(No Model.) 3 Sheets—Sheet 1.

F. MELKERSMAN.

PROCESS OF HULLING, CLEANING, AND SEPARATING GRAIN.

No. 385,870. Patented July 10, 1888.

Fig. 1.

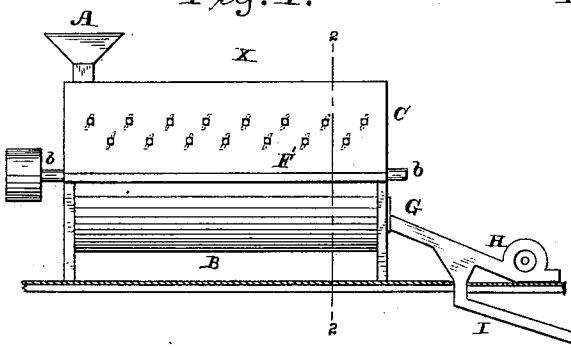
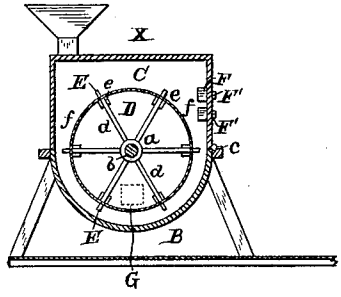
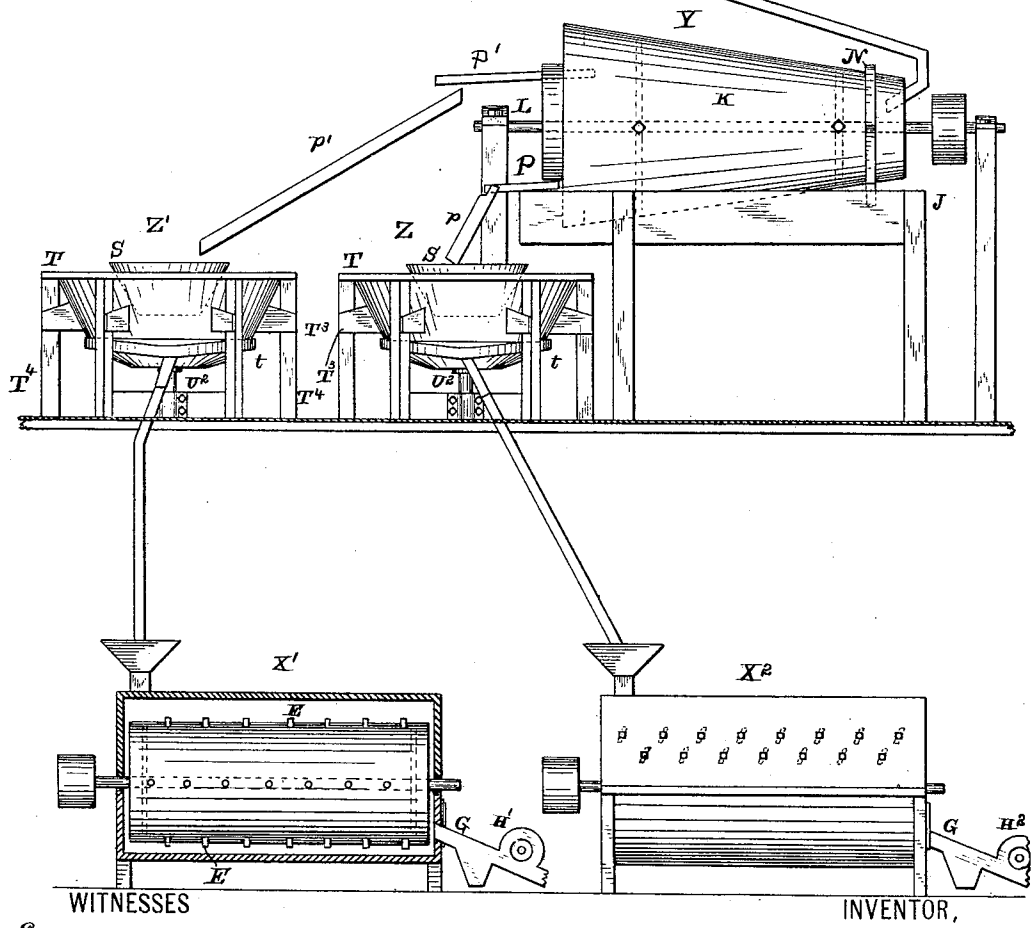


Fig. 2.





