(No Model.) 3 Sheets—Sheet 1.

G. A. KRAUSE.

MALTING APPARATUS.

No. 481,958. Patented Sept. 6, 1892.

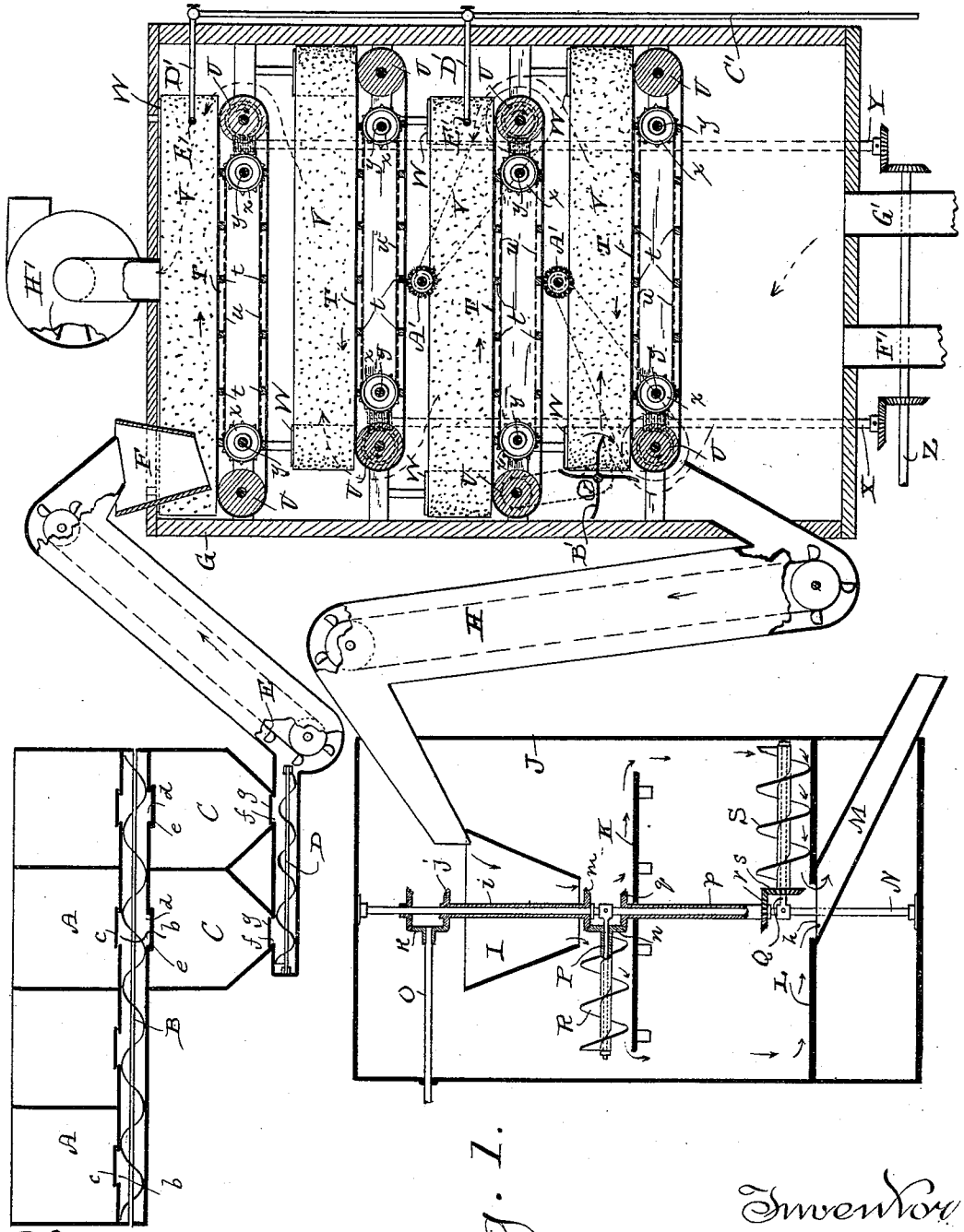

Fig. 1.

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Fig. 3.

