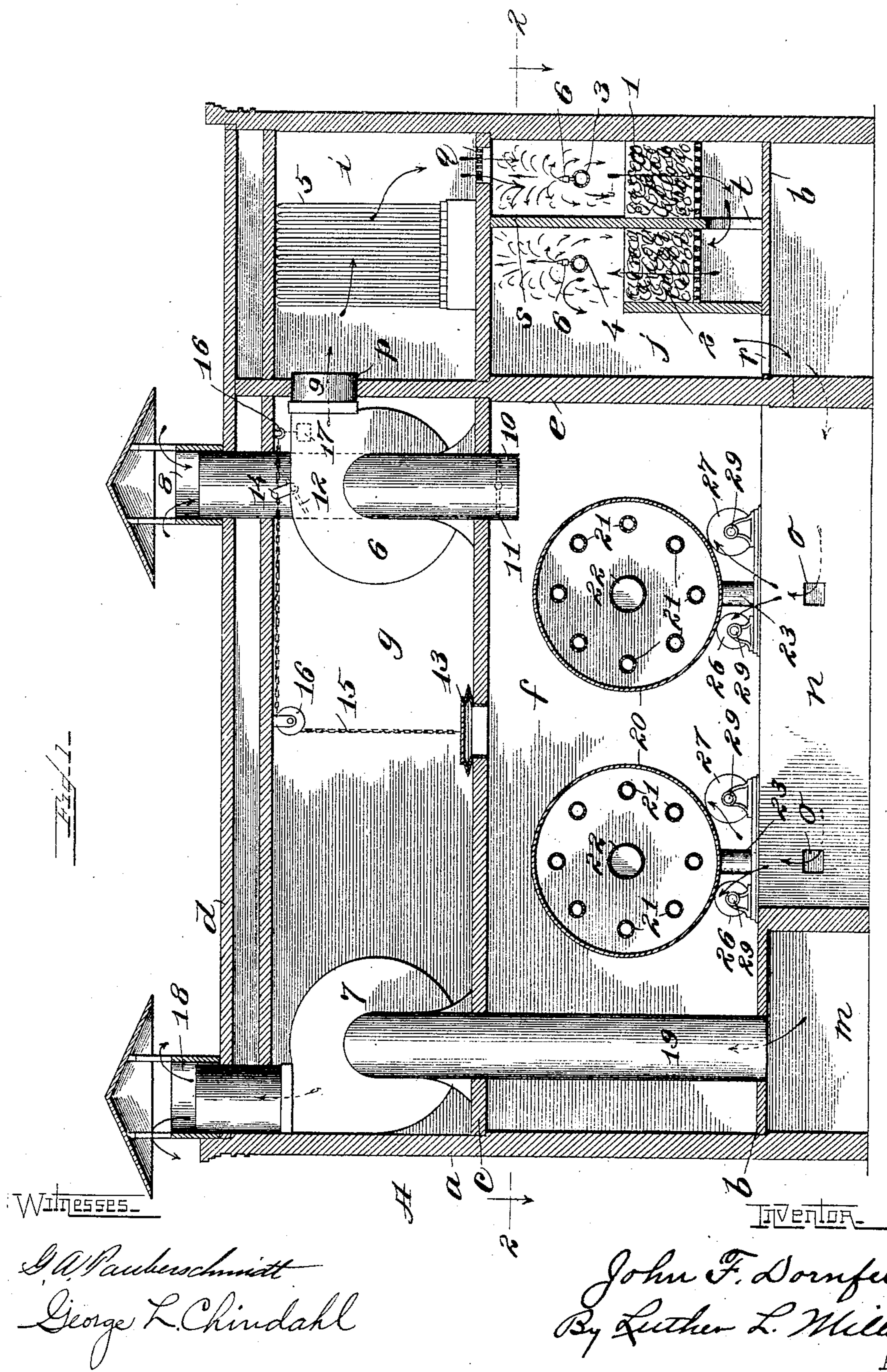


J. F. DORNFELD.
MALTING APPARATUS.
APPLICATION FILED APR. 18, 1903.

3 SHEETS—SHEET 1.



WITNESSES—
D. A. Paulschmitt
George L. Chindahl

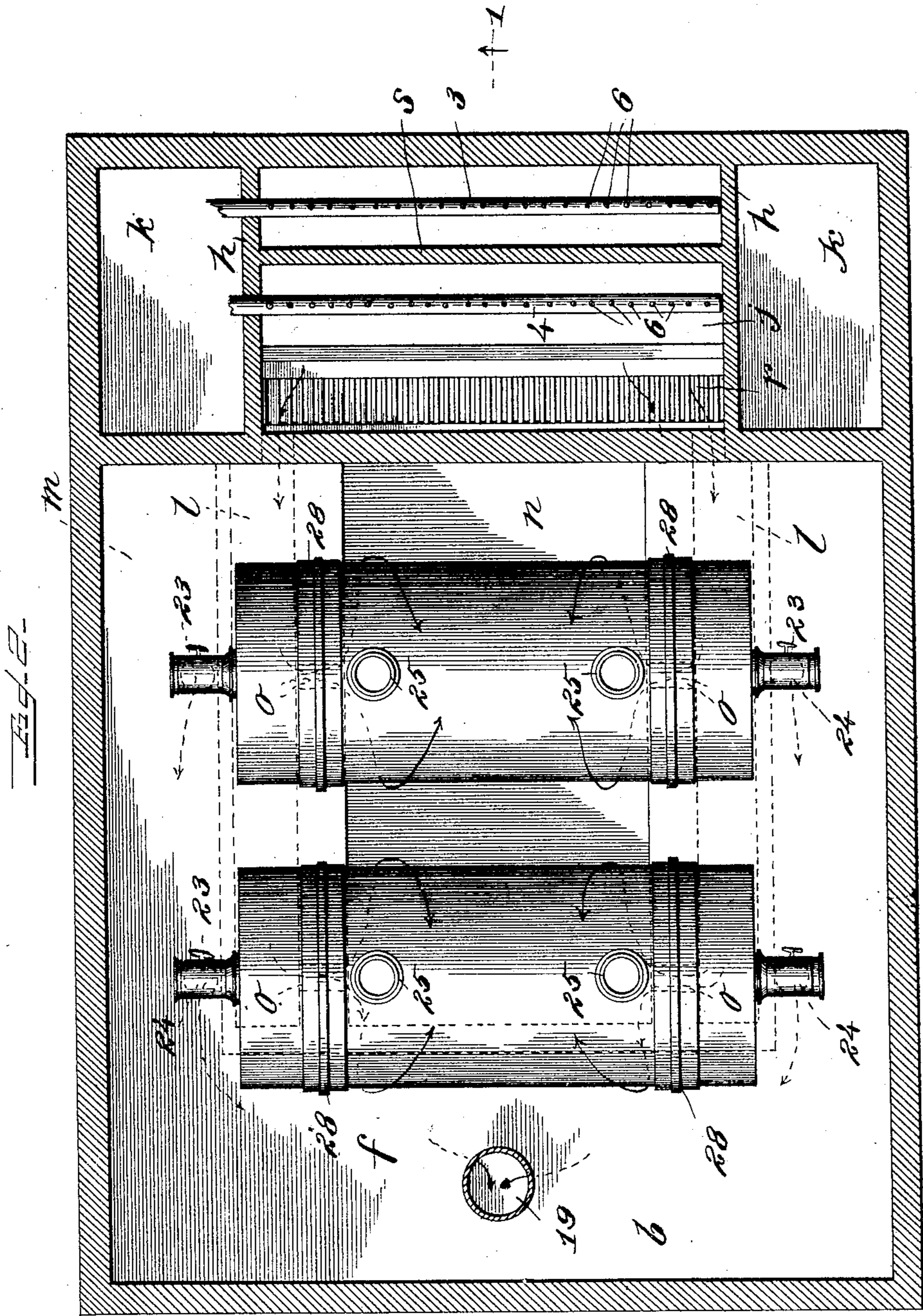
INVENTOR—
John F. Dornfeld
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No. 803,675.

PATENTED NOV. 7, 1905.

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3 SHEETS—SHEET 2.



