J. R. CHAPMAN.

METHOD AND APPARATUS FOR HULLING GRAIN.

APPLICATION FILED JAN. 22, 1915.

1,188,151. Patented June 20, 1916.

Fig. 1.

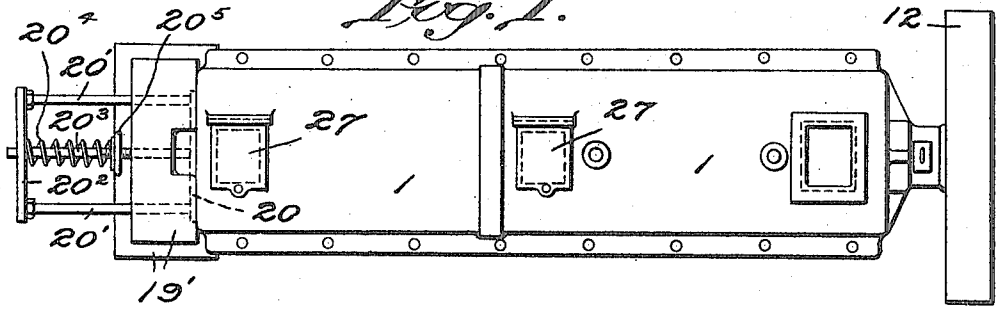


Fig. 2.

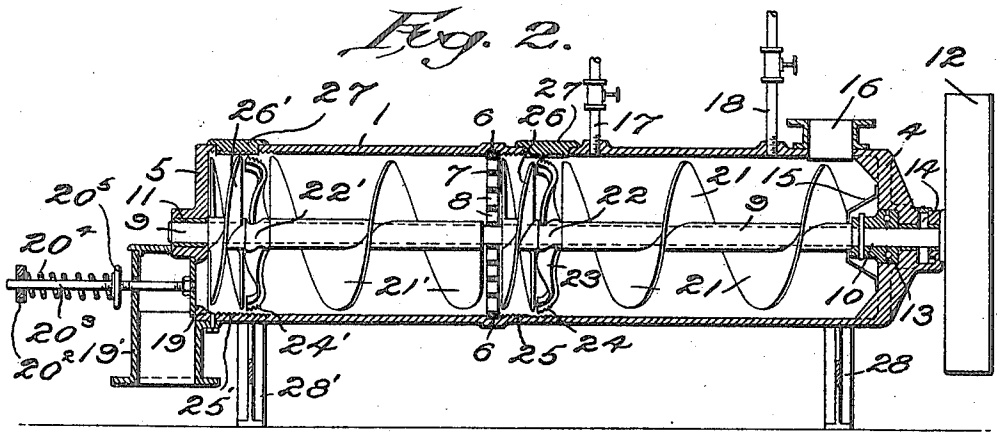


Fig. 3.

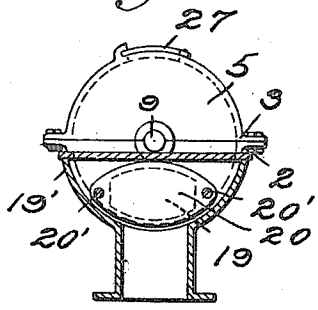
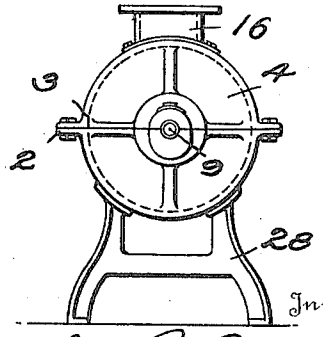


Fig. 4.



Witnesses

C. S. Thompson.

J. Austin Stone.

Inventor

John R. Chapman

by Clark, Prentiss & Clark,

Attorneys

THE COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

JOHN R. CHAPMAN, OF SPRINGFIELD, MISSOURI.

METHOD AND APPARATUS FOR HULLING GRAIN.

1,188,151. Specification of Letters Patent. Patented June 20, 1916.

Application filed January 22, 1915. Serial No. 3,780.

To all whom it may concern:

Be it known that I, JOHN R. CHAPMAN, a citizen of the United States, residing at Springfield, in the county of Greene and State of Missouri, have invented new and useful Improvements in Methods and Apparatus for Hulling Grain, of which the following is a specification.