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Fig. 3.

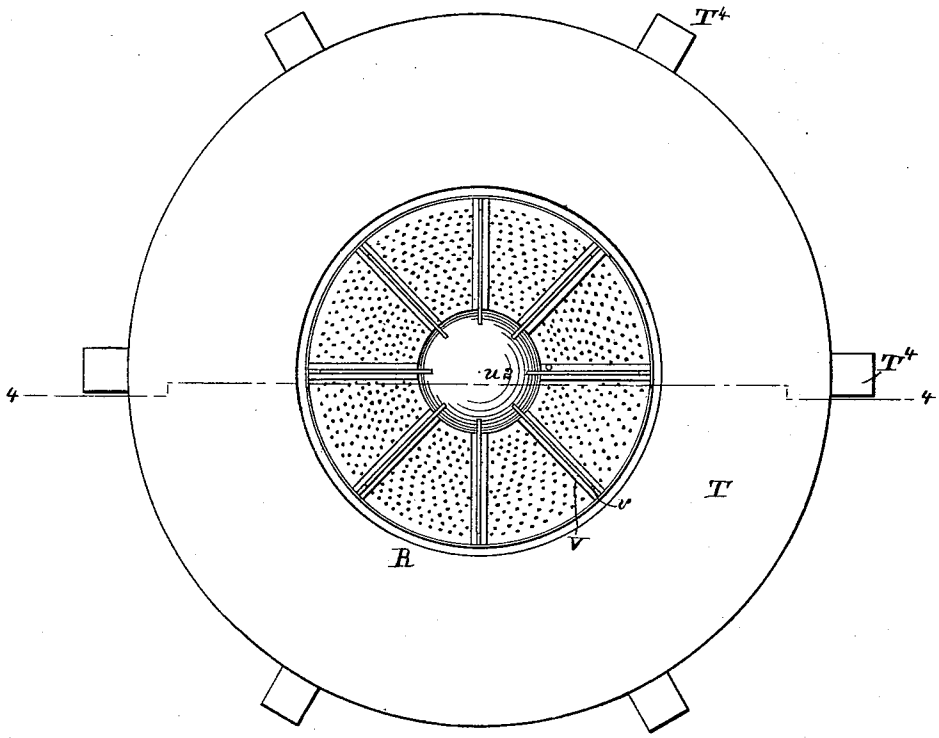
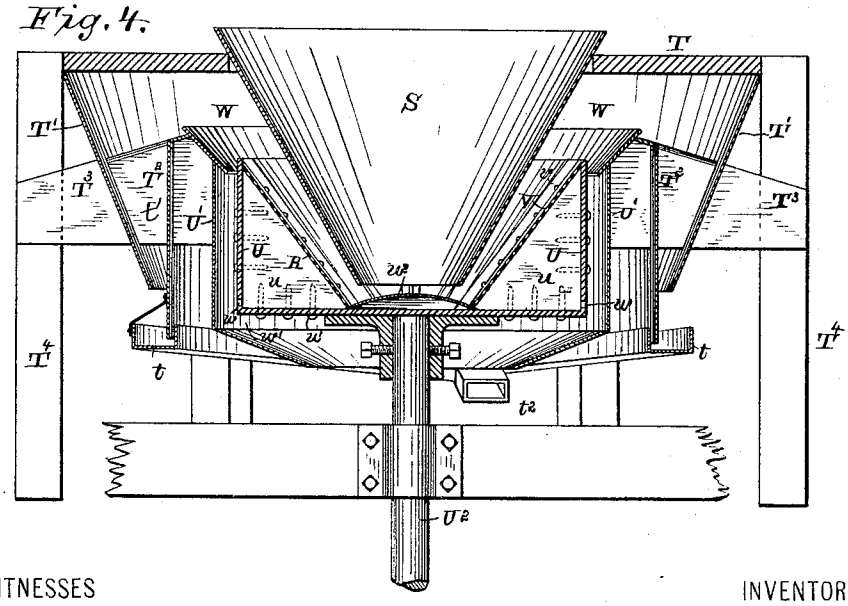


Fig. 4.