Witnesses—

W. Pauberschmidt
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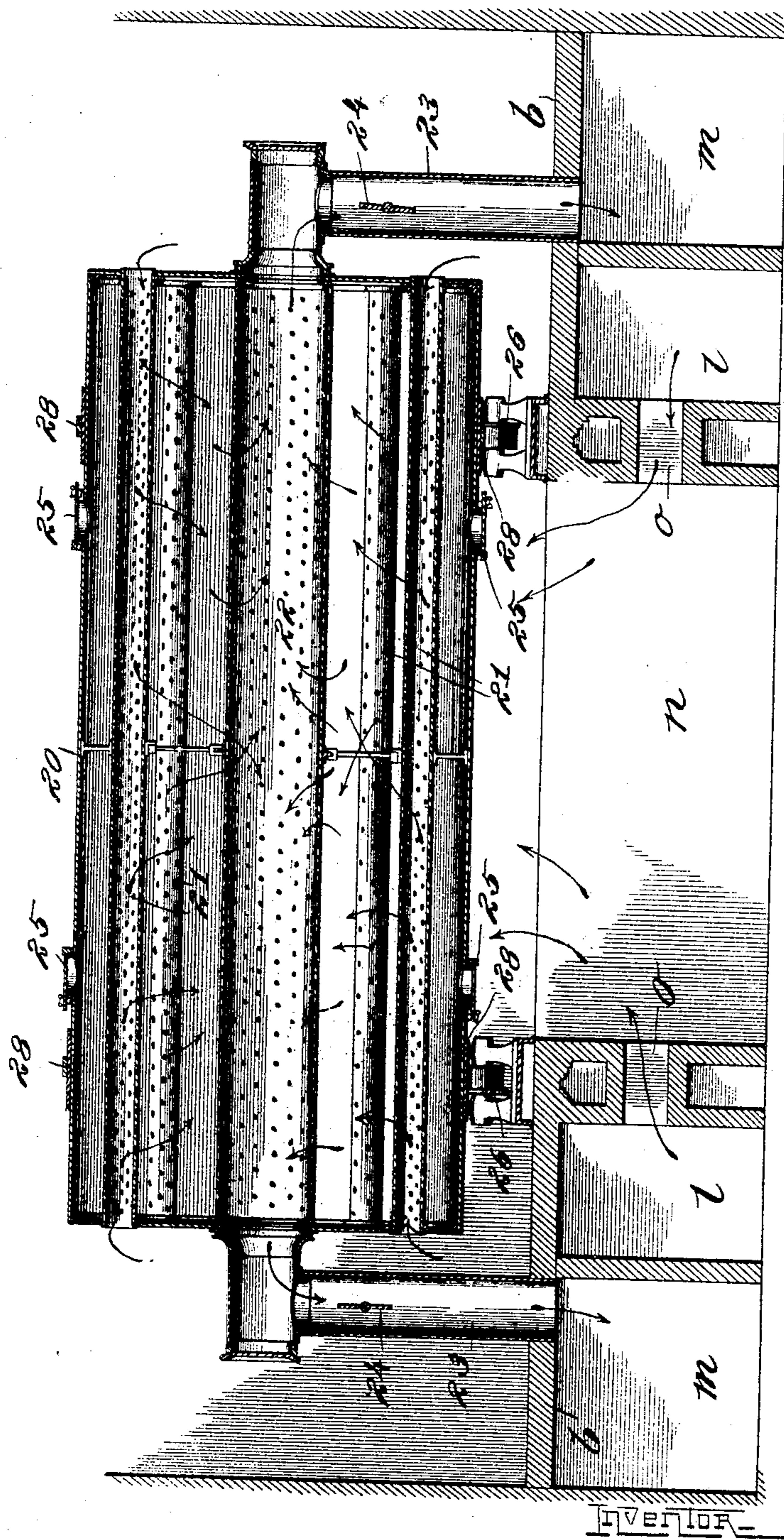
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3 SHEETS--SHEET 3.



Witnesses -

~~G A Paulenschmitt~~
George L Chindahl

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UNITED STATES PATENT OFFICE.

JOHN F. DORNFELD, OF CHICAGO, ILLINOIS.

MALTING APPARATUS.

No. 803,675.

Specification of Letters Patent.

Patented Nov. 7, 1905.

Application filed April 18, 1903. Serial No. 153,188.

To all whom it may concern:

Be it known that I, JOHN F. DORNFELD, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Malting Apparatus, of which the following is a specification.

During the germinating step in the process of malting grain it is essential that the grain be kept uniformly at a certain moderate temperature. The germinating kernel generates a considerable amount of heat, and therefore some artificial means must be adopted to remove this heat. In cold weather the problem is not a difficult one; but in the summer months it heretofore has been nearly, if not quite, impossible to maintain a uniformity of the product of breweries owing to the differing treatment with reference to heating bestowed upon different batches of malt. Ice and artificial refrigeration as means for maintaining a uniform temperature in the malting-room are alike too expensive, a plentiful supply of cold water being apparently the only practical cooling agent.