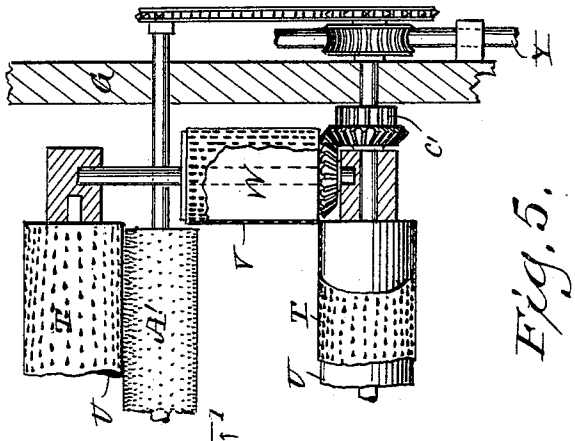
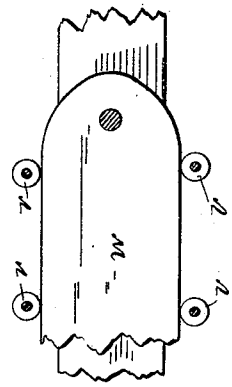


Fig. 5.



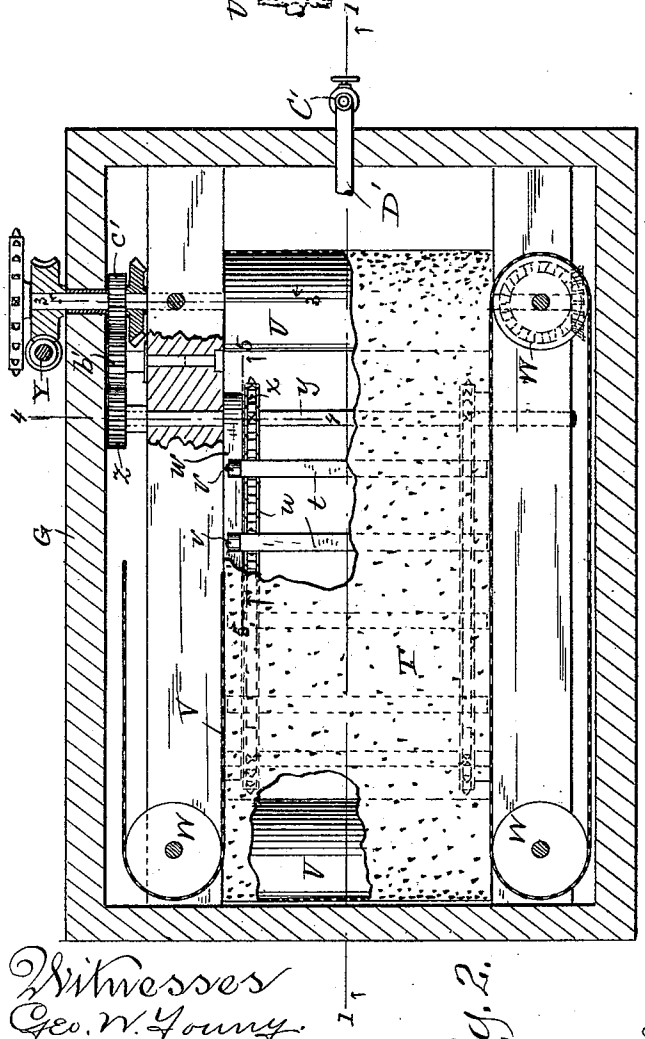


Fig. 2.

Fig. 4.

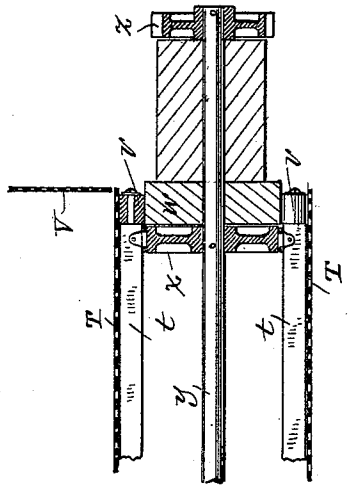


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Fig. 6.

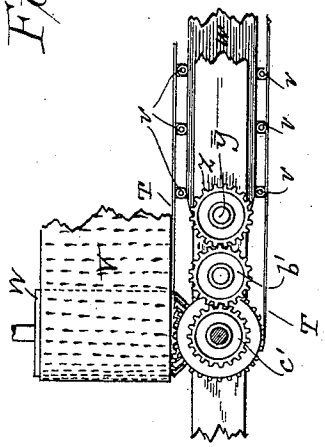


Fig. 7.

