of a revolving receptacle mounted above the same, a steam-pipe entering the casing, a steam-exhaust pipe communicating with the casing and receptacle, a deflector-plate within the receptacle, and a conveyer operatively connected to rotate said receptacle, substantially as described.

5. In a grain-drier, the combination with the casing and its conveyers, of a steam-pipe entering the casing, a revolving receptacle, a steam-exhaust pipe communicating with the casing and emptying into the receptacle, a deflector-plate within the receptacle, means for revolving the receptacle and the initial conveyer arranged beneath the receptacle and operatively connected therewith; substantially as described.

6. In a grain-drier, the combination of a casing and its conveyers, of a revolving receptacle, a stationary mixer depending therein, a rim having an opening opposite said mixer, means for revolving the receptacle, and a stationary conductor from the receptacle to a conveyer; substantially as described.

7. The combination with the casing and a conveyer mounted above the same, of a bevel-pinion on the shaft of said conveyer, a rotatable receptacle, and a bevel-pinion on the lower end thereof engaging the pinion on the conveyer-shaft; substantially as described.

8. The combination with the casing having compartments and a chamber beneath the

same, of the steam-pipe entering said chamber, the hot-air coil within said chamber, the hot-air conduit connected with all of said compartments and the spiral conveyers having hollow shafts connected therewith; substantially as described.

9. The combination with the casing having compartments and the conveyers therein, of the hot-air coil beneath the casing, the steam-pipe entering a chamber beneath the casing, the exhaust-steam pipe leading from the upper portion of the casing, and the hot-air conduit leading from the lower portion of the casing and having connections with all of the compartments thereof; substantially as described.

10. In a grain-drier, the combination of a casing having compartments and the conveyers, of the hot-air conduit having connection with a portion of the compartments of the casing and with the hollow, perforated shafts of the upper conveyers; substantially as described.

11. The combination with the casing and the conveyers mounted for movement in alternately opposite directions, the rotating receptacle and the initial conveyer operatively connected therewith, of the hot-air coil, the hot-air conduits, the lateral branches therefrom, the steam-supply pipe, and the exhaust-steam outlet-pipe; substantially as described.

12. The combination with the casing and the revolving receptacle mounted at the upper end thereof and the initial conveyer operatively connected with said receptacle, of the spiral conveyers, hot-air conduits, the steam-supply pipe and the steam-exhaust pipe emptying into the chamber of the receptacle; substantially as described.

13. The combination with the casing and the revolving receptacle mounted at the upper end thereof and the initial conveyer operatively connected with said receptacle, of the spiral conveyers, hot-air conduits, the steam-supply pipe and the steam-exhaust pipe emptying into the chamber of the receptacle, and a stationary steam-exhaust outlet communicating with the chamber of said receptacle; substantially as described.

14. The combination with the casing and the revolving receptacle mounted at the upper end thereof and the initial conveyer operatively connected with said receptacle, of the spiral conveyers, hot-air conduits, the steam-supply pipe and the steam-exhaust pipe emptying into the chamber of the receptacle, a stationary steam-exhaust outlet communicating with the chamber of said receptacle, and a horizontal deflector-plate within said chamber between the inlet and outlet of steam; substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN KURTZWORTH.

Witnesses:
JAS. H. MEETEER,
JOHN GAUTSCHY.