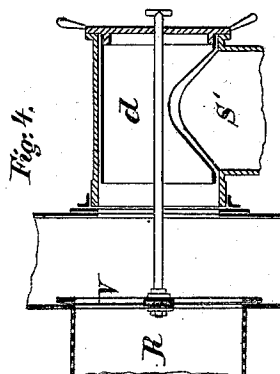
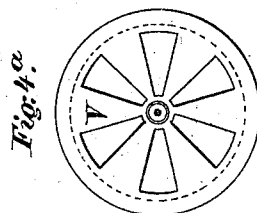
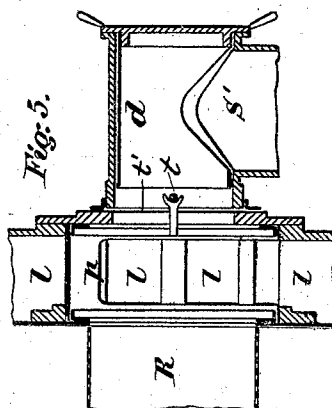
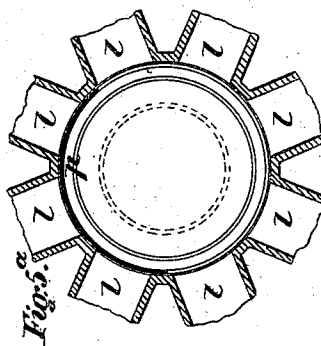
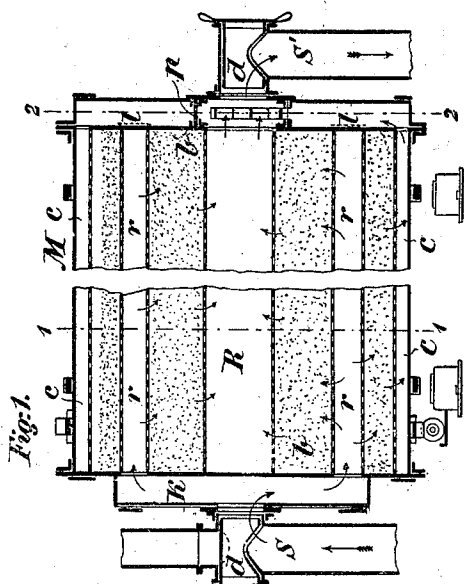
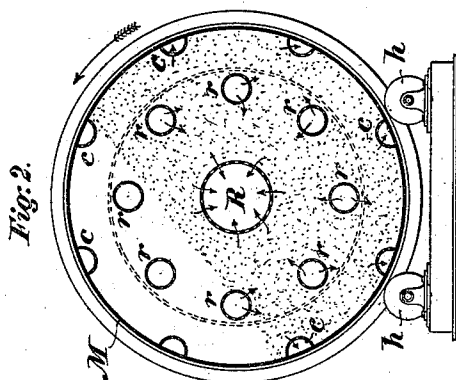
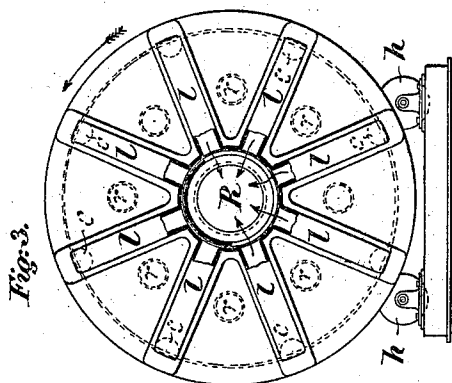


(No Model.)

F. KNÜTTEL.
MALTING APPARATUS.

No. 513,467.

Patented Jan. 23, 1894.



Witnesses:
W. L. Kue
L. C. Kue

Inventor:
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his atty.

UNITED STATES PATENT OFFICE.

FRIEDRICH KNÜTTEL, OF CHARLOTTENBURG, GERMANY.

MALTING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 513,467, dated January 23, 1894.

Application filed June 20, 1893. Serial No. 478,259. (No model.)

To all whom it may concern:

Be it known that I, FRIEDRICH KNÜTTEL, a subject of the King of Prussia, residing at Charlottenburg, near Berlin, in the Kingdom of Prussia, German Empire, have invented new and useful Improvements in Apparatus for Use in Malting Grain, of which the following is a specification.

This invention relates to an improved apparatus for use in malting grain, and has for its object to provide improved means whereby currents of air properly prepared for malting may be passed through the grain during the malting process. By the improved construction of malting drum hereinafter described large quantities of grain can be treated at once.

In order that my invention may be more clearly understood I will now proceed to describe the same by the aid of the accompanying drawings, in which—

Figure 1 is a vertical longitudinal central section of a malting drum constructed according to my invention. Fig. 2 is a transverse section on the line 1, 1, Fig. 1. Fig. 3 is a transverse section on the line 2, 2, Fig. 1. Figs. 4, 4^a, 5 and 5^a are detail sectional views drawn to a larger scale and hereinafter more particularly described.

Referring to Figs. 1 to 3, M is a drum having a cylindrical periphery, and end plates *b*, *b'*, and supported on rollers *h h* so as to be rotatable about a horizontal axis.

c, c are tubes made of perforated sheet metal, wire gauze or the like secured to or in the vicinity of the periphery of the drum and extending from the plate *b'* to the remote end of the drum. The said tubes communicate each with one of the external radial pipes *l, l*, see Fig. 3, secured to the end plate *b'*, through apertures in this plate.

R is a central tube formed of perforated metal or other material and penetrating freely the plate *b'* by means of an orifice in the latter. An extension of the central tube R forms a circular chamber into which open the aforesaid radial pipes *l l*, the openings being controlled by a curved shield *p* as hereinafter more fully described. The ends of the tubes *c c* and of the central tube R on the other side of the drum M are closed by the end plate *b* of the drum.