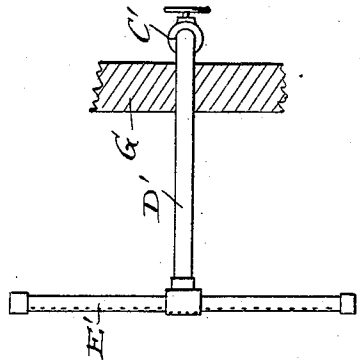
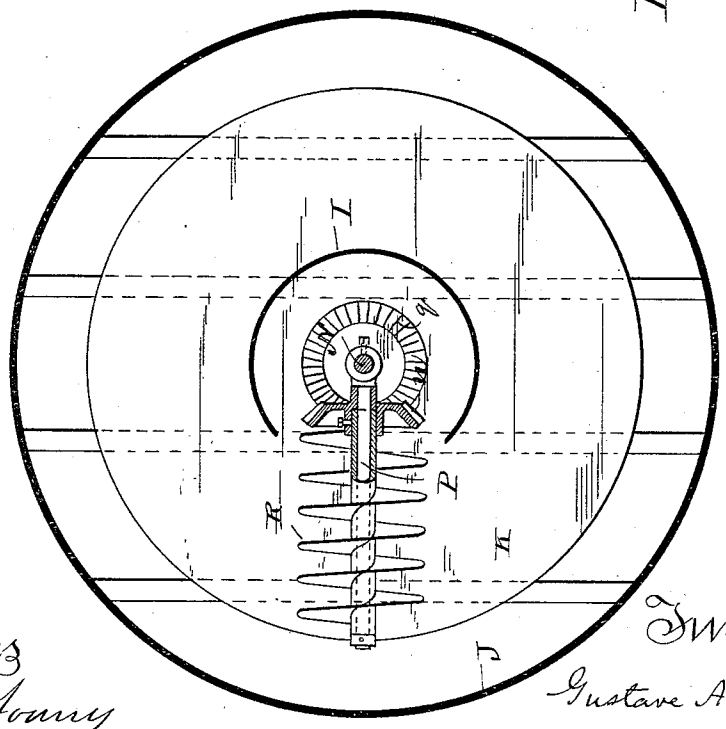


Fig. 8.



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UNITED STATES PATENT OFFICE.

GUSTAVE A. KRAUSE, OF MILWAUKEE, WISCONSIN, ASSIGNOR OF ONE-FOURTH TO GEORGE C. H. GUETTLER AND GEORGE KRAUSSLACH, OF SAME PLACE.

MALTING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 481,958, dated September 6, 1892.

Application filed September 7, 1891. Serial No. 404,968. (No model.)

To all whom it may concern:

Be it known that I, GUSTAVE A. KRAUSE, a citizen of the United States, and a resident of Milwaukee, in the county of Milwaukee, and in the State of Wisconsin, have invented certain new and useful Improvements in Malting; and I do hereby declare that the following is a full, clear, and exact description thereof.

My invention has for its object to make a whiter, cleaner, and more brittle malt than is ordinarily the case without the employment of chemicals, as well as to produce the malt in a continuous stream, and also to do away with the necessity of working said malt in vats or drums or on open floors.

My invention consists in certain peculiarities of construction and combination of parts, to be hereinafter described with reference to the accompanying drawings, and subsequently claimed.

In the drawings, Figure 1 represents a sectional view of an apparatus constructed according to my invention for the purpose of carrying out my improved system of malting, the section being mainly taken on line 1 1 of the succeeding figure; Fig. 2, a horizontal section of a portion of said apparatus, certain of the parts being partly broken away; Figs. 3, 4, and 5, detail sectional views, respectively, taken on lines 3 3, 4 4, and 5 5 of the preceding figure; Fig. 6, a detail elevation of a system of gearing forming part of said apparatus; Fig. 7, a detail plan view of a sprinkler, and Fig. 8 a horizontal section of a kiln that forms part of the aforesaid apparatus.

Referring by letter to the drawings, A represents a series of steeping-vats arranged over a screw or other suitable conveyer B, and each of these vats has a bottom opening *b*, normally closed by a sliding cover *c*, as shown in Fig. 1.

