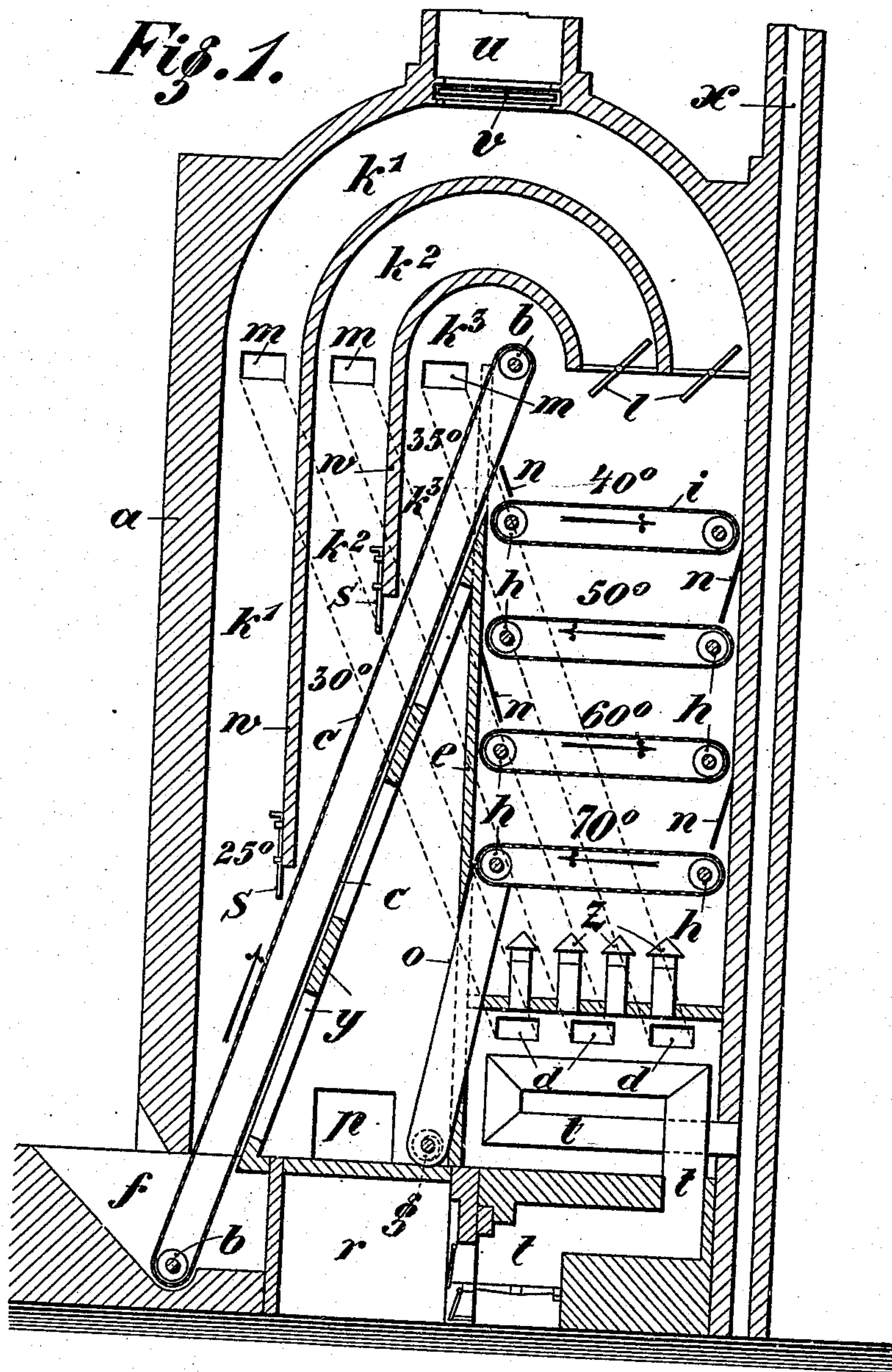


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R. ROTH.
MALT KILN.
APPLICATION FILED APR. 10, 1909.

Patented Oct. 12, 1909.
2 SHEETS—SHEET 1.



