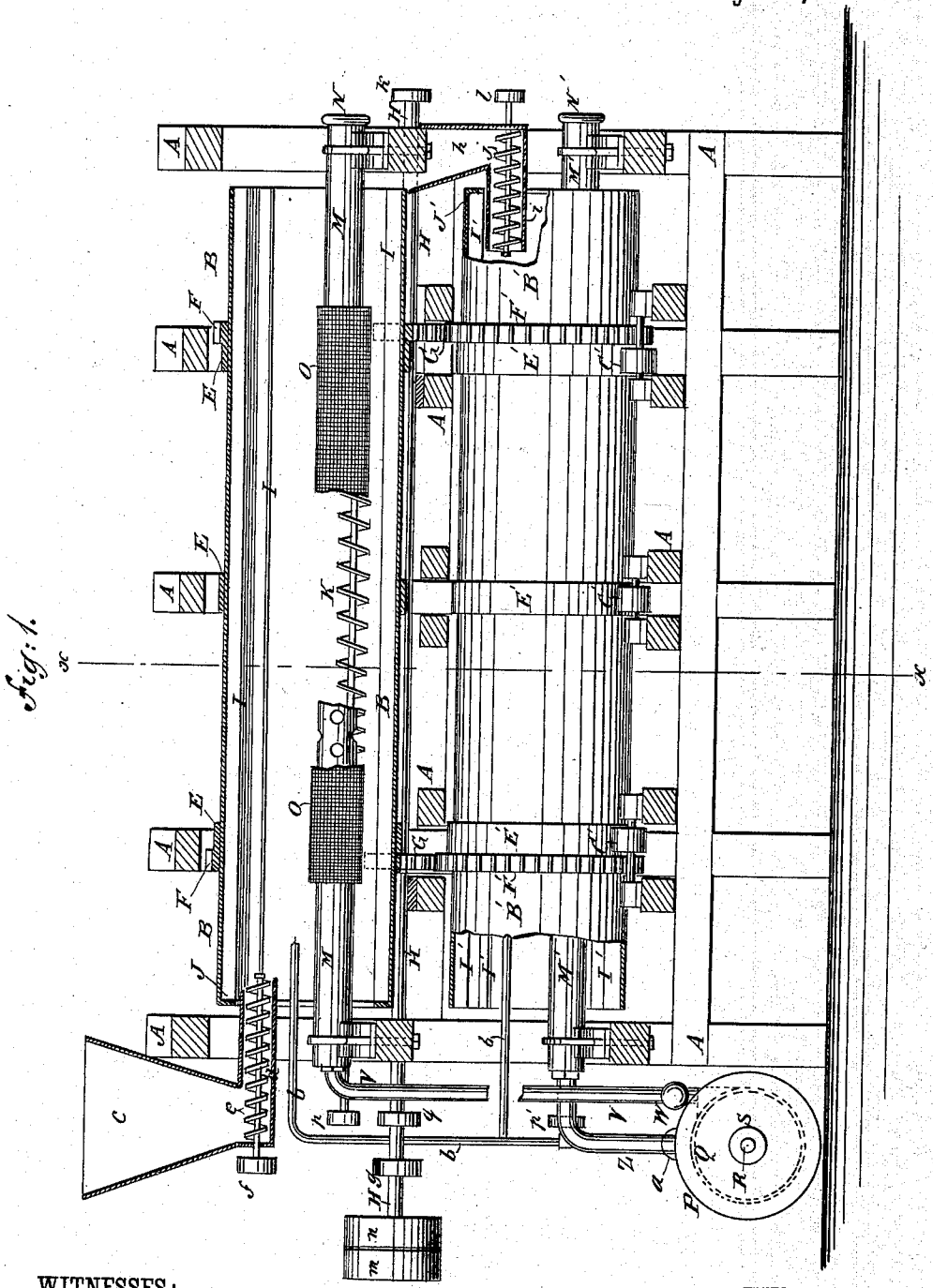
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D. M. BUNNELL.

METHOD OF DRYING GRAIN.

No. 322,252. Patented July 14, 1885.

Fig. 1.



WITNESSES:

Chas. Nida.

C. Sedgwick

INVENTOR:

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No. 322,252. Patented July 14, 1885.

Fig. 3.