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Fig. 5.

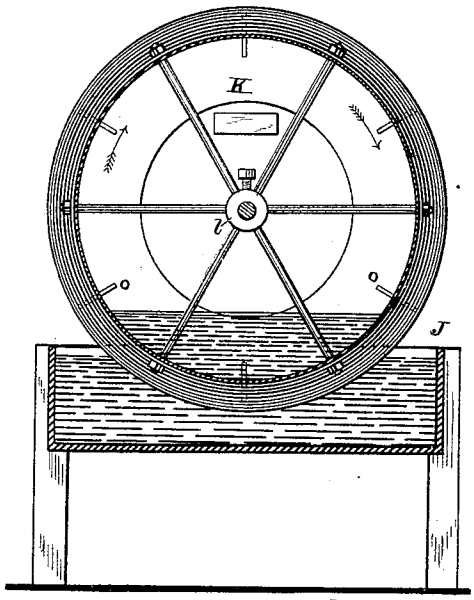


Fig. 6.

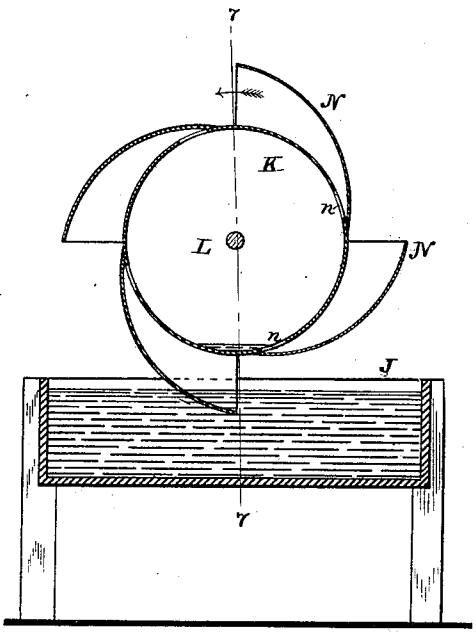
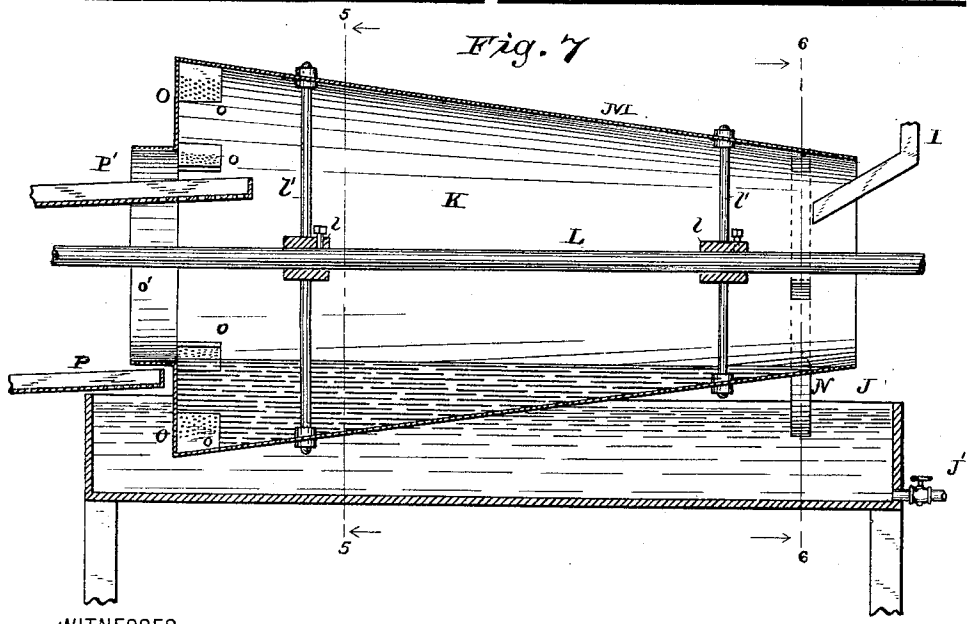


Fig. 7.



