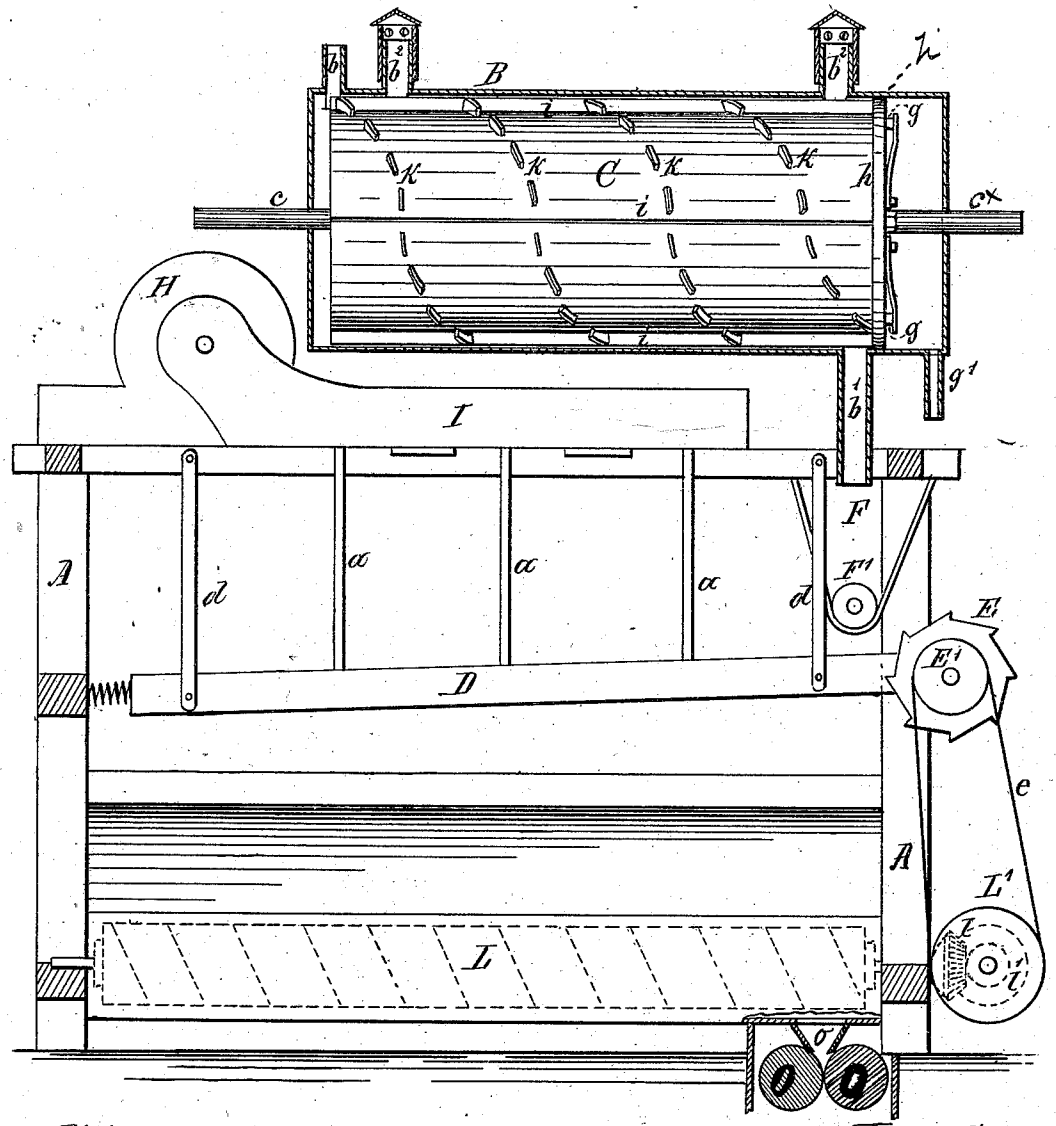
C. R. KNICKERBOCKER.

MANUFACTURE OF FLOUR.

No. 194,356. Patented Aug. 21, 1877.



Witnesses.

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UNITED STATES PATENT OFFICE.

CHARLES R. KNICKERBOCKER, OF JACKSON, MICHIGAN.

IMPROVEMENT IN THE MANUFACTURE OF FLOUR.

Specification forming part of Letters Patent No. **194,356**, dated August 21, 1877; application filed March 30, 1877.

To all whom it may concern:

Be it known that I, CHARLES R. KNICKERBOCKER, of Jackson, in the county of Jackson and State of Michigan, have invented certain new and useful Improvements in Method or Process of Drying Flour, Meal, Grain, or similar substance; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to which it appertains to make and use the same.

Prior to the date of my invention it had been customary to subject the meal to the action of artificial heat during its passage from the burrs to the reel-bolts for the purpose of drying it, in order to facilitate the separation of the impurities from the flour, and in some cases the middlings which had been bolted from meal thus treated were purified by air-currents.

But I have found that the above-described method is defective in its results, and in some respects more objectionable than the still earlier method of sending the meal or chop directly to the bolting-reels without the intervention of the heating process; because, first, the chop is not thoroughly dried, or, at least, is not dried quickly enough to insure a thorough separation by bolting; and, secondly, the introduction of the chop into the bolting-chest in a heated condition, and carrying with it a large amount of aqueous vapor, acts badly upon the bolting-cloths, "sweating" the cloth and the bolt-chest.

