

UNITED STATES PATENT OFFICE.

JOHN R. DAVIS, JR., OF NEENAH, WISCONSIN.

ART OF REDUCING GRAIN TO FLOUR.

SPECIFICATION forming part of Letters Patent No. 372,016, dated October 25, 1887.

Application filed February 18, 1882. Serial No. 53,085. (No model.)

To all whom it may concern:

Be it known that I, JOHN R. DAVIS, Jr., of Neenah, in the county of Winnebago and State of Wisconsin, have invented a new and useful Improvement in the Art of Reducing Grain to Flour, of which the following is a specification.

My invention has reference to the modern method of milling now generally used in this country, and known as the "gradual-reduction system," in which the material is passed through successive "breaks" or "reductions" and flour removed from the chop between each two reductions, the residue—"middlings" and "tailings"—constituting material for the succeeding break; and it has for its object to effect a more thorough and perfect separation and grading of the chop or meal as it comes from the reducing apparatus preparatory to its subsequent treatment. Heretofore the meal has been sent direct from the break to a bolt or bolts, whereby the flour is removed. From this bolting operation the middlings pass to the purifier, while residuum or tailings containing the bran and coarser products of the break go direct to the next break without purification.

The improvement consists in removing the flour and finer middlings from the chop or meal immediately after each break, and then subjecting the entire mass of the residuum—to wit, the remaining middlings, the bran, and the coarse pieces of the unreduced grain—to the conjoint actions of sifting and winnowing before rebreaking. For this purpose the plan I consider preferable is to subject the chop on its passage from the reducing instrumentalities to the action of air-currents graduated to such intensity as to take out the flour, the finer middlings, and of course the dust, after which the residuum passes to the head of the purifier-shaker, clothed with graded cloths for the separation and grading of the remaining middlings, and perflated by air drafts or blasts as it shakes, whereby the material is winnowed while being sifted. The bran and coarse particles passing over the tail of the shaker may be, and advisably are, subjected to the action of still another air-current as they fall, and, instead of sending them bodily to the next break, this latter air-current may be made to separate them into grades, a por-

tion of which will be suitable for said break, while the residue may go to the bran-duster, or be otherwise treated or disposed of.

In the accompanying drawing is represented apparatus by which my invention may be worked. This apparatus, however, forms subject-matter of an application filed by me on the 21st day of December, 1880, of which the present application is a division, and I lay no claim to it herein or to anything now specifically claimed in said parent application.

A is the frame of a purifier, provided with any suitable casing.

B is the shaker, covered with graded bolting cloth and actuated by means of the cam *b* and pulley *b'*, or in any other ordinary and desirable manner. Beneath the shaker are pockets C, for the respective grades of middlings passing through, and from these pockets lead the usual spouts, *c*, to convey their contents to the next operation. Adjustable plates or deflectors *c'* may also be provided to turn more or less of the middlings falling from the shaker into any given pocket.

Above the shaker are compartments D, practically one to each underlying pocket, communicating by means of ports *d* and adjustable gates *d'* with the air chamber E at the top of the machine, through which a strong current is induced by the suction-fan F discharging into the dust-room.

At the head of the machine, and upon the upper side timbers of its frame, is mounted a set of rolls, H H, with their appropriate adjusting devices. Other instrumentalities which, like the rolls, will discharge or feed a stream of material substantially the width of the shaker may, however, be used. Beneath the rolls or feeding mechanism is a wind-trunk and settling-chamber, H', having converging sides and vertical end pieces terminating in a spout, *h*, at the head of the shaker and extending practically the whole width thereof. The outer side of this trunk, which also forms an end piece to the purifier, is built up with slats or formed with air-ports *h'*, one above another, slanting inwardly and downwardly, so as to prohibit the escape of the falling chop or meal while admitting air-currents freely, and these air-ports are adjustable in size or closed at will by means of gates *h''*. At its inner side the trunk communicates by means of

