No. 643,965. Patented Feb. 20, 1900.

F. KNÜTTEL.

MALT DRUM.

(Application filed Apr. 24, 1899.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

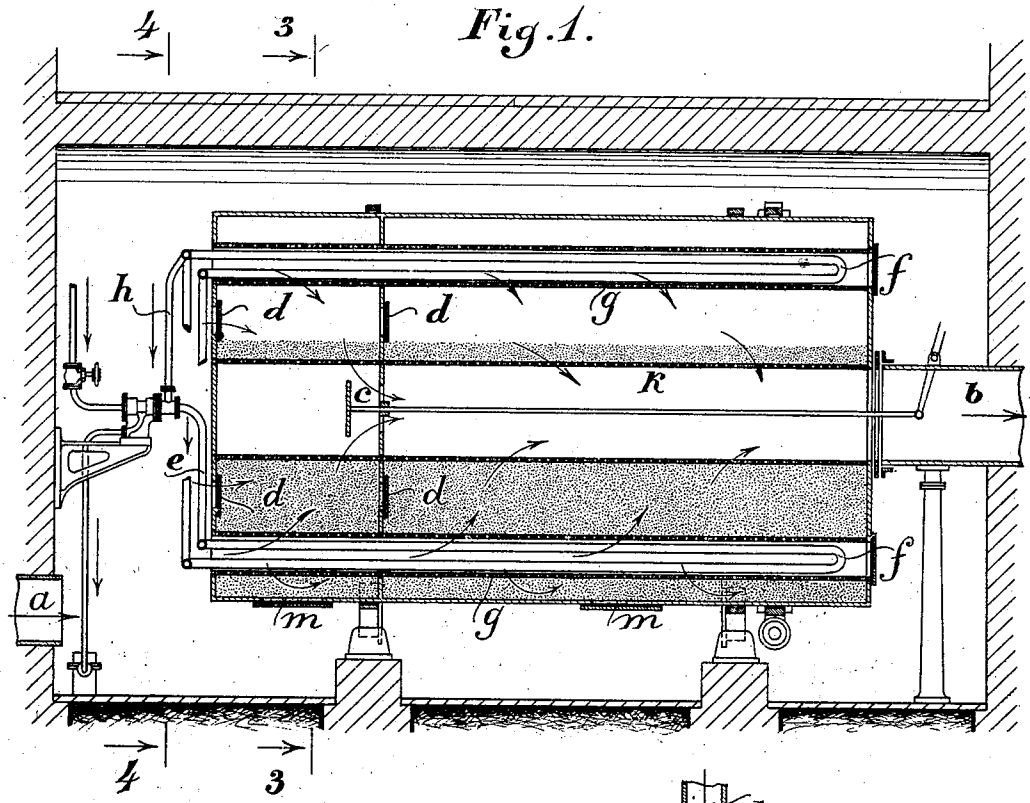
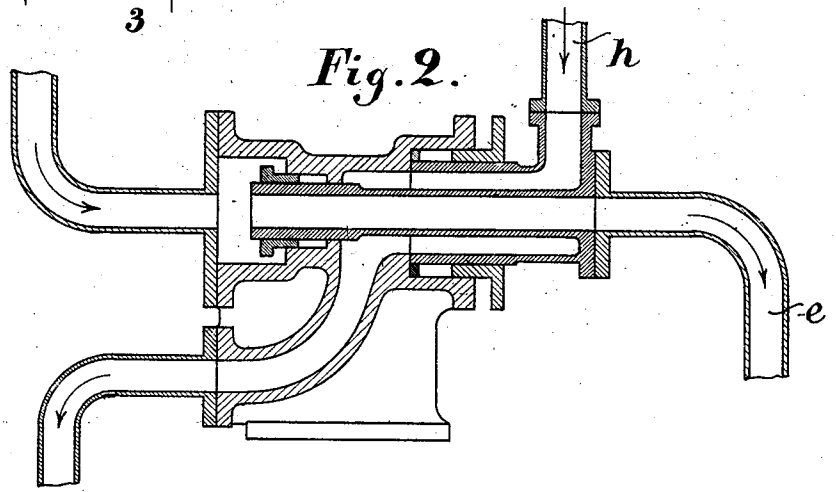


Fig. 2.



Witnesses:
Estella Dick
H. Thurston Talbert

Inventor:
Friedrich Knüttel
by Meredith Dick
his Attorney

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 643,965. Patented Feb. 20, 1900.

F. KNÜTTEL.

MALT DRUM.

(Application filed Apr. 24, 1899.)

(No Model.) 2 Sheets—Sheet 2.

Fig. 3.