Beneath the conveyer B are one or more receptacles C, (two being shown,) the top of each receptacle being closed, except for an opening *d*, that is controlled by a slide *e*, while at the same time the bottom of each receptacle has an opening *f*, that is normally closed by a slide *g*.

Arranged beneath the receptacle C is a screw or other suitable conveyer D, that leads to an elevator E of any suitable construction, and the latter discharges into a hopper F in the top of a casing G, wherein is contained a series of traveling screen-floors, to be hereinafter described as to details of construction.

An elevator H of any suitable construction leads from the casing G to a hopper I within a kiln J, and beneath this hopper is a floor K of less diameter than the kiln, another floor L of a diameter equal to that of said kiln being arranged a certain distance below the first and provided with a central discharge-opening *h* in register with a spout M, that extends outside of the aforesaid kiln.

A vertical shaft N, centrally arranged in the kiln J, is bevel-geared to a drive-shaft O, and fast on the first of these shafts are arms P Q, on which are sleeved screw-stirrers R S, these stirrers being relative to the floors K L above described.

A sleeve *i* on the shaft N is provided with a bevel gear-wheel *j*, in mesh with the driving gear-wheel *k*, and another bevel gear-wheel *m* on the same sleeve meshes with a like wheel *n* on the stirrer R. Another sleeve *p* on the shaft N carries a bevel gear-wheel *q* in mesh with the one *n* on the stirrer R, and this latter sleeve also carries a like wheel *r* in mesh with a similar wheel *s* on the stirrer S. By means of the gearing just described the stirrers R S are given a planetary movement, or, in other words, they are rotated with the shaft N while having a rotation on their own axes. It is also to be observed that the rotation of the stirrer R is such as to cause material on the floor K to be forced toward the periphery of the latter, while at the same time the rotation of the stirrer S is such as to cause material on the floor L to move in toward the center and fall through the central opening *h* into the spout M, that extends outside the kiln.

Each of the above-mentioned traveling screen-floors comprises an endless apron T, of any suitable foraminous material, arranged on horizontal rollers U, journaled in suitable bearings within the casing G, and at each edge of the apron is a guard-belt V, also of suitable foraminous material, arranged on

vertically-disposed rollers W, that are journaled in suitable bearings.

Extending up outside the casing G are two vertical shafts X Y, bevel-geared to a drive-shaft Z in such a manner as to rotate in opposite directions, and these vertical shafts are worm-geared to journals of certain of the screen-floor rollers. In Fig. 1 I have shown four screen-floors in the series' the first (counting from the top) and third having one of their driving-rollers in gear with the vertical shaft Y, while the second and fourth of said floors have the driving-rollers thereof in gear with the vertical shaft X, whereby each alternate floor is caused to travel in a direction opposite to its predecessor. The screen-floors are supported by braces *t*, that are fast to drive-chains *u*, and carry antifriction-rollers *v*, arranged to travel on suitably-arranged tracks *w*, the chains being mounted on sprocket-wheels *x* on shaft *y*, that rotate in suitable bearings. One sprocket-wheel shaft of the supporting mechanism for each screen-floor carries a gear-wheel *z* in mesh with an idler *b'*, and this idler meshes with another gear-wheel *c'* on the adjacent roller-journal that is in gear with one or the other of the vertical shafts X Y above described, whereby each support is caused to travel in the same direction as its relative screen-floor, and the gearing is preferably proportioned so that the speed of said support corresponds to that of said screen-floor. One roller of each guard-belt V is bevel-geared to a journal of the drive-roller for the adjacent screen-floor, and all of the guard-belts move in the same direction and at the same speed as their relative screen-floors.

As shown in Fig. 1, a rotary brush A' may be arranged to clean any one or all of the traveling screen-floors, each brush being driven by a chain-gear in connection with the driving-roller of the relative screen-floor, as best illustrated in Fig. 3.

As shown in Fig. 1, a rotary picker B' is arranged at the discharge end of the lowermost screen-floor, this picker being driven by a chain-gear in connection with a roller for the adjacent screen-floor.