This invention relates to the treatment of grain preparatory to its milling and consists of a new and practical process and apparatus for removing the dirt from the grain and loosening or removing the outer hull or cuticle of the berry.

One of the objects of this invention is to provide a process for the treatment of grain whereby the final milled product will be lower as regards the percentage of ash, and a much higher quality of product both as regards purity and color.

A further object of the invention is to provide a simply constructed practical machine for accomplishing this result and one which will quickly wash and loosen the outer hull of the grain berry without loss of time in operation or care on the part of the attendant.

The invention consists of the novel construction and arrangement of parts together with the novel method of operation and will be more fully described and set forth in the following specification and claims, and illustrated in the accompanying drawings, in which—

Figure 1 is a top plan view of the machine. Fig. 2 is a central longitudinal vertical section of the same machine. Fig. 3 is an elevation of the discharge end of the machine, showing a section through the discharge manifold. Fig. 4 is an elevation of the intake end of the machine with the drive wheel removed, showing the supporting frame beneath the cylinder.

In the drawings like numerals refer to like parts,

1 is a longitudinal metal cylinder formed by fastening together the lower section 2 and the upper section 3. Suitable cylinder heads 4 and 5 may be formed integral with the cylinder or made separately and attached thereto. Within the cylinder approximately centrally thereof and extending around the inner surface in a vertical plane is a groove 6 adapted to hold rigidly and retain a perforate plate 7 having holes 8. Extending centrally through the cylinder is a drive shaft 9 provided with bearings 10 and 11 and drive wheel 12. Suitable thrust ball bearings 13, ring oil bearing 14 and dust cap 15 are shown.

An intake opening 16 and steam and water inlet pipes 17 and 18, respectively, are mounted on top of the cylinder. At the opposite end a discharge opening 19 is located in the lower half of the cylinder head and is controlled by a valve 20.

Mounted on said drive shaft 9 and keyed thereto is a screw conveyer 21 having a single spiral thread of a large pitch. Adjacent this screw 21 is an agitator 22, also keyed to the drive shaft, having the arms 23 set with a pitch and having the ends of the arms curved. On these ends are provided rough surfaces 24 and on the inner surface of the cylinder a similar rough surface 25 extends from the agitator 22 to the perforate plate or diaphragm 7. Between the agitator and the plate is a short double threaded screw of small pitch 26. On the discharge side of the plate 7 is another set of conveyer screws and agitator numbered 21^1, 22^1 and 26^1, respectively, in addition to which are the rough surfaces 24^1 and 25^1 on the ends of the agitator arms and on the walls of the cylinder adjacent the discharge opening.

Over the opening 19 and extending outwardly and downwardly is a discharge manifold 19^1. This member covers practically all of the end of the lower section 2 and provides a support for the valve mechanism of the oscillating valve 20. Referring in detail to the valve construction it will be observed that the valve proper is an oblong plate 20 adapted to seat against the walls of the opening 19. Extending through the manifold 19^1, rearwardly from the lower half of the cylinder head, are the guide rods 20^1. A yoke 20^2 connects their outer ends. From the valve plate 20 and rigidly connected thereto is a valve rod 20^3. This rod it will be observed is slidably mounted in the yoke 20^2 and manifold 19^1 and carries a spring 20^4 which abuts against the yoke 20^2 on one end and against a hand wheel tensioning device 20^5 on the other. The combination of parts mentioned permits a yielding action on the part of the discharge valve and allows for adjustment of the spring without interfering with the operation of the machine. Suitable openings and covers

27 are provided for access to the interior of the cylinder and supports 28 are shown for mounting the machine.