In practice the germinating grain is robbed of its surplus heat by passing air through it, and it therefore is essential not only that this air be supplied at a certain uniform and low temperature, but that the malting-room also be filled with cool air in order that the radiating-surfaces of the malting-drums may be employed to remove the generated heat. To accomplish this, it is necessary that the air within the room that has become warmed by contact with the surfaces of the malting-drums be removed, cooled, and returned.

In order that all air admitted to the malting-room be pure and cool, I have arranged that a slight pressure in excess of the usual atmospheric pressure exist in the malting-room, so that any accidental air-leakage shall be outward rather than into the room, insuring that all air passing through the grain shall have been subjected to the action of the purifying and filtering means.

The objects, therefore, of this invention are to produce means for maintaining a low and uniform temperature in a malting-room, for introducing tempered and purified air into said malting-room, for supplying tempered and purified air to the malting apparatus, for positively withdrawing air from the malting-room should the air therein become warm,

for maintaining a pressure within the malting-room in excess of the usual atmospheric pressure, and for automatically regulating the amount of this excess pressure.

The invention further refers to various improvements in the construction of apparatus of the kind described.

As will be understood, this improved malting apparatus is of a considerable size, occupying ordinarily two or more stories of a malt-house.

In the accompanying drawings, Figure 1 is a vertical sectional view, on dotted line 1 1 of Fig. 2, through a malt-house embodying my improvements and containing the apparatus of my said invention, a portion of said apparatus being shown in section and a portion in side elevation. Fig. 2 is a horizontal sectional view taken on dotted line 2 2 of Fig. 1. Fig. 3 is a vertical central section through one of the malting-drums, this view also showing the air-tunnels beneath said drums.

In the construction of my improved malting apparatus I first provide a building A, having supporting-walls *a*, a first floor *b*, a second floor *c*, and a roof *d*. A partition *e*, extending transversely of the building from top to bottom thereof, sets off the malting-room *f* and the fan-room *g*, and the short longitudinal partitions *h h* set off the tempering-room *i* on the second floor and the purifying-room *j* on the first floor. The air-shafts *k k* are dead-spaces not used in my invention. Below the first floor *b* are two longitudinal air-inlet tunnels *l l* and an air-outlet tunnel *m*, extending beside said inlet-tunnels and across one end of the building. In the center of the malting-room *f* an open pit *n* is provided between the two air-inlets *l l*, and said pit is placed in communication with each of said inlet air-tunnels by means of the ducts *o o*, one of said ducts opening into the pit *n* at each side of said pit, directly beneath each of the malting-drums, to be later herein described.

An opening *p* is provided in the partition *e* between the fan-room and the tempering-room. A grated opening *q* is formed in the floor *c* between the tempering-room and the purifying-room, and a similar opening *r* in the floor *b* provides a communication between the purifying-room and the inlet-tunnels *l l*. The purifying-room *j* is divided by the transverse partition *s*, extending between the floors

b and *c* and having an opening *t* near the bottom of said partition to connect the two parts of the purifying-room.

The purifying-room *j* is provided with two
5 filter-chambers 1 and 2, adapted to receive coke or any other suitable filtering material, and the bottoms of these filter-chambers are perforated or of grate form to permit the passage of air through the filters. Directly over
10 the filters are two transversely-extending sprinkler-pipes 3 and 4, which are provided with a row of spraying-nozzles 6 along their upper sides. The pipes 3 and 4 are connected with a supply of cold water under pressure, the water issuing in showers from the
15 nozzles and bathing the air passing through the filter-chambers. The tempering-room *i* contains a series of steam or hot-water pipes 5, which may be used to raise the temperature
20 of the air when that is desirable or necessary.

The fan-room *g* is provided with two rotatory fans 6 and 7, the former being a blower to force air into the tempering-room *i*, the latter an exhaust-fan to draw air from the outlet air-tunnel *m*. The fan 6 has an intake-pipe 8 communicating with the outer air, a discharge-pipe 9 extending into the tempering-room *i* through the opening *p*, and an auxiliary intake-pipe 10 opening into the malting-room *f*, which auxiliary pipe is adapted to be closed by a damper 11. The opening in the intake-pipe 8 is controlled by means of a damper 12, intended to be automatically actuated by the atmospheric pressure in the
25 malting-room *f* in the following manner: A pressure-diaphragm 13, having elastic sides, opens freely into the malting-room and is connected with a bell-crank arm 14, fixed with relation to the damper 12 by means of a chain
30 15, passing over the idler-sheaves 16 and supporting the counterweight 17 at its end opposite to that attached to the diaphragm 13. When the air-pressure in the malting-room rises to a certain degree, (dependent upon the
35 weight of the diaphragm as compared with that of the counterweight 17,) the damper 12 is moved to open or close the intake-pipe 8, and thus increase or diminish the quantity of air that the fan 6 discharges into the tempering-room *i*.
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The exhaust-fan 7 has a discharge-pipe 18, extending into the open air, and an intake-pipe 19, communicating with the outlet-tunnel *m*.