a throat controlled by the gate *j* with the air-chamber *E* at the top of the machine, and thence with the suction-fan *F*, so that a draft controllable as to intensity may be induced across it and through the falling stream of meal therein and up through said settling-chamber. This draft will be so regulated as to take out all of the flour, the finer middlings, and the dust, and carry them up through the fan-case and into the dust-room, whence as they settle they are run off by a conveyer and conducted to the reel or other bolt. The middlings unaffected by the air-current or released from it before its exit from the chamber *H'* fall upon the shaker through spout *h*, or are conveyed back thereto by means of the inclined board or chute *j'*, forming the inner wall of the chamber, and are subjected to the operation of said shaker and to the other air-currents passing therethrough, which take up flour and fine dust released by the shaking action and carry them up through the ports *d* to the fan and dust-room.

The gates *h²* enable the attendant to shut off or moderate the air-currents in chamber *H'* at any point in the height of the stream of chop falling from the rolls, and thereby apply it to produce the best effects.

Over the board *j'* is placed a series of slats, *j²*, leaving a free space between the bottom of the slats and the surface of the board. These admit the settlings to the board and allow them to pass down toward the shaker, but form a barrier to the blast, which otherwise would impinge upon them. At its bottom it is provided with a spout, whereby the settlings are kept distinct from the material delivered through the spout *h* until the moment they reach the shaker.

In some cases, particularly where the reducing mechanism is such as to tend to cake or flatten the chop as well as the germ, a beater or disintegrator, *I*, may be used at the head of the wind-trunk or directly beneath said reducing mechanism, with or without a case around it to shake up or lighten the chop, so that the flour may be thoroughly taken out by the air-blasts and the middlings and germ reach the shaker in proper condition for separation.

At the tail of the machine is a vertical air-trunk, *K*, opening at the top into the chamber *E* and at its bottom into the spout *L*, the connection with the latter being controlled by the gate *k*, so that a draft of any desired intensity may be induced in the spout. The tailings as they fall from the shaker are delivered into the spout through a hopper, *M*, or other suitable opening. Through the side of the spout upon that side of the hopper or stream of tailings opposed to the air-trunk *K*

is an aperture, *N*, communicating with the external air, and provided, if desirable, with a gate for adjustment, and the spout is otherwise practically closed, so that the line of draft shall be transverse of the stream, as indicated by the arrows. Beneath the pathway of the air-current the spout *L* is divided by lengthwise partitions into a number of compartments or sub-spouts, *m m'*, &c., the inner one, *m*, being directly beneath the tail of the shaker or the mouth of the tailings-hopper, and each having its individual valve *o*, that its contents may be properly discharged. At the top, or at a point along their length, the partitions are provided with movable gates or gather-boards *n n'*, &c., in order that the tailings may be cut off from any one or more of the sub-spouts in case it should be desired to lessen the number of grades into which they are distributed. I have shown such an arrangement of gather-boards that the tailings may all be thrown into the single sub-spout *m* without interrupting the air-current if it should at any time be desirable.

The air blast or draft as it strikes the stream of tailings deflects the particles composing it according to gravity, so that the heaviest only fall into the sub-spout *m*, the next heaviest into the sub-spout *m'*, and thus on, while any remaining dust is carried up the air-trunk with the draft and through the fan-case to the dust-room. The different grades as they escape from their respective sub-spouts are led away to appropriate mechanism, as to sets of rolls differing in fineness of dress or gage for the succeeding break, or to bran-dusters, according to their condition.

I have described the machine as constructed with a single suction-fan; but it is evident that more than one may be used, or that a blast fan or fans, although less convenient and beneficial, may be substituted. I have also referred only to roller-mills; but neither the form of reducing mechanism nor the other specific features of the apparatus hereinabove described are essential to the working of my process, said apparatus being referred to for the purpose of illustrating the invention and as a compact and convenient means of carrying it out.

I claim—

As an improvement in the art of manufacturing flour by gradual reduction, first taking from the break the flour and finer middlings, and then subjecting the entire mass of the residuum to the conjoint operations of sifting and winnowing before rebreaking, substantially as set forth.

JOHN R. DAVIS, JR.

Witnesses:

ALEX. MCNAUGHTON,
C. A. PIEWEGER.