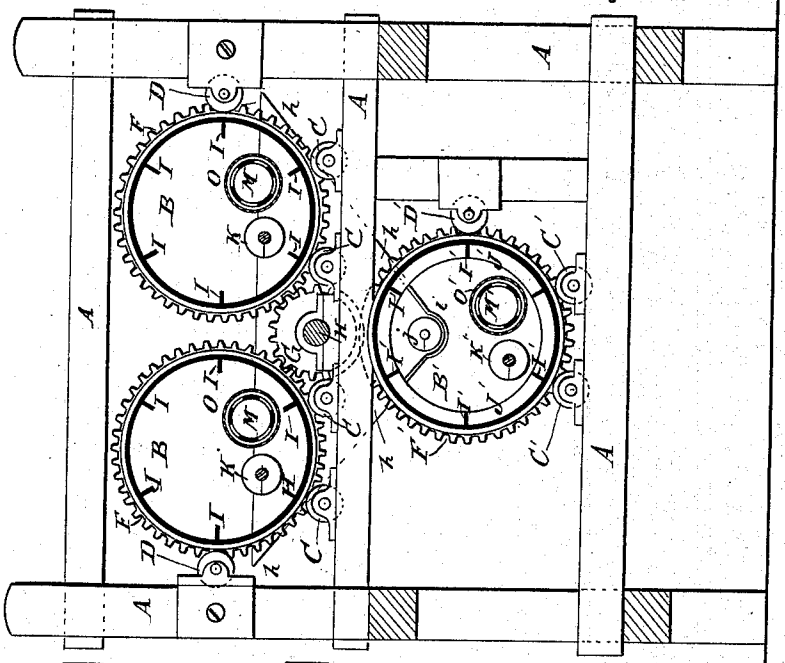


Fig. 2.

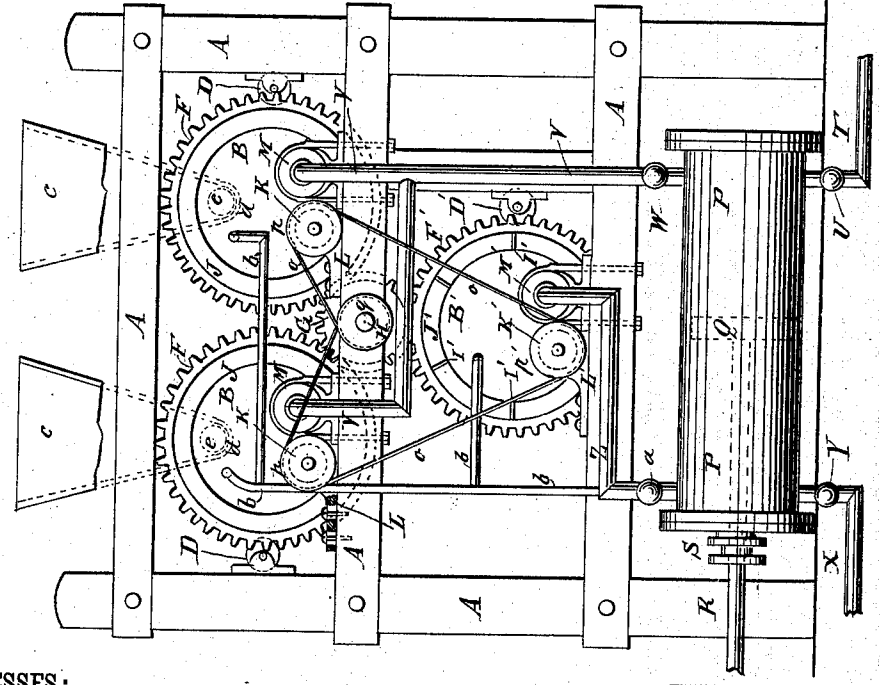
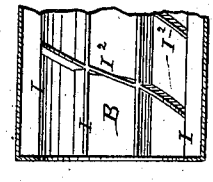


Fig. 4.



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UNITED STATES PATENT OFFICE.

DAVID M. BUNNELL, OF BROOKLYN, NEW YORK, ASSIGNOR OF ONE-HALF TO JESSE H. BUNNELL, OF SAME PLACE.

METHOD OF DRYING GRAIN.

SPECIFICATION forming part of Letters Patent No. 322,252, dated July 14, 1885.

Application filed July 11, 1884. (No model.)

To all whom it may concern:

Be it known that I, DAVID M. BUNNELL, of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Drying and Cooling Malt, Grain, and other Substances, of which the following is a full, clear, and exact description.

Reference is to be had to the accompanying drawings, forming part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a sectional side elevation of my improvement, parts being broken away. Fig. 2 is a front end elevation of the same, parts being broken away. Fig. 3 is a sectional end elevation of the same, taken through the line *x x*, Fig. 1; and Fig. 4 is a detail plan view of the inside of a cylinder in part.

The object of this invention is to facilitate the drying and cooling of malt, grain, and other substances, and promote efficiency and rapidity in such drying and cooling operations.

The invention consists in applying a blast of heated air to the interior of a mass of moving grain and driving off the moisture arising therefrom by a blast of air admitted above the grain, all as hereinafter fully described.

A is the frame of the machine. B are two hollow cylinders, which rest upon small rollers C, pivoted to supports secured to the middle cross-bars of the intermediate sections of the frame A. The cylinders B are held from outward movement by small rollers D, pivoted to supports attached to the posts of the intermediate sections of the frame A.

B′ is a hollow cylinder placed beneath the space between the cylinders B, and which rest upon small rollers C′, pivoted to supports secured to the lower cross-bars of the intermediate sections of the frame A. The cylinder B′ is held from outward movement by small rollers D′, pivoted to supports attached to studs attached to the cross-bars of the said intermediate sections of the frame A.