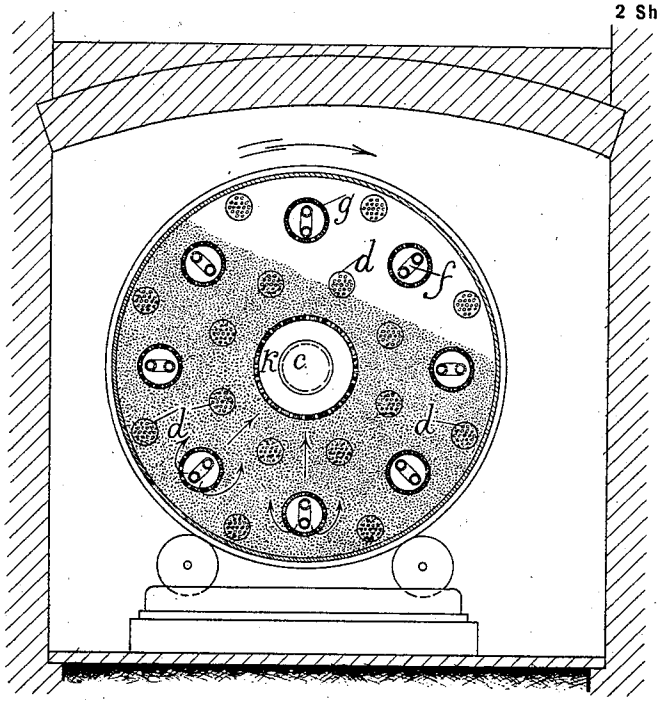
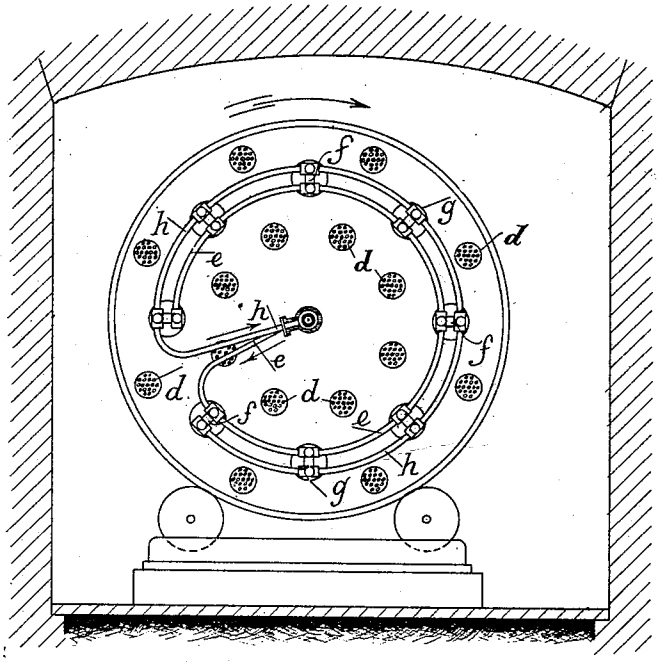


Fig. 4.



Witnesses:
Ewell Dick
A. Adams Talbert

Inventor:
Friedrich Knüttel
by Marcellus Davis
his Attorney

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

FRIEDRICH KNÜTTEL, OF CHARLOTTENBURG, GERMANY.

MALT-DRUM.

SPECIFICATION forming part of Letters Patent No. 643,965, dated February 20, 1900.

Application filed April 24, 1899. Serial No. 714,276. (No model.)

To all whom it may concern:

Be it known that I, FRIEDRICH KNÜTTEL, managing director, a subject of the King of Prussia, Emperor of Germany, residing at Charlottenburg, near Berlin, in the Kingdom of Prussia, German Empire, have invented new and useful Improvements in Malt-Drums, of which the following is a specification.

For preparing a malt of certain predetermined quality from raw malt by drying and curing the latter the following conditions must be observed: First, the malt must be ventilated by means of warm air, and the moisture of this air, as well as the intensity of the current, must be capable of regulation, and, second, the heating must be independent of the ventilation. These requirements are fulfilled in the arrangement of the drum represented in the accompanying drawings, in which—

Figure 1 is a longitudinal section of the apparatus constructed according to the present invention. Fig. 2 is a detail view of a portion of the apparatus shown in Fig. 1. Fig. 3 is a cross-section of the apparatus on the line 3 3 of Fig. 1; and Fig. 4 is a cross-section of the said apparatus, taken on the line 4 4 of Fig. 1.

Similar letters of reference indicate corresponding parts in the several figures of the drawings.