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UNITED STATES PATENT OFFICE.

FREDERICK MELKERSMAN, OF ST. CHARLES, MISSOURI.

PROCESS OF HULLING, CLEANING, AND SEPARATING GRAIN.

SPECIFICATION forming part of Letters Patent No. 385,870, dated July 10, 1888.

Application filed July 16, 1887. Serial No. 244,528. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK MELKERSMAN, a citizen of the United States, and a resident of St. Charles, in the county of St. Charles and State of Missouri, have invented or discovered certain new and useful Improvements in the Process of Hulling, Cleaning, and Separating Grain, of which the following is a specification.

My invention is especially designed to hull, clean, and separate oats, to prepare them for use as an article of food.

Hulling grain between stones is wasteful, owing to the fact of the varying sizes of grain. The body of the larger grain is liable to be crushed, while the hulls of the smaller are incompletely separated. It has been found impracticable to remove the hulls and inner covering of the grain thoroughly in a single operation by beating and stirring without breaking, wearing away, or otherwise injuring the body of the grain.

My invention contemplates taking the grain just as it is brought to the market, treating it by my new and improved process, and delivering it thoroughly cleansed, without deterioration, ready for use, by a single continuous operation, in which the inferior grain is separated from the good grain, leaving both in the best practicable condition. This end I obtain by subjecting the grain to the continuous successive operation of an apparatus embodying in its organization, first, a primary dry-hulling machine, which separates the greater portion of the hulls from the grain; second, a dry-separating machine, which removes the disconnected hulls and dust from the grain; third, a washing and separating machine, which moistens the grain, so as to facilitate the detachment of the remaining hulls and inner covering of the grain, and separates the good from the imperfect grain, and also removes impurities; fourth, straining and drying mechanism acting separately on the previously-separated different qualities of grain; fifth, dry-hulling and hull-separating mechanism, which removes hulls, &c., from the different qualities of grain and delivers both qualities thoroughly cleansed into separate receptacles.

The accompanying drawings represent so much of the apparatus as is necessary to illustrate the process herein claimed. The apparatus itself is, however, not herein claimed, as it constitutes the subject-matter of three several applications for Letters Patent of the United States, filed by me December 19, 1887, respectively numbered 258,336, 258,337, and 258,338.

Figure 1 represents the apparatus organized to carry out my improved process. Fig. 2 represents a transverse vertical section through the primary dry-hulling machine on the line 2 2 of Fig. 1; Fig. 3, a plan or top view of one of the centrifugal driers with its hopper removed; Fig. 4, a vertical section therethrough on the line 4 4 of Fig. 3; Fig. 5, a vertical transverse section through the washing and separating apparatus on the line 5 5 of Fig. 7; Fig. 6, a similar section on the line 6 6 of Fig. 7, and Fig. 7 a vertical central longitudinal section therethrough on the line 7 7 of Fig. 6.

The grain is fed through a hopper, A, into the primary dry-hulling machine X, which is mounted on suitable supports or standards. The casing of this machine consists, preferably, of a semicircular lower portion, B, and a rectangular upper portion, B′, connected thereto at C in a well-known way. A drum, D, rotating in suitable bearings, is preferably constructed with a hub, *a*, mounted on a driving-shaft, *b*, and spokes *d*, radiating from the hub, and having horizontal cross-pieces *e* secured thereto, which connect the spokes and form a frame-work on which a sheet-iron cover, *f*, is secured. The ends of the drum are closed in any suitable way. A series of beaters or pins, E, preferably of hard steel, are secured at suitable distances apart on the outside of the drum just over the cross-pieces. The outer ends of these beaters are preferably square or blunt. These pins are made round and smooth, so as to act as a beater and not as a rasp, knife, or cutter. The beaters revolve in such proximity to the concave bottom of the casing as to feed the grain along from the hopper to the opposite or discharge end of the apparatus. A row or series of guides or wings, F, are arranged on that side of the interior of the casing on which the beaters move upwardly, substantially parallel with the axis of the drum.