Witnesses:

John Hans
Carl Singer

Inventor:

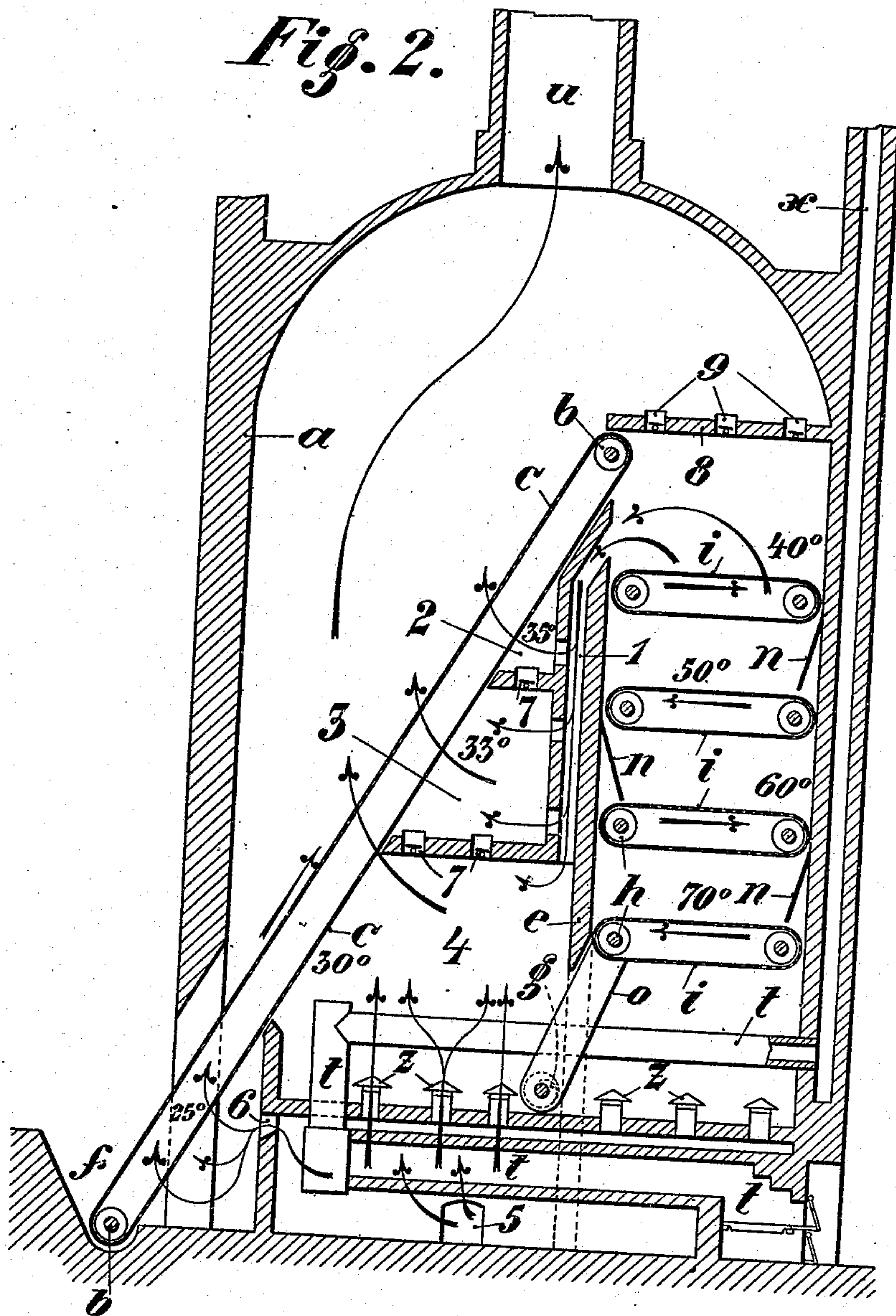
Richard Roth.

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Fig. 2.



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UNITED STATES PATENT OFFICE.

RICHARD ROTH, OF ERFURT, GERMANY.

MALT-KILN.

936,947.

Specification of Letters Patent.

Patented Oct. 12, 1909.

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To all whom it may concern:

Be it known that I, RICHARD ROTH, a subject of the Emperor of Germany, residing at 81 Göthestrass, Erfurt, Saxony, Germany, have invented new and useful Improvements in Malt-Kilns, of which the following is a specification.

Previous to recharging ordinarily constructed malt kilns with green-malt, said kilns must be cooled and then gradually reheated for the treatment of the fresh charge, as a too sudden exposure of the moist material to great heat would produce hardening or vitrification of the starchy or dextrin matter contained in the same. Also kilns having separate air-currents for each drying floor, are not exempt from said disadvantage, as the malt cannot be directly transferred from one floor to another which is considerably hotter. The necessary cooling and re-heating of the kiln incur, naturally, increased consumption of fuel as well as waste of time, disadvantages which are obviated in a kiln constructed according to the present invention.

