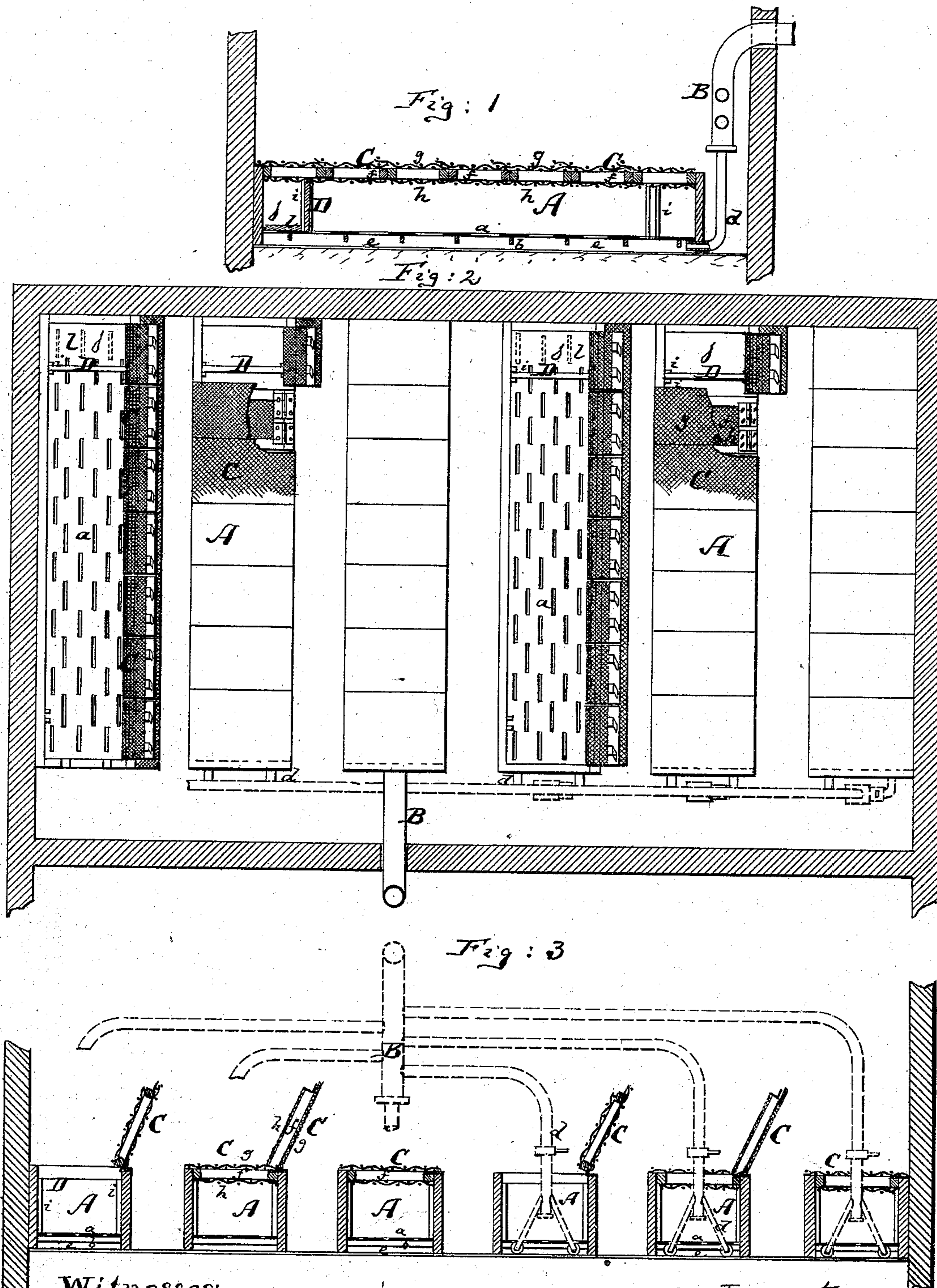


A. MARBEAU.
Apparatus for Malting.

No. 224,554.