These guides are inclined from top to bottom toward the discharge end of the huller, so that when the grain is thrown up by the rapid rotation of the beater-drum toward the top of the casing it will strike against the guides and be deflected toward the discharge-opening G at the end of the machine opposite the entrance-hopper A. This organization secures the automatic discharge of all the grain. The shanks of the guides or wings F project through the casing, and are secured thereto by nuts F′ acting on the screw-shanks, by which means the inclinations of the wings may be adjusted so as to regulate the discharge of the grain. This machine separates about three-fourths of the hulls from the grain, which is equivalent to about nine pounds per bushel. A larger quantity cannot be removed without injury to the body of the grain.

The grain and hulls pass from the huller X through a discharge-opening, G. A blast from a fan, H, connected with this opening blows off the loose hulls and like impurities, while the grain itself continues its descent down a chute, I, to a washing and separating apparatus, Y. (Shown in detail in Figs. 5, 6, and 7.)

A conical drum, K, revolves on a substantially horizontal shaft, L, mounted in suitable bearings, the organization being such that the lower portion of the drum revolves in a water-trough, J, while the upper or smaller end is above the water-level. Arms or spokes *l′*, secured on hubs *l*, mounted on shaft L, support the solid sheet-iron metal drum or casing K above mentioned, on the smaller end of which buckets N are so arranged as to scoop up water from the trough as the drum revolves and deliver it through openings *n* into the interior of the drum. The opposite or larger end of the drum is provided with an annular rim, O, preferably flanged at *o′*, as shown, which partially closes that end. Blades or wings *o*, contiguous to this rim, project inwardly and are suitably inclined to form a series of buckets. These wings are preferably perforated for about two-thirds of their length inwardly toward the casing.

The grain fed through the chute I, as above mentioned, into the smaller end of the drum falls into the water contained therein. The heavy grain sinks to the bottom and finds its way down the inclined surface of the drum to the blades or wings *o*, which elevate and deliver it to an inclined plate, P′, extending into the mouth of the drum, the water escaping through the perforated parts of the blades *o* and through the perforated bottom of the plate P′. Through this plate the good grain passes over a chute, *p′*, to a centrifugal drying apparatus, Z′. The lighter grain and impurities float on the surface of the water from the rim O and a perforated inclined plate, P, through which the water drains back into the trough, while the grain passes over a chute, *p*, to a separate centrifugal drying apparatus, Z.

The apparatus described is that preferred for washing, separating, and draining the grain. The inclined plates may, if preferred, be shaken or vibrated by well-known means toward and from the receiving-chutes in order to facilitate the feed. The drum is rotated just fast enough to pick up and discharge the good grain as it accumulates, and to permit the imperfect grain and other impurities to flow over the rim and be delivered to a separate drying apparatus. The water-level in the trough and cylinder may be regulated in any suitable way, and its temperature regulated to accommodate the character of the grain. The trough may be emptied by a cock, J′.

My apparatus, as will be seen, requires but a small quantity of water for its successful operation, as it only needs replenishing often enough to keep it from becoming foul.

In the washing and separating apparatus Y the inner hull or "skin," which adheres so firmly to the body of the grain, and which cannot be removed by the hulling apparatus, is moistened and partially separated from the grain, so that when the grain is dried the skin becomes warped and is easily removed by the final hullers. The centrifugal driers are of similar construction and operate in like ways—one upon the good and the other upon the imperfect grain. A hopper, S, is mounted upon a main frame, and corresponds nearly to a funnel-shaped strainer, R, in which it is partially inclosed. The strainer is preferably formed of perforated sheet metal supported in a cylindrical carrier, U, mounted on a shaft, U^2, revolved in any well-known way in suitable bearings in the frame. The strainer is braced and supported by suitable triangular braces, *u*, interposed between it and the carrier.

