H. B. STEVENS.

Rice-Hulling Machines.

No. 148,774. Patented March 17, 1874.

Fig. 2.

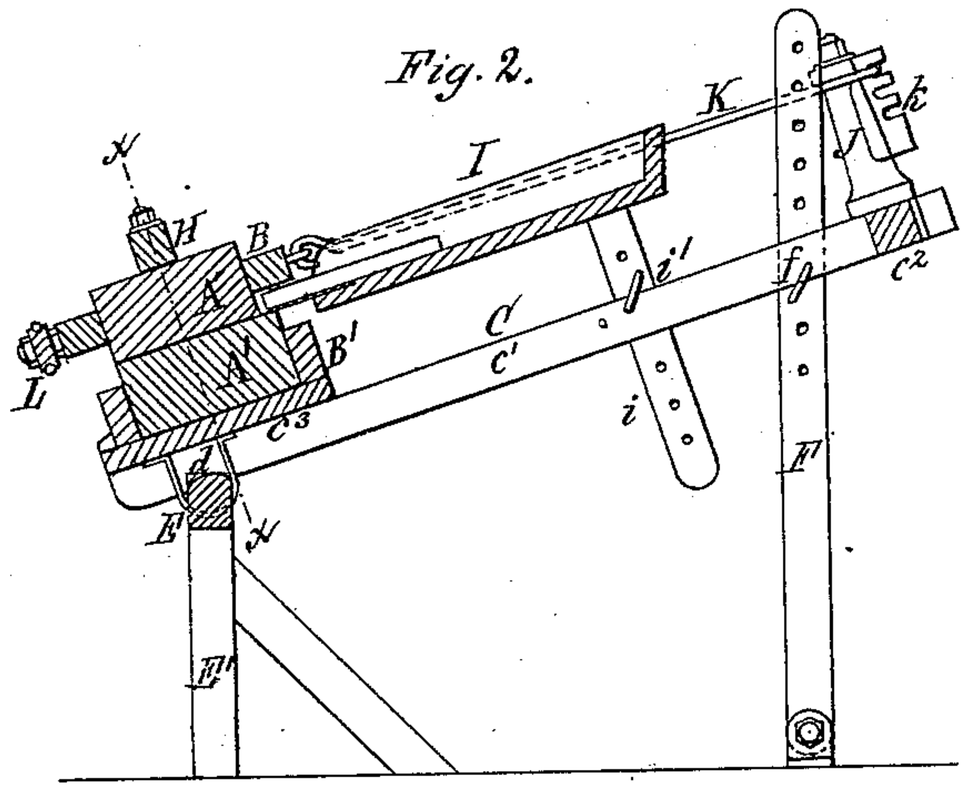


Fig. 1.