Grain is fed into the machine through the intake opening 16 and is carried along by the spiral screw and thoroughly mixed with the steam and water forced in through the openings 17 and 18. The arms of the agitator assist in stirring the mass and the rough ends aid in the rubbing and churning the berries. The augerlike double screw 26 forces the grain through the opening 8 in the plate 7. Attention is again called to the fact that the pitch of the threads of this member 26 is decidedly less than that of the first conveyer screw. After passing through the plate 7 this same process is repeated until the grain reaches the outlet opening 19. At this point it comes into contact with the flat surface of the stationary upper half of the cylinder head and the metal valve plate 20 and the pressure of the grain driven by the conveyer screws forces open the valve, making a reciprocating motion, causing one grain to come in contact with another and thereby loosening the outside hull or cuticle of the berry. Attention is directed to the fact that at the end of its treatment within the cylinder the grain is forced against the rigid upper half of the cylinder head and then out against the flat face of the discharge valve, a maximum scouring action thus being obtained. This particular action is caused by the operative relation of the working parts at the discharge end of the chamber. During each revolution of the member 26, the end of each thread moves past the discharge opening and the material within the chamber is compressed as the thread end approaches the opening and is forced out as the end of the thread wipes past the opening. This causes the reciprocating motion of the valve just mentioned. When the machine is in operation this reciprocating motion becomes a rapid pulsating movement and the material which was already treated with steam and water in the first part of the chamber is forced out past the flat face of the discharge valve. The treatment of the grain at this discharge end of the chamber may be described as follows: The grain, after the preliminary treatment and softening of the hull as it passes through the agitator conveyers and perforate plate in the treating chamber, is momentarily compressed as the screw-thread ends travel past the discharge openings until sufficient pressure termed "hulling pressure" is exerted to rub one grain against the other and the valve when it is forced out past the latter. This treatment involves sufficient pressure merely to loosen the hull of the grain and distinctly does not include any mangling or mashing of the grain which might destroy its usefulness in subsequent manufacture or sale. After passing out of the discharge opening the grain stands for several hours in what is known as the tempering bins after which it is put through a final process known as scouring in which the outer coat which has been loosened by the machine just described, is taken off the grain leaving the berry perfectly clean.

It has been found that by using the process indicated above the flour made from the grain so treated showed a much lower percentage of ash and a product of a higher quality both as regards the cleanliness and color of the flour.

From the foregoing it will be clear that this invention provides a machine which is simple in construction and easy to operate and a process of thoroughly cleaning grain preparatory to its use in other types of machines.

Changes in shape, material and the relative stages of the process may be made without departing from the scope of the invention.

What I claim is:

1. In a machine for the treatment of grain, a normally closed treatment chamber, means for supplying moistening and softening medium for the grain hulls to said chamber, a perforate plate within said chamber, and a plurality of screw conveyer agitator members for conveying the grain and fluid medium within said chamber to said perforate plate, the last of said screw conveyers being of relatively small pitch and adjacent said perforate plate for forcing the moistened grain therethrough.

2. In a machine for the treatment of grain, a normally closed treatment chamber, means for supplying moistening and softening medium for the grain hulls to said chamber, a resiliently yieldable reciprocating outlet valve substantially at the lowest point of the chamber, and a plurality of screw conveyer agitator members for conveying the grain and fluid medium within said chamber to said outlet valve, the last of said screw conveyers being of relatively small pitch and adjacent said outlet valve for forcing the moistened grain therethrough.

3. In a machine for the treatment of grain, a normally closed treatment chamber, means for supplying moistening and softening medium for the grain hulls to said chamber, a removable perforate diaphragm within said chamber, and a separate set of screw conveyer agitator members within said chamber on either side of said diaphragm, each of said sets consisting of a plurality of screw conveyer agitator members, the pitch of the blade of successive members being different, and a central drive shaft for operating said conveyer members.

4. In a machine for the treatment of grain, a normally closed treatment chamber, an inlet opening and an outlet valve for said chamber, means for supplying moistening and softening medium for the grain hulls to said chamber, a removable perforate diaphragm within said chamber, and a separate set of screw conveyer agitator members within said chamber on either side of said diaphragm, each of said sets consisting of a plurality of screw conveyer agitator members, the pitch of successive members of each set being different, the last of each set being a relatively small pitch and adjacent the perforate diaphragm and outlet valve respectively for forcing the grain through each.

5. In a machine for treating grain, a normally closed treatment chamber, a perforate diaphragm extending across the interior of said chamber, means for holding said perforate diaphragm in position, a separate set of screw conveyer agitator members within said chamber on either side of said diaphragm, each of said sets consisting of a plurality of screw conveyer agitator members, the pitch of the thread of each of said members being different, an agitator member in each set having propeller blades with curved ends, abrading surfaces on the ends of said blades adjacent the walls of said chamber, and a central drive shaft for rotating said conveyer and agitator members.