Patented Feb. 17, 1880.



Witnesses:
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UNITED STATES PATENT OFFICE.

AUGUSTE MARBEAU, OF DIJON, FRANCE.

APPARATUS FOR MALTING.

SPECIFICATION forming part of Letters Patent No. 224,554, dated February 17, 1880.

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To all whom it may concern :

Be it known that I, AUGUSTE MARBEAU, of Dijon, France, have invented an Improved Apparatus for Malting; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the annexed sheets of drawings.

Figure 1 is a longitudinal vertical section of a vat embodying my invention. Fig. 2 is a top view of a series of such vats connected in one apparatus. Fig. 3 is a vertical cross-section of the same.

My invention relates to an improved apparatus for malting barley, and the object thereof is to cause a current of moistened fresh external air to pass through the steeped and sprouted barley while undergoing germination.

The air might be made to pass through the grain by means of a powerful exhaust fan or pump; but to do this at once economically and effectively involves the employment of a special apparatus combining, with the utmost simplicity of construction, a maximum efficiency for the production of malt of superior quality. This desirable result is obtained by the present invention, which I will now proceed to describe in detail and with reference to the accompanying drawings.

This apparatus consists of a suitable number of chests or vats, A, (six being shown in the drawings,) by preference of rectangular form, in which is placed the barley to be malted. For convenience of access passages are left on either side of the chests or vats A, except the first and last, which are close against the walls of the malt-house, as in Figs. 1 and 2. One end of all the chests is or may be formed by the wall of the malt-house, the opposite end and sides being preferably constructed of brick laid edgewise in cement and cemented on the inside and outside. The sides and front angles of the chests or vats are strengthened by suitable posts fixed in the ground or floor, and united at top by suitable cross-bars. A free passage is left at the front ends of the chests. At about five inches from the bottom of each chest or vat is placed a perforated galvanized sheet-iron tray, a, supported on an open iron frame, b.

d are branch exhaust-pipes connected at one end to the main exhaust-pipe B, leading to the fan or air-pump, and at the other end with

the space e beneath the perforated sheet-iron false bottoms or trays, upon which the layers of barley are placed. These pipes d are furnished with suitable valves for regulating the exhaust. The branch pipes d of the six chests A are all united to the main exhaust-pipe B, which is of such diameter that its sectional area is at least equal to the areas of five of the six pipes d combined. The main pipe B leads to the exhaust-fan or other apparatus employed, which may either be placed on the ground-floor or the one above, as most convenient.

All the joints of the several pipes are carefully luted with strips of cloth or paper, or, better still, soldered, so as to be air-tight.

The whole being arranged as described, the following is the system of malting adopted: The barley, after being steeped to the point desired in the ordinary way, is conveyed by chutes into one or other of the six chests—say No. 1, for example. In about twenty to twenty-four hours the barley will have commenced to sprout, and when the shoot has attained about a millimeter in length the pipes d of chests Nos. 2, 3, 4, and 5 are shut off, and the exhaust apparatus set in motion for chest No. 1 either by means of a horse-gear or a steam-engine, where one is available. All the air exhausted is drawn through the grain in chest No. 1, so that the temperature is thus regulated as desired, the lowest temperature being attained when the branch exhaust-pipe is full open, and if this appears too low and retards the germination too much the draft of air may be at once reduced by partially closing the valve, whereupon the temperature immediately rises and the germination becomes more active. From twenty to thirty hundred-weight of steeped barley are introduced every twenty-four hours into a fresh chest, so that after Nos. 2, 3, 4, and 5 are filled the malt in No. 1 will be ready to be taken to the kiln and be replaced by a fresh supply of steeped barley.

The barley should be turned over at intervals of twelve hours, and this requires no special skill for its performance, all that is necessary being to shovel it into the empty compartment reserved for this purpose, as hereinafter described, and afterward to level it.

Care should be taken to shut off the valve

on the exhaust-pipe before turning the barley or emptying the chests.