Between the peripheral tubes *c c* and the tube R a second set of tubes *r* of similar pattern are arranged. These tubes *r* are closed at one end by the plate *b'* of the drum and at the other end thereof communicate with a chamber K formed outside the end plate *b*. This chamber K as well as the extension of tube R on the opposite side of the drum communicate with the air-trunks S and S' respectively through a sleeve of india-rubber, a stuffing box, or through other suitable connection forming an air-tight joint therewith. The quantity of air passed through the trunks is regulated by a valve *d* in each trunk which valve consists of a cylinder with an aperture at the side and is adapted to be rotated so as to more or less close the opening from the air-trunk.

The drum when at work is not quite filled with grain for the reason that the grain varies in bulk during the operation. For instance when germinating it increases in bulk and when drying it decreases in bulk, and for the further reason that the grain requires to be turned over during the malting process. The surface of the grain assumes an oblique position when the drum is rotating, as shown in Fig. 2, and through the air space thus left in the drum the air would travel very easily, that is without resistance, unless the pipes communicating with said space were not shut. I therefore employ, for closing the pipes *c*, automatically as they enter the free air space during the rotation of the drum, a curved shield *p*. Shown very clearly in the detail views of Figs. 5 and 5^a. This shield forms a portion of a cylindrical surface and is pivoted loosely so as not to turn with the drum and is retained in its position so as to close the entrance to the radial pipes *l l*, which lead to those peripheral pipes passing through the free air space above the malt as shown in Fig. 3. The shield is retained in position by means of a bolt *t* in the stationary elbow pipe S' and a forked bracket or arm *t'* arranged on the shield, as shown in Fig. 5.

I prefer to employ a simple regulator to control the supply of air to the central tube R so that the proportion of air passing through the malt between the pipes *r* and the said central tube shall be about the same as that which passes through the malt between the

pipes *r* and *c*. A suitable regulator for this purpose is shown in Figs. 4 and 4^a. The end of the tube *R* is covered by a diaphragm having suitable orifices, and a plate *v* pivoted at the center of the diaphragm and provided with similar orifices is arranged to be rotatable from the outside so as to partially cover or uncover the orifices in the diaphragm as required.

I prefer to provide doors in the outer walls of the chamber *K* and the radial pipes *l* opposite the ends of the several tubes *r* and *c*. These doors are arranged to be tightly closed when the apparatus is in use, but can be readily opened to afford access to the tubes for the purpose of cleaning the same.

When the apparatus is in use, the drum is rotated and air, suitably prepared for malting, is passed through the apparatus by way for example of the air-trunk *S* to the chamber *K* and tubes *r*. The air then passes through the malt toward the peripheral tubes *c* and also toward the central tube *R* from which tubes it is led through the radial pipes *l* to the air-trunk *S'*. The direction of the air current is shown by the arrows in Figs. 1, 2, and 3, but it is obvious that I may pass air in the opposite direction through the malt, that is to say, I may pass air into the apparatus by way of the trunk *S'* and out by the trunk *S*. I use either a blowing engine or an exhaust pump or fan for causing the current of air to pass through the drum.

By this invention very large quantities of grain may be treated in one operation, and moreover owing to the provision of the intermediate tubes, the air is caused to thoroughly permeate the entire mass of grain.

I am aware that pneumatic malting drums are known having a perforated central conduit and perforated peripheral conduits communicating with an air passage or chamber provided at one end of the drum as shown in Patent No. 400,338; and I have also described in my prior patent, No. 470,480, means for automatically controlling the inlet and outlet passages of the air in similar drums.

What I herein claim is—

1. In a pneumatic malting apparatus, the combination with a rotatable drum of a perforated tube *R* in the axis of the drum said tube being closed at one end and open at the other end to an air-trunk *S'*, perforated tubes

c, c near the periphery of the drum, also closed at one end and open at the other to said air-trunk *S'*, a set of perforated tubes *r* intermediate of the central tube *R* and peripheral tubes *c c*, said tubes *r* being open at one end to an air-trunk *S* and closed at the other end, and means for causing a current of air through said tubes, substantially as, and for the purpose, specified.

2. In a pneumatic malting apparatus, the combination, with a rotatable drum *M* of a perforated tube *R* in the axis of the drum, said tube being closed at one end and open at the other end to an air-trunk *S'* perforated tubes *c c* near the periphery of the drum also closed at one end and open at the other end to the said air trunk *S'* through radial pipes *l*, a set of perforated tubes *r* intermediate of the central tube *R* and peripheral tubes *c c* said tubes *r* being open at one end to an air-trunk *S* and closed at the other end, means for causing a current of air through said tubes, and a shield *p* for closing those tubes *l* which communicate with the tubes *c* in the free space of the drum, substantially as, and for the purpose specified.

3. In a pneumatic malting apparatus, the combination, with a rotatable drum *M*, of a perforated tube *R* in the axis of the drum, said tube being closed at one end and open at the other end to an air-trunk *S'* perforated tubes *c c* near the periphery of the drum also closed at one end and open at the other end to the said air trunk *S'* through radial pipes *l*, a set of perforated tubes *r* intermediate of the central tube *R* and peripheral tubes *c, c*, said tubes *r* being open at one end to an air-trunk *S* and closed at the other end, means for causing a current of air through said tubes, a shield *p* for closing those tubes *l* which communicate with the tubes *c* in the free space of the drum, and a valve *v* for regulating the amount of air passing through the tube *R*, substantially as described, for the purpose specified.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

FRIEDRICH KNÜTTEL.

Witnesses:

EMIL GERHARDT,
RUDOLF REUTER.