The upper end of the strainer coincides with the top of the carrier, its lower end extending to a base-plate, *u′*, thereof, and is closed by a bottom plate, u^2. The strainer is formed in sections, and is fastened to the braces by T-shaped ribs V and bolts and screws. The ribs V are arranged radially on the interior of the strainer, and blades or wings *v* of the ribs cause the grain to revolve with the strainer, and also create a draft or blast, which aids materially in the drying operation. The centrifugal force created by the rapid rotation of the apparatus causes the bulk of the water to flow through the strainer and opening *w* in the carrier into an annular discharge-passage, *w′*, between the carrier and the jacket U′. The grain, together with a small portion of the water, passes over the top of the strainer and strikes an annular inclined deflector, W. The water here separates from the grain and is discharged through the passage *w′*, and the grain strikes an annular top plate, T, and inclined sheet-iron casing T′, and falls into receiving-chute in trough *t* at the bottom of the casing, provided with a spout, t^2. An annular partition, T^2, between the casing T′ and jacket U′

forms a passage through which the grain is conducted to the trough *t*, above mentioned.

The main frame may be of any suitable construction, but is preferably formed, as shown, with arms T^3, that extend from the standards T^4 to the jacket U′, and form supports to which the jacket U′, the partition T^2, and the casing T′ are secured.

Chutes *x* convey the grain from the respective centrifugal driers to their respective hulling-machines X′ X^2, similar in construction and operation to the primary hulling-machine X, above mentioned, the good grain going to X′ and the imperfect grain to X^2. In these machines the remaining hulls, including the inner hulls or skin, are completely removed from the partially-softened grain, and the hulls are separated by fans H' H^2. This completes the process, with the exception of the final drying, which is done by heat applied in any suitable way, such apparatus being so well known as to require no description.

I prefer to perform the operations of hulling, cleaning, separating, and finally hulling the grain continuously; but there may be a pause after the grain is first hulled in the primary huller X; but when the grain is carried to the washer and separator and enters it, the operation must be continued through the drier, and preferably through the final huller, so that the grain may not be impaired by moisture.

My apparatus is arranged and so operated that the grain is passed through the washer and separator very rapidly and continues directly to the centrifugal driers. Here it is quickly deprived of all surplus moisture and immediately passed to the final-hulling machines. The washing, separating, drying, and final hulling are all accomplished in a very short time—not exceeding two minutes—so that the grain is not injured by being soaked or unduly moistened.

As before remarked, the primary-separating apparatus removes a large portion of the outer hulls, which portion I have found in practice to average about nine pounds per bushel. This primary separating avoids the necessity of washing and handling this matter, which amounts to nearly seventy-five per cent. of all the hulls or outer covering. By washing all the grain, dirt and dust are removed, and the inner hulls are moistened and partially separated from the grain, and by then separating the imperfect from the good grain, and continuing subsequently to treat them separately, the good grain comes out from the process in fine condition, and the imperfect grain is also largely cleansed and separated from the good grain, which obviously is a great advantage, as if the two remain together the good grain would be deteriorated to the extent of the mixture.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The hereinbefore-described process of hulling, cleaning, and separating grain, which consists in first removing a large proportion of the hulls from all the grain, then separating the disconnected hulls, then washing and moistening the grain, then straining and drying it, then removing the remaining hulls and inner skins from the grain, and finally separating the disconnected hulls and skins, substantially as herein set forth.

2. The hereinbefore-described process of hulling, cleaning, and separating grain, which consists in first removing a large proportion of the hulls from all the grain, then separating the disconnected hulls, then washing and moistening all the grain, then separating the good grain from the imperfect grain during the process of washing, and then drying the grain and removing and separating the remaining hulls therefrom, substantially as herein set forth.

In testimony whereof I have hereunto subscribed my name.

FREDERICK MELKERSMAN.

Witnesses:

LLOYD B. WIGHT,

GEO. G. COLEGATE.