Around the cylinders B B′, at their centers and at a little distance from their ends, are placed strengthening-bands E E′, which serve as bearings or tracks for the rollers C D C′ D′.

Upon the outer parts of the end bands, E E′, are formed or with them are connected gear-wheels F F′, into the teeth of which mesh the teeth of small gear-wheels G, attached to the shaft H, placed in the center of the space between the cylinders B B B′, and journaled in bearings attached to the cross-bars of the frame A, so that the said cylinders will be revolved by the revolution of the said shaft H. The sides of the gear-wheels F F′ rest against the outer ends of the end rollers, C C′, and thus hold the cylinders B B B′ from longitudinal movement.

The cylinders B B′ are made with interior longitudinal flanges, I I′, which, as the said cylinders revolve, act as buckets to raise the grain and allow it to fall back into the middle parts of the said cylinders.

As shown in Fig. 4, diagonal flanges I^2 are to be arranged spirally between the flanges I and I′ to assist the movement of the grain. The cylinders B at their forward ends and the cylinder B′ at its rear end are provided with interior annular flanges, J J′, to prevent the grain from falling out at the said ends.

Within the cylinders B B′, below and at one side of their centers, are placed spirally-threaded conveyers or endless screws K K′, which are journaled to bearings L L′, attached to the end cross-bars of the frame A.

The bearings L L′ are slotted to receive their fastening-bolts, so that the conveyers K K′ can be adjusted laterally, as circumstances may require.

Within the cylinders B B′, at one side of and a little higher than the conveyers K K′, are placed tubes M M′, which are closed at their rear ends by caps N N′, and have numerous perforations formed through them, as shown in Figs. 1 and 3. The perforations do not extend quite to the ends of the tubes M M′, and the perforated parts of the said tubes are covered with wire-gauze O O′ of such a fineness of mesh as will prevent the grain or other substance being treated from entering the said tubes through their perforations. The ends of the tubes M M′ are secured to supports attached to the cross-bars of the end sections of the frame A.

P is a pump-cylinder, which is provided with a piston, Q. The rod R of the piston Q

passes out through a stuffing-box, S, in the head of the cylinder P, and is operated from a steam-engine or other convenient power.

With one end of the cylinder P is connected a pipe, T, leading to a hot-air furnace or other air-heating apparatus, and provided with a valve, U, opening inward. With the same end of the cylinder P is connected a pipe, V, provided with a valve, W, opening outward. The pipe V is branched, and is connected with the ends of the tubes M of the cylinders B.

With the other end of the cylinder P is connected a pipe, X, provided with a valve, Y, opening inward, for the admission of cold air. With the same end of the cylinder P is connected a pipe, Z, provided with a valve, *a*, opening outward. The pipe Z is connected with the open end of the tube M′, and is provided with branch pipes *b*, leading into the upper parts of the interiors of the cylinders B B B′.

The substance to be dried is fed into the cylinders B from hoppers *c* through discharge-spouts *d* by spiral-threaded conveyers *e*, driven from the shaft H′ by pulleys *f g* and a band. The dry hot substance falls from the rear ends of the cylinders B into the inclined spouts *h*, the lower ends of which are connected with the outer end of a spout, *i*, projecting into the rear end of the cylinder B′, and provided with a spiral-threaded conveyer, *j*, for feeding the said substance into the said cylinder in uniform quantities. The conveyer *j* is driven from the shaft H by pulleys *k l* and a band. The cylinders B B′ are designed to be kept about two-thirds full, and their contents are kept in motion by the flanges I I′, and are fed through the said cylinders by the conveyers K K′. The spiral flanges I² serve to assist in feeding the contents of the cylinders forward, and also to cause the same to feed forward when a small quantity only is in the cylinders, whereby all of the material can be run out of the cylinders. The substance passing through the cylinders B is dried by the hot air introduced by the tubes M into its mass and rising into the upper parts of the said cylinders B, whence it is driven by the currents of cold air from the pipes *b*. The substance passing through the cylinder B′ is cooled by the cold air introduced into its mass by the tube M′, and rising into the upper part of the said cylinder, whence it is driven off by the current of air from the pipe *b*.

The shaft H is provided with a fast pulley, *m*, and a loose pulley, *n*, to receive a driving-belt from any convenient power.

With this construction the substance is dried and cooled in a continuous operation, and is delivered from the forward end of the cooling-cylinder ready for storage or transportation.

The conveyers K K K′ are driven from the shaft H by the band *o*, passing around the pulleys *p p p′ q*, attached to the said conveyers and shaft.

The apparatus herein shown and described forms no part of the present invention; but I reserve to myself the right to make a separate application therefor at some future time.

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

The herein-described method of drying malt or other grain, consisting in delivering a blast of heated air into the interior of a mass of malt or grain while in movement and driving off the moisture arising therefrom by a blast of air admitted above the grain, as set forth.

DAVID M. BUNNELL.

Witnesses:
JAMES T. GRAHAM,
C. SEDGWICK.