6. In a machine for treating grain, a normally closed treatment chamber, a perforate diaphragm extending across the interior of said chamber, means for holding said perforate diaphragm in position, a separate set of screw conveyer agitator members within said chamber on either side of said diaphragm, each of said sets consisting of a plurality of screw conveyer agitator members, the pitch of the thread of each of said members being different, an agitator member in each set having blades with curved ends lengthwise of the chamber for rubbing the grain to be treated between the curved ends and the walls of the chamber, and a central drive shaft for rotating said conveyer and agitator members.

7. In a machine for treating grain, a normally closed treatment chamber, means for supplying moistening and softening medium for the grain hulls to said chamber, a perforate diaphragm extending across the interior of said chamber, means for holding said diaphragm in position, a separate set of screw conveyer members within said chamber on either side of said diaphragm, each of said sets consisting of a plurality of screw conveyer members, the pitch of the blades of successive members being different, a central drive shaft for operating said conveyer members, and an outlet reciprocating valve at the discharge end of said chamber, said valve being located below the line of said drive shaft with the lower edges of the valve substantially on a line with the lowest point of the chamber for the discharge of fluid and waste matter with the grain from the bottom of the chamber, the last member of each of said sets of agitator members having a thread of relatively small pitch and being adjacent the perforate diaphragm and outlet valve respectively for forcing the grain through each, the outlet valve yielding resiliently to the action of the last-member and the material within the chamber.

8. In a machine for treating grain, a normally closed treatment chamber, means for supplying moistening and softening medium for the grain hulls to said chamber, a perforate diaphragm extending across the interior of said chamber, a separate set of screw conveyer members within said chamber on either side of said diaphragm, each of said sets consisting of a plurality of screw conveyer members, the pitch of the blades of successive members being different, a central drive shaft for operating said conveyer members, an outlet reciprocating valve at the discharge end of said chamber, said valve being located below the line of said drive shaft with the lower edge of the valve substantially on a line with the lowest point of said chamber for the discharge of fluids and waste matter with the grain, a spring for normally holding said valve in its closed position, and adjusting means for controlling the tension of said spring, the last member of each set of agitator conveyers having a thread of relatively small pitch and being adjacent the perforate diaphragm and outlet valve respectively for forcing the grain through each, said outlet valve yielding resiliently to the action of said last member and the fluid matter within the chamber.

9. In a machine for treating grain, a normally closed treatment chamber, means for supplying moistening and softening medium for the grain hulls to said chamber, a perforate diaphragm extending across the interior of said chamber, a screw agitator conveyer on one side of said diaphragm to force grain through said perforate plate, a second screw agitator conveyer to force grain out of the discharge end of said chamber, the end wall of said chamber having a discharge opening eccentrically located with respect to the axis of said agitator conveyers, and a valve resiliently mounted in said opening to overbalance the screw action of said second conveyer until hulling pressure is reached and to yield outwardly as the conveyer thread end reaches and passes said opening, whereby the grain is subjected to a pulsating rubbing pressure to remove the softened outer portion.

10. In a machine for treating grain, a normally closed treating chamber, means for supplying moistening and softening medium for the grain hulls to said chamber, a screw agitator conveyer within said chamber, the end wall of said chamber having a discharge opening off center with respect to the axis of said conveyer, and a valve resiliently mounted in said opening to overbalance the pressure of the grain due to the screw action of the conveyer until hulling pressure is reached and to yield outwardly as the conveyer thread end reaches and passes said opening, whereby the grain is subjected to a pulsating rubbing action to remove the softened outer portion.

11. In a machine for treating grain, a normally closed treating chamber, means for supplying moistening and softening medium for the grain hulls to said chamber, a screw agitator conveyer having a plurality of screw threads within said chamber, the end wall of said chamber having a discharge opening eccentrically located with respect to the axis of said screw conveyer and opposite the path of the thread ends thereof, and a valve resiliently mounted in said opening to normally close the same and overbalance the pressure of the grain due to the screw action of the conveyer threads until hulling pressure is reached and to yield outwardly as the conveyer threads reach and pass said opening, whereby the grain is subjected to a pulsating rubbing action to remove the softened outer portion.

12. The process of treating grain to remove the outer portion which comprises softening the outer portion of the grains and subjecting the grains so treated to a combined rapidly varying pressure and rubing action.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN R. CHAPMAN.

Witnesses:
FRANK OTT,
LEE E. POTTER.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."