On the outside of the casing G is a vertical pipe C' for connection with a source of water-supply, and leading from this pipe are horizontal valve-controlled branches D', that lead into said casing and terminate in right-angled perforated extensions E', arranged above certain of the screen-floors, these branches and their perforated extensions being hereinafter designated by the general term "sprinklers."

Leading into the bottom of the casing G is a cold-air pipe F' and a hot-air pipe G', and a draft is created in said casing by means of a suction-fan H', arranged at the top, as clearly illustrated in Fig. 1.

The malting operation is as follows: The grain is first steeped in the vats A for a certain length of time, said vats being successively filled and emptied. The grain in the first vat being sufficiently steeped, it is let into the conveyer B and delivered to one of the receptacles C, from whence it is taken by the conveyer D to the elevator E and delivered onto the first of the traveling screen-floors T, from whence it passes onto the next of these screen-floors, and so on throughout the series, the air within the casing G being kept at a temperature sufficient to cause a germination of said grain, said air being moistened, when necessary, by means of the sprinklers above described. While the grain from one vat is being treated, that in the next vat is being delivered to the second of the receptacles C and the grain in the third vat is undergoing the steeping process. The vats being successively emptied at regular intervals and their contents delivered to the traveling screen-floors, the malting operation is a continuous one, and this is one of the principal objects of my invention. The germinated grain passes from the last of the traveling screen-floors into the elevator H, being assisted thereto by the rotary picker B', and is delivered through the hopper I onto the kiln-floor K and while being subjected to heat is agitated by the stirrer R. It is to be understood that the material has become gummy by the time it reaches the delivery end of the last screen-floor and the picker B' is employed to shred the mass, so that it will readily enter the elevator H, leading to the kiln. The stirrer R forces the material outward toward the edge of the first kiln-floor, from whence it falls onto the second kiln-floor L and is further agitated by the stirrer S and drawn in toward the delivery-opening in the bottom of this latter kiln-floor to be spouted out of the kiln as malt of more than ordinarily-fine character.

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

1. A germinating-chamber provided with a series of endless screen-floors the alternate members of which are made to travel in opposite directions, a support for each screen-floor, consisting of a pair of endless chains driven by sprocket-wheels and connected at intervals by transverse braces that impinge against said screen-floor, suitable means for conveying steeped grain to the germinating-chamber, and other suitable means for conveying the germinated material to a drying-kiln, substantially as set forth.

2. A germinating-chamber provided with a series of endless screen-floors the alternate members of which are made to travel in opposite directions, endless traveling supports for the screen-floors, endless traveling guards for said floors, suitable means for conveying steeped grain to the germinating-chamber, and other suitable means for conveying the germinated material to a drying-kiln, substantially as set forth.

3. A germinating-chamber provided with a series of endless screen-floors the alternate members of which are made to travel in op-

posite directions, tracks arranged in the germinating-chamber, a support for each screen-floor, consisting of a pair of endless chains driven by sprocket-wheels and connected at intervals by transverse braces that impinge against said screen-floor, antifriction-rollers carried with the support to run on said tracks, suitable means for conveying the steeped grain to the germinating-chamber, and other suitable means for conveying the germinated material to a drying-kiln, substantially as set forth.

4. A series of steeping-vats, combined with a germinating-chamber connected thereto by a conveyer mechanism, a series of traveling screen-floors within the germinating-chamber, a kiln having upper and lower floors of different diameters, the lower one being the one of the greater diameter and provided with a discharge-opening, a delivery-spout in register with the discharge-opening, a screw-stirrer arranged above each kiln-floor, suitable means for imparting a planetary movement to each of the stirrers, and a conveyer mechanism connecting said germinating-chamber and kiln, substantially as set forth.

5. A malting apparatus comprising a series of steeping-tanks, a germinating-chamber, a conveyer mechanism connecting the tanks and chamber, a series of endless screen-floors the alternate members of which are made to travel in opposite directions, a support for each screen-floor, consisting of a pair of endless chains driven by sprocket-wheels and connected by transverse braces that impinge against said screen-floor, a drying-kiln, and a conveyer mechanism connecting said chamber and kiln, substantially as set forth.

In testimony that I claim the foregoing I have hereunto set my hand, at Milwaukee, in the county of Milwaukee and State of Wisconsin, in the presence of two witnesses.

GUSTAVE A. KRAUSE.

Witnesses:
N. E. OLIPHANT,
WM. KLUG.