In the malting-room are located malting-
55 drums of any suitable construction. In this instance I have provided the drums 20, each of which has a concentric series of longitudinally-extending air-pipes 21, open at their ends to the air in the malting-room. Intermediate their ends these air-pipes are perforated, permitting ingress for the air to the inside of the malting-drums. Each drum is also provided with a central perforated air-tube 22. The opposite ends of the air-tube 22
60 65 are connected, by means of rotatory joints of

common construction, with air-pipes 23, extending downwardly and communicating with the outlet-tunnel *m* at opposite sides of the building A. These downwardly-extending air-pipes 23 are provided with dampers 24 for
70 regulating the amount of air passing through the malting-drums or, if it is desired, for putting out of service any particular malting-drum. Suitable filling-openings 25 of common form are provided for giving access to
75 the interior of the malting-drums. In this instance each of the malting-drums is supported upon rollers 26 and 27, which rollers run upon annular tracks 28, secured upon the periphery of the drum. The roller 27 is supported upon a drive-shaft 29, to which shaft power is communicated from a prime mover in any suitable manner.
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In operation grain in condition for the germinating process is introduced into the malting-drums 20 and power supplied to rotate said drums slowly. Power is also communicated to the blower 6 and the exhaust-fan 7 for driving them. The blower 6 draws air from outside the building through its intake-pipe 8 and discharges said air through its discharge-pipe 9 into the tempering-room *i*, where if the incoming air is extremely cold its temperature may be raised by means of the heating-pipes 5. The air passes from the
85 tempering-room through the grated opening *q* into the purifying-room, in which latter room it encounters the shower from the sprinkler-pipe 3. Passing through this shower and being bathed by it the air enters
90 the filter-chamber 1, passing downwardly therethrough and emerging from the grated bottom of said chamber. Turning in the lower part of the purifying-room the current of air passes through the opening *t* in the partition *s* and passes upward through the grated
95 bottom of the filter-chamber 2, through the filtering material therein, and above said filter-chamber enters the spray from the sprinkler-pipe 4. Turning here the air-current passes downward through the grated opening *r* in the floor of the purifying-room and separates to enter the two inlet-tunnels
100 105 110 115 120 125 130 *l l*. From the inlet-tunnels the air-currents pass through the ducts *o o* to the air-pit *n* in the malting-room *f* beneath the malting-drums 20, the tempered and purified air entering the perforated air-pipes 21, extending through said drums. The pressure produced by the blower 6 and the draft caused by the suction-fan 7 urge the air forward through the grain in the malting-drums, the course of the air being through the central air-tube 22 of each of the malting-drums and downward through the discharge-pipes 23 at the ends of said drums into the outlet-tunnel *m* beneath the floor *b* of the malt-house, from which it is drawn through the intake-pipe 19 of the exhaust-fan 7 and discharged into the open air through the discharge-pipe 18. Any

desired pressure within certain moderate limits may be maintained within the malting-room by adjusting the pressure-diaphragm 13, hereinbefore described. When the air-pressure within the malting-room f reaches a certain point, the air-diaphragm 13 is inflated and the damper 12 in the intake-pipe 8 of the blower 6 is turned to partially close said intake-pipe, diminishing the quantity of air admitted through the intake-pipe 8 to the blower. If the temperature within the malting-room rises unduly, the damper 11 may be opened by the operator and air drawn from the malting-room by the blower 6 and again passed through the purifying-room j , where from contact with the filtering material in the chamber 1 and 2 and the showers of water from the sprinkler-pipes 3 and 4 it will be again purified and cooled.

As will readily be seen, the means for supplying air to the malting-room and for withdrawing heated air therefrom for the purpose of again cooling and returning it to the room may be separated and rendered wholly distinct. I have combined them to attain greater simplicity. It is also apparent that many other changes might be resorted to in the construction and arrangement of the parts of this invention without departing from the spirit and scope thereof, wherefore I desire to have it understood that I do not limit myself to the forms or arrangement herein shown and described.