The construction of the drum itself is, generally speaking, not novel. It consists of a slowly-revolving closed shell or drum which for aerating purposes is provided with a perforated central tube closed at one end and a number of perforated tubes *g* in proximity to the periphery of the drum, which are closed at the other end. The ventilating-air enters the tubes *g*, passes through the perforations of the same into the grain with which the drum is charged, and finds its exit through the central tube. In order now to enable special predetermined qualities of malt to be produced, the tubes *g* are provided with heaters for the circulation of a heating medium, such as steam, air, or a liquid. These heaters *f*, Figs. 1, 3, and 4, are connected together at the front end of the drum in such a manner and are so arranged that the heating medium enters by pipe *e*, passes through the heaters *f*, disposed inside the outer tubes *g*, and finds its exit through pipe *h*.

Fig. 2 shows in detail the connection of pipes *e* and *h* with the supply and discharge pipe of the heating medium, which connection, as is clearly shown in the drawings, allows the whole drum to revolve, together with the pipes *e* and *h* and the heaters *f*.

The drum is mounted in a closed kiln, into which heated air can be introduced through the inlet *a*, the moisture of such air being regulated by mixing, for example, steam therewith. This air enters the tubes *g* of the drum, where it becomes still further heated by contact with the heating-pipes. The air then passes through the malt and finally escapes at *b* through the central flue *k*. The sprouts of malt are thereby broken off as usual. In order to insure regularity in the heating and ventilating of the malt in the corners near the head of the drum, holes covered by perforated plates *d* are provided, as shown in Figs. 1, 2, and 3.

It is well known that malt on being cured and dried loses in volume by desiccation, the proportion of the dried malt to the raw or green malt being about 1 to 1.8 or 1 to 1.9. For this reason it is impossible to carry out in one operation the process of drying and curing in a single drum because of the central tube becoming partially uncovered from the malt during the curing process and this again preventing the malt from being thoroughly and evenly ventilated. It is, however, of importance, particularly in small malting plants, to carry out the process in one and the same drum, and this, I find, can be successfully accomplished by dividing the drum into a plurality of compartments, as in Fig. 1, where there are two of such compartments. The division is made by means of internal partitions, which, like the head-plate of the drum, are provided with holes covered by perforated plates *d*. The compartments all of them are in the first instance filled to the proper extent with raw malt, as indicated in Fig. 1, and the first stage of the operation is carried on in all the compartments; but when during the progress of the operation the volume of malt becomes so much reduced by shrinkage as to prevent proper ventilation then the contents of one compartment—for

example, the left-hand end compartment in Fig. 1—is emptied into the other compartment, so as to properly fill the latter, the compartment thus emptied remaining so during the subsequent stages of the operation.

A regulation-valve C is provided, which is closed whenever one compartment is empty. Without such valve all the air entering the empty compartment would pass out from the drum by the easiest path—that is, directly from the empty compartment into the central tube *k;* but by closing the valve *c* the air entering the empty compartment will be forced to pass through the perforated plates of the partition into the adjoining filled compartment and to act upon and pass through the mass of malt therein contained.

m m are manholes provided with covers serving for charging and emptying the drum or the compartments of the same.

The improved arrangement as here adopted is therefore suitable, first, for malt-drying by supplying a ventilating air-current, either cold or hot, through the outer tubes and thence into the drum itself and giving such air-current any desired force, temperature, and moisture, and, second, for curing the malt by heating the product to any temperature desired independent of ventilation.

What I claim, and desire to secure by Letters Patent, is—

1. A revolving drum for malting and drying grain comprising an outer shell, a central perforated tube closed at one end of the drum, perforated tubes arranged near the periphery of the shell, and closed at the opposite end of the drum, in combination with a closed kiln, means for supplying the same with hot and moist air, and heaters arranged within said peripherally-located perforated tubes, substantially as and for the purposes hereinbefore set forth.

2. A revolving drum for malting and drying grain comprising an outer shell, a central perforated tube closed at one end of the drum, perforated tubes arranged near the periphery of the shell and closed at the opposite end of the drum, in combination with a closed kiln, means for supplying the same with hot and moist air, heaters arranged within said peripherally-located perforated tubes, supply and discharge pipes for the heating agent, and connections between said heaters and said supply and discharge pipes, substantially as and for the purposes hereinbefore set forth.

3. A revolving drum for malting and drying grain consisting of an outer shell, internally partitioned off into a plurality of communicating compartments, a central perforated tube closed at one end of the drum and extending through said compartments, perforated tubes arranged near the periphery of the shell and also extending through said compartments, heaters arranged in said peripherally-located perforated tubes and a regulating valve or valves C in the central perforated tube, substantially as and for the purposes hereinbefore set forth.

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

FRIEDRICH KNÜTTEL.

Witnesses:
HENRY HASPER,
WOLDEMAR HAUPT.