It is obvious that this second objection is removed by subjecting the material to the action of air-currents during its passage from the heater to the bolt, and thus thoroughly cooling and drying it before it is placed upon the bolting-cloths for separation; and I have found by experiment that the separation of the refuse from the valuable material is very greatly facilitated by drying the chop quickly by means of air-currents and before it is separated by a bolt.

The first part of my invention consists, therefore, in subjecting the material to the action of air-currents immediately after such material has left the heater, and before it is placed upon the separating-cloth, whereby it (the material) is first heated, secondly quickly cooled and dried, and, thirdly, separated.

The second part of my invention relates to passing bran or middlings which have been treated according to the first part of my invention through rollers, for the purpose of detaching the flour-producing portion of the berry from the outer husk or cuticle.

It has been customary to send the chop or meal directly to the bolting apparatus or to a hopper-boy, where it becomes gradually cool, and in either case imperfectly dried before bolting.

I have found by experimenting that if the material be exposed to currents of cool air while it is hot, and the moisture which it contains vaporizes readily, the particles, particularly of the larger granules of the flour-producing portion of the berry and of the bran, being expanded by the action of the heat, the entire mass will be much more thoroughly dried than the same material will be if it is allowed to cool slowly.

I find also that if the material, after leaving the heater, be cooled quickly by means of air-currents the impurities adhere to the flour and middlings with much less tenacity than they do where the mass is cooled slowly, and is, during the slow cooling process, stirred together, as in a reel-bolt or hopper-boy, that, after the particles have been detached from each other by the action of heat and the vapor produced by the heat, such separation remains much more perfect, and the impurities are more easily removed by reel-bolts or middlings-purifiers if the material is rapidly dried by the application of air-currents, than if the same is slowly cooled by the treatment to which it is ordinarily subjected in bolts.

In the carrying out of my invention or new method of purifying the products of grinding wheat, I propose to employ any of the well-known apparatus for heating and drying meal, flour, middlings, grain, or other similar substances, for the purpose of heating the chop or middlings to the temperature and for the length of time which the kind or condition of the material may indicate as being advantageous, and in substantially the usual manner.

I next place the heated mass upon a shaker covered with bolting-cloth, and by means of a fan pass an upward current of air through it while it is moving in a thin sheet or stream from or upon a pair of rollers or other distributing device, or while traveling over the surface of a shaker in a thin sheet. This air-current carries with it a good deal of moisture, which would otherwise be retained in the material, and leaves the flour, middlings, bran, and other impurities in a crisp and sharply-granulated condition, which greatly facilitates their subsequent separation.

I have shown in the drawings one construction of apparatus adapted for carrying out my invention, in which the parts B *b* b^1 b^2 C *c* $c^\times$ *g* *g'* *i* *k* represent that part of the apparatus in which the material is subjected to the action of heat, and is more specifically described in Patent No. 162,910 granted to C. S. Fuller, May 4, 1875.

After the heat has been applied the material passes to that part of the apparatus where it is suddenly cooled and dried by the action of air-currents.

The shaker is represented by D, the fan by H, the air-trunk by I, and the conveyer by L. F' is the feed-roller, and E a cam or ratchet wheel to impart motion to the shaker.

After the material has been sufficiently cooled and dried it may be collected by the conveyer and carried to the head of the machine, where it may be delivered through the the spout *o* to the crushing-rollers O O.

Under some circumstance I may find it advantageous to employ a reel, or some of the purifiers in which suction-spouts are employed, in which to apply the air-currents during this drying process; but I prefer the shaker, as above described.

When preferred, the flour may be bolted out without drying and the middlings only be heated, and the middlings or a portion of them may be passed through rollers, either before or after heating and drying, or between the heating and drying operations.

In order to remove the adhering flour from bran, I heat such bran, and dry it quickly by air-currents, then either pass it through a bran-duster directly or crush it by rollers or otherwise, and then either bolt out the flour or run it through a bran-duster, as its condition may indicate.

Although I have pointed out the machinery and the method of using it which I regard as being the most desirable, yet I do not wish to be limited to the use of the appliances here set forth, as many modifications might be employed without departing from the spirit of my invention, which consists, essentially, in subjecting the material to air-currents immediately after it has been acted upon by artificial heat, and before bolting.

I do not claim, broadly, the preparation of flour or middlings for bolting by heating with artificial heat, as that is shown in patent to C. F. Fuller, May 4, 1875; but Fuller's specification states that the meal which has been heated is subsequently separated into flour, middlings, &c., by bolting, and that the middlings may be then purified by an air-current, whereas the first part of my invention consists in subjecting the material to the action of artificial heat, and then to the action of air-currents, as treatment preparatory to the separation of the refuse from more valuable portion.

From the above description it will be seen that the first part of my invention may be applied to middlings, as well as to the chop, by heating them, and then cooling and drying them suddenly by means of air-currents; and it will also be seen that such treatment of middlings is not described by Fuller, as he nowhere explains that he followed the application of heating by the application of air-currents without an intervening process of bolting.

What I claim is—

1. The herein-described process of preparing the product of grinding grain for separation by heating it and then subjecting it, while in a heated condition, to the cooling and drying action of air-currents, substantially as set forth.

2. The herein-described method or process of separating flour from bran, by first heating the bran, then drying it by air-currents, then crushing it, and then removing the flour which has been thus detached, substantially as described.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

CHARLES R. KNICKERBOCKER.

Witnesses:
J. C. BONNELL,
W. B. KNICKERBOCKER.