I claim as my invention—

1. In a malting apparatus, in combination, a malting-room; a malt-receptacle therein; means for supplying air to said room; and means controlled by the air-pressure in the malting-room for regulating the air-supply to said room.

2. In a malting apparatus, in combination, a malting-room; a malt-receptacle therein; means for supplying air to said room; means for positively withdrawing air from said room; and means controlled by the air-pressure in the malting-room for regulating the air-supply to said room.

3. In a malting apparatus, in combination, a malting-room; a malt-receptacle therein; means for supplying air to said room; an air-outlet from said room so situated as to pass the air through the grain being treated; and means controlled by the air-pressure in the malting-room for regulating the air-supply to said room.

4. In a malting apparatus, in combination, a malting-room; a malting-drum therein; a blower for supplying air to said room; means for passing air from the malting-room to the blower; and an exhaust-fan connected with said malting-drum so as to pass the air of the room through the grain being treated.

5. In a malting apparatus, in combination, a malting-room; a malt-receptacle therein; a blower for supplying air to said room; an

exhaust-fan adapted to pass the air from said room through the grain being treated; and a diaphragm moved by the pressure of air within the malting-room to regulate the supply of air to the blower.

6. In a malting apparatus, in combination, a malting-room; a malting-drum therein; a blower for supplying air to said room and for withdrawing air from said room; an air-inlet tunnel communicating with said room; an air-outlet tunnel communicating with said malting-drum; and an exhaust-fan having connection with said outlet-tunnel for withdrawing air from the malting-room through said malting-drum.

7. In a malting apparatus, in combination, a malting-room; a malting-drum therein; a blower for supplying air to said room and for withdrawing it therefrom; means for tempering the air; an inlet-tunnel communicating with the malting-room; an outlet-tunnel communicating with said malting-drum; and an exhaust-fan connected with said outlet-tunnel for withdrawing air from said room through said malting-drum.

8. In a malting apparatus, in combination, a malting-room; a malt-receptacle therein; a blower for supplying air to said room; means for tempering the air; means for purifying and cooling the air; an inlet-tunnel and an outlet-tunnel; an exhaust-fan having connection with said outlet-tunnel; and means controlled by the air-pressure in the malting-room for regulating the air-supply to said blower.

9. In a malting apparatus, in combination, a malting-room; a malt-receptacle therein; a blower for supplying air to said room; means for tempering the air; means for purifying and cooling the air; an inlet-tunnel and an outlet-tunnel; an exhaust-fan having connection with said outlet-tunnel; and a diaphragm controlled by the air-pressure in the room for regulating the air-supply to said room.

10. In a malting apparatus, in combination, a malting-room; a malt-receptacle therein; a blower for supplying air to said room; means for tempering the air; means for purifying and cooling the air; an inlet-tunnel and an outlet-tunnel; an exhaust-fan having connection with said outlet-tunnel; a diaphragm adapted to be moved by the air-pressure in the malting-room; a damper for regulating the admission of air to said blower; and a connection between said diaphragm and said damper.

11. In a malting apparatus, in combination, a malting-room; a malt-receptacle therein; a blower for supplying air to said room; an auxiliary intake-pipe for said blower in communication with said malting-room; a damper for said auxiliary intake-pipe; and an outlet for the air from said room.

12. In a malting apparatus, in combination, a malting-room; a malting apparatus in said room, having an air-inlet communicating with the air in said room; means for withdrawing

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foul air from said malting apparatus; and means for withdrawing pure air from and returning it to said room.

13. In a malting apparatus, in combination, 5 a malting-room; a malting-drum in said room adapted to admit air from said room to its interior; and means for supplying air to said room, the room having an air-outlet communicating with the air-supplying means and an 10 air-outlet communicating with the interior of said drum.

14. In a malting apparatus, in combination, a malting-room; a malting-drum in said room adapted to admit air from said room to its interior; and means for supplying air under pressure to said room to maintain a pressure therein somewhat greater than normal atmospheric pressure, the room having an air-outlet com-

municating with the air-supplying means, and an air-outlet communicating with the interior 20 of said drum.

15. In a malting apparatus, in combination, a malting-room; a malting-drum in said room adapted to admit air from said room to its interior; means for supplying air to said room; 25 means for attemperating and purifying said air; an air-outlet for the pure air in said room, which outlet communicates with the air-supplying means; and another air-outlet from said room communicating with the interior of 30 said drum.

JOHN F. DORNFELD.

Witnesses:

L. L. MILLER,
GEORGE L. CHINDAHL.