From the foregoing it will be seen that the wider the valves are opened the greater will be the air-draft and the lower the temperature in each "couch" of barley, and that thus, by means of the valves, the temperature may be regulated as desired.

In order that the air which traverses the barley-couch contained in the chests A may not abstract any of the moisture, and thus arrest the germination, a cover is applied to each chest, extending over its whole length and width, and consisting of hinged frames *cc*, laid upon the sides of the chest, and properly fitted together and carrying cross-bars *f*, from which are suspended two or three diaphragms, *g h*, of cloth, superposed at a certain distance apart, the latter being sprinkled with water from time to time, so that the air in passing through these moist diaphragms will become sufficiently charged with humidity and reduced in temperature to maintain the necessary moisture in the barley for producing perfect germination.

The above-described apparatus may be advantageously used in connection with the movable partition D in each chest—that is to say, to the inner sides of the chest, at a distance of about a yard from each end, are fixed upright cleats *i*, against which rests a vertical partition, D, extending across the chest, and equal in height to the depth of the latter above the perforated false bottom *a*. This partition is movable, and is placed at the one end of the chest or the other, according to requirements. In the short compartment *j*, formed in the chest by the partition D, which compartment *j* is thus separated from the main portion of the chest, the perforated false bottom is covered with a piece of india-rubber, *l*, or other air-proof fabric, which completely stops the perforations and prevents the exhaust from acting through the chamber *j*.

When it is necessary to turn the barley the partition D, and then the air-proof fabric *l*, are removed, whereupon the barley can be readily shoveled into the space *j* thus reserved without loss of time in clearing away a space for the purpose.

When the couch is turned the air-proof fabric and partition are successively replaced, but at the other end of the chest, care being taken that they are so arranged as to prevent any entrance of air at this point.

By the use of frames thus constructed and carrying several cloth diaphragms, *g h*, superposed and spaced as above described, I obtain the following advantages:

First, I avoid any dripping of water on the couch, because if the first or uppermost dia-

phragm, which is of woolen or other cloth, receives more water than it can absorb those beneath it receive and absorb the excess.

Second, the contact of the air with the moistened diaphragms is doubly or trebly prolonged, and the refrigeration and humefaction of the air are consequently more complete and effective.

Third, the vacant spaces between the diaphragms permit the moisture to evaporate to a great extent, whereby the temperature of the air traversing the couch is rapidly lowered.

Fourth, the sprinkling of the diaphragm with water may be more abundant and less frequent, and the diaphragms hold sufficient moisture to prevent any risk of the surface of the couch being dried by the ventilation, and the malting process may thus be carried on on any floor of the malt-house, although I would observe that on the upper floors it is advantageous to add a fourth diaphragm.

Before concluding it is very important to observe that if the level of the ground will admit of running off the water, it is extremely advantageous to perform the steeping of the grain in the chests or vats themselves. In this case, instead of laying the bricks of which they are constructed edgewise, they are laid in the usual way, as the walls of the vats are much stronger, and the posts and tie-bars before used are not required.

When lined with a tolerably thick layer of good cement the vats may, without fear of giving way or leaking, be used both for steeping and germinating or malting. A considerable economy is thus effected in material, labor, and space.

I claim—

1. In an apparatus for malting barley, the chest or vat A, provided with perforated false bottom *a*, and with suitable air-exhausting apparatus communicating with the space *e* under false bottom *a*, in combination with the diaphragms *f g*, for supplying moisture, in the manner set forth, to the currents of air drawn through the said diaphragms, for the purpose of keeping the germinating barley in the vat A properly moistened, substantially as described.

2. In the vats A of a malting apparatus constructed as described, the combination of the movable partition D and the air-proof fabric *l*, placed on the floor *a* of the space *j*, divided off by the partition D, for the purpose of reserving a space in the vat to enable the grain to be quickly turned in the manner substantially as described.

AUGUSTE MARBEAU.

Witnesses:

VELTEN, Neveu, Fils,
RICORD, AXN.