While being conveyed through the improved kiln on a traveling, preliminary drying-hurdle in one continuous flow, the green-malt is exposed to separated air-currents of which each succeeding one has a higher temperature than the other so that, when reaching the uppermost hurdle in the kiln proper, it is sufficiently dry for enduring the increased heat without the risk of vitrification.

In the annexed drawings, two forms of construction of the improved kiln are shown diagrammatically in vertical sections.

The kiln *a* is divided, by means of a partition *e*, into two parts, the kiln proper and a preliminary drying chamber.

In Figure 1 the kiln proper is provided with a furnace *t*, which can be of any suitable construction and connected to a chimney *x*. Said furnace is fed from the stoke-hole *r*. The heated air rises through pipes *z* into the kiln proper where it passes through the hurdles, consisting of a series of superposed traveling-aprons *i* on which the initially dried malt is placed. Gradually cooled through the passing of the hurdles, the air then enters the flues *k*¹, *k*² and *k*³, by which it is conducted in an upward circle to the drying-chamber where it passes the drying-hurdle *c* arranged in slanting position in said chamber, and is subsequently drawn out through the flue *p*. The temperature of the

separate air-currents can be adjusted according to requirement, partly by means of dampers *l*, arranged in the flues so as to regulate the admission of heated air, and partly by the arrangement of air-shafts *m* through which either cold air from the atmosphere, or, in case of need, hot air from the flues *d* connected to the furnace, can be supplied. Besides, a ventilator *u*, provided with a damper *v*, is arranged in the crown of the kiln, through which hot air may, if need be, be discharged.

The drying-hurdle consists of an endless apron *c* formed of open material, so as to allow the air to pass through. It is carried on rollers *b* and receives in the feed-chute *f* a uniform layer of green-malt. The walls *w* of the flues *k*¹, *k*², *k*³, are adapted to closely approach the malt-layer, and a further tightening is effected by means of slides *s* arranged at the extremities of the walls. In this manner each separate air-current, the temperature of which is adjusted according to requirement, can only pass through the portion of the malt-layer that closes the particular flue. Here it absorbs moisture according to its dryness and temperature and then, without coming into contact with other parts of the malt-layer, passes out through the discharge flue *p*. A wall *y*, carried underneath and parallel to the apron *c*, is provided with apertures coinciding with the flues *k*¹, *k*², *k*³, so as to aid in keeping the separate air-currents apart from each other. Moving either continuously or stepwise, the apron *c* carries the malt-layer from one flue to the other, there to be exposed to the different air-currents of which each succeeding one has a higher temperature than the other. The malt is thereby gradually freed from moisture so that, when reaching the end of the hurdle *c* it is sufficiently dry for being transferred to the hurdles in the kiln proper. Instead of three, any suitable number of flues may, of course, be arranged. In view of the intended continuous rotation of the aprons, the latter are preferably arranged for self-clearing, which can be done in the same way as in the case of ordinary belt picking-tables, or in any other manner. The kiln hurdles also consist of endless aprons *i* rotating on rollers *h* and moving alternately in opposite directions so that the malt passes, over deflectors *n*, from one hurdle to another in succession. The lowermost hurdle, which is exposed to the greatest

heat, delivers the malt into the discharge chute *o* whence it is removed by suitable means, for instance by a worm-conveyer *g*.

The working of the kiln is as follows:—

5 The green-malt is collected from the feed-chute *f* by the apron *c* and, while being exposed to the air-currents emanating from the flues *h*¹, *h*², *h*³, it is conveyed by said aprons to the top of the kiln. It is immaterial
10 whether the apron *c* moves continuously or by leaps from flue to flue, as the result remains the same in both cases. The apron *c* delivers the malt to the first hurdle in the kiln proper, whereupon it travels from hurdle to hurdle until it is discharged into the discharge chute *o*. All the hurdles, or
15 aprons, are preferably connected to the same actuating mechanism by means of a chain- or a worm-wheel gearing or the like, so that the same quantity of malt is always taken
20 up from the chute *f* as discharged into the chute *o*, whether the movement of the hurdles be continuous or otherwise. As the same temperature is maintained in the furnace during the whole of this operation in
25 spite of the constant introduction of green-malt, the consumption of fuel is considerably lessened and, as no time is occupied in cooling and clearing the kiln or in turning the material, a saving of time as well as of labor
30 is effected.

In the modification shown in Fig. 2, the air is conducted from the kiln proper into the drying chamber through a downwardly
35 directed flue arranged underneath the drying-hurdle or apron *c*. From said flue it is distributed into different compartments whence the air-currents of different temperature thus produced are conducted
40 through the drying-hurdle and its layer of green-malt and subsequently discharged through the pipe *u*. Also in this case the action of the different air-currents is restricted to the particular portion of the malt-layer which faces each particular chamber.
45 In order to regulate the absorptivity of the dry air acting on the green-malt, a flue is arranged at the base of the kiln for the introduction of fresh air from the atmosphere,
50 which air becomes more or less heated through its contact with the furnace and then mixes with the other dry air rising through the malt-layer. As the furnace in this construction projects into the drying
55 chamber, also the lower part of the drying-hurdle, which descends into the feed-chute *f*, can be actuated by a current of dry air, so that the green-malt is, during its whole travel from said chute to the kiln hurdles,
60 exposed to air currents of which each succeeding one has a higher temperature than the other. The malt will therefore be sufficiently dry before reaching the kiln proper to completely prevent the production of
65 vitreous particles. By opening and closing

the passages arranged between the compartments as well as at the top of the kiln proper; the drying of the green-malt can, if desired, be retarded and even fully suppressed. This regulation is, in addition, effected through
70 the inlet of fresh air from the base of the kiln. Said air may be either slightly or not at all heated by the furnace.

In the drawing (Fig. 2) 1 is the flue leading from the kiln proper into the drying
75 chamber and conducting the air to the compartments 2, 3 and 4. The lower one of said compartments is located above the rear part of the furnace *t*, the pipes *z* of which introduce the heated air into the drying chamber.
80 At the base of the kiln, a flue 5, provided with a damper and adapted to supply fresh air, is arranged. A passage 6 is provided in the wall of the furnace which supplies heated air to the lower part of the
85 drying-hurdle. Between the compartments 2, 3 and 4, adjustable passages 7 are arranged whereby the different temperatures of said compartments can, if desired, be more
90 or less equalized. In order to retard or completely suppress the drying process, the roof 8, arranged at the top of the kiln proper, is provided with adjustable passages 9, through
95 which the air rising from the kiln can be directly discharged. The working of this construction is the same as in Fig. 1.

In the drawing the approximate temperatures at each stage of the process are indicated in degrees of centigrade.

The drying-hurdle is placed in slanting
100 position only in order to economize space; any other position may be resorted to, in which case the structure of the kiln must be correspondingly modified and the hurdle
105 may also be divided up into parts. The slanting position is, however, preferable in that thereby a separate elevator for the green-malt is dispensed with.

I claim:

1. A malt-kiln for uninterrupted kiln-drying, comprising in combination, a kiln divided into two parts: a kiln proper and a preliminary drying chamber, a feed-chute arranged at the base of the kiln and in front
110 of said drying chamber, hurdles consisting of a series of superposed traveling aprons arranged in said kiln proper, a drying hurdle consisting of an endless traveling apron formed of open material arranged in said
115 drying chamber and adapted to convey the green malt from said feed-chute to the hurdles of the kiln proper, means for dividing the heated air, rising from the kiln proper, into separate currents and conducting said
120 currents through the drying hurdle arranged in the drying chamber and through its layer of green-malt, and means for regulating the temperatures and the absorptivity of the air-currents, substantially as set forth.
125

2. A malt-kiln for uninterrupted kiln-drying
130

ing, comprising in combination, a kiln divided into two parts: a kiln proper and a preliminary drying chamber, hurdles consisting of a series of superposed traveling
5 aprons arranged in said kiln proper, a drying hurdle consisting of an endless traveling apron arranged in said drying chamber and adapted to convey the green-malt through said chamber, flues adapted to divide the air, rising from the kiln proper,
10 into separate currents and to pass such air-currents through the drying hurdle, means for supplying heated air from the furnace direct to the drying chamber and means for
15 supplying cold air from the atmosphere to the same, substantially as and for the purpose set forth.

3. A malt-kiln for uninterrupted kiln-drying, comprising in combination, a kiln di-

vided into two parts: a kiln proper and a preliminary drying chamber, a drying-hurdle consisting of an endless traveling apron formed of open material and adapted to serve as elevator for the green-malt, kiln-hurdles consisting of a series of superposed
20 endless aprons, traveling alternately in opposite directions, arranged in said kiln proper and adapted to receive the green-malt from said drying-hurdle, a discharge-chute into which the malt is discharged by
25 the lowest hurdle, and means for exposing said drying-hurdle and its malt-layer to separate air-currents of different temperature, substantially as set forth.

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