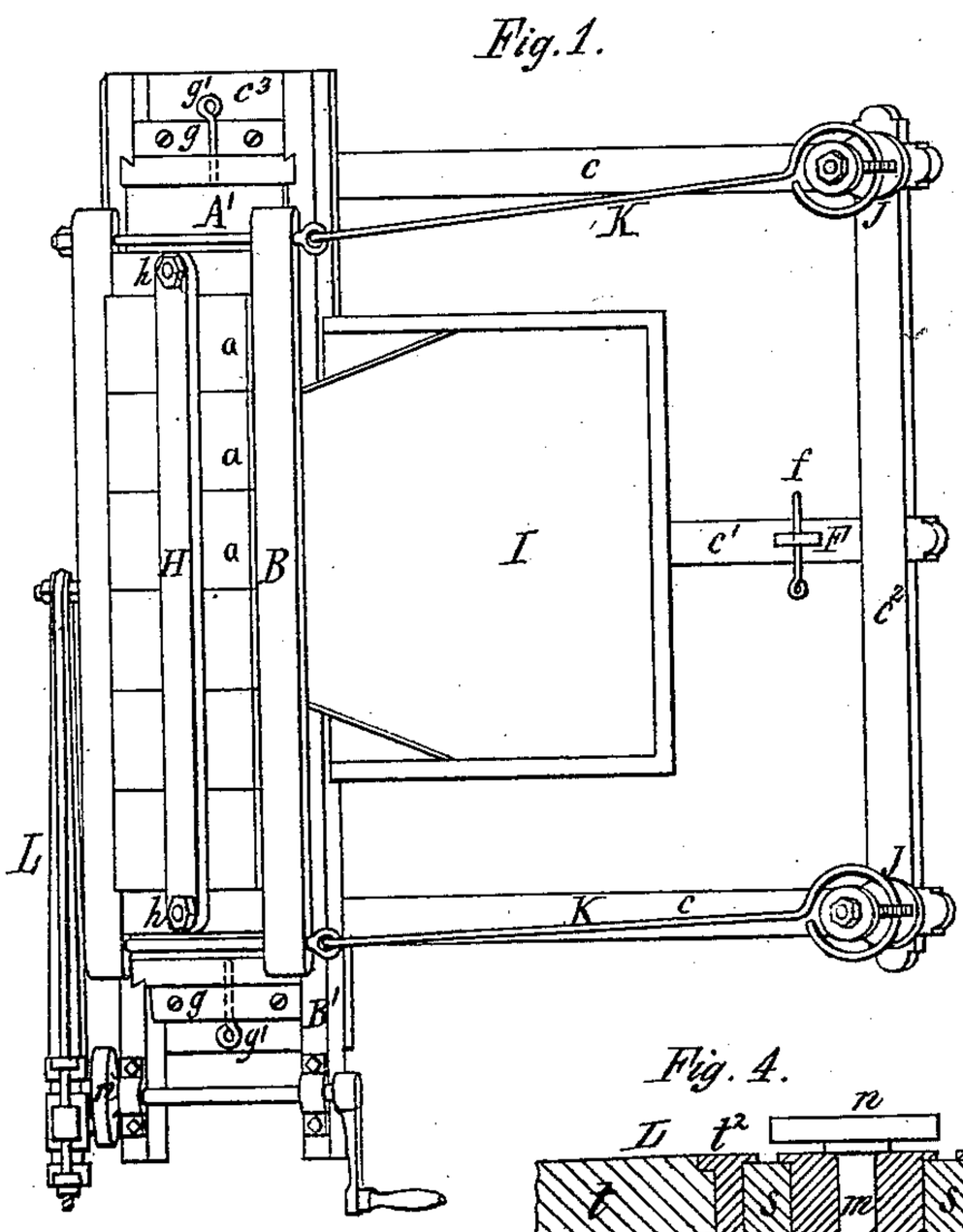


Fig. 5.

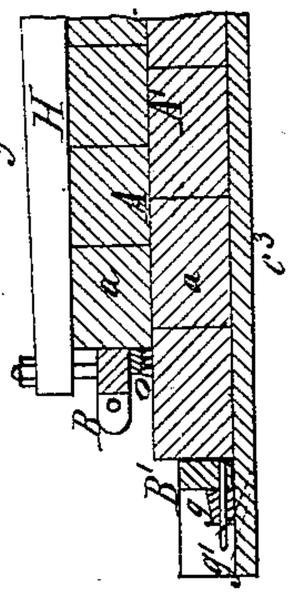
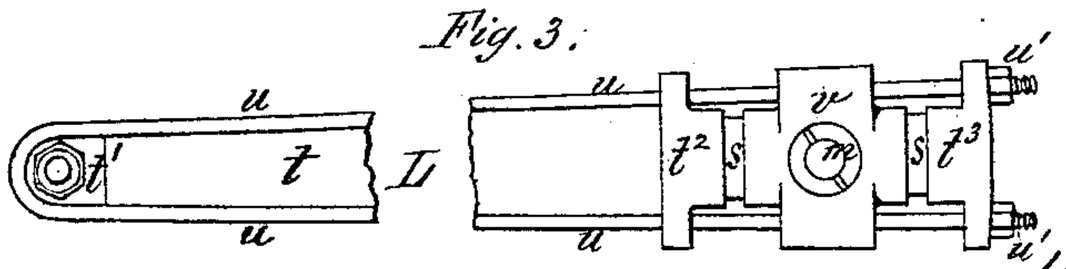


Fig. 4.

Fig. 3.



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UNITED STATES PATENT OFFICE.

HENRY B. STEVENS, OF BUFFALO, NEW YORK, ASSIGNOR TO GEORGE L. SQUIER, OF SAME PLACE.

IMPROVEMENT IN RICE-HULLING MACHINES.

Specification forming part of Letters Patent No. **148,774**, dated March 17, 1874; application filed February 17, 1874.

To all whom it may concern:

Be it known that I, HENRY B. STEVENS, of the city of Buffalo, in the county of Erie and State of New York, have invented certain Improvements in Machines for Hulling Rice and other Grains, of which the following is a specification:

In the accompanying drawing, Figure 1 is a plan of my machine; Fig. 2, a central transverse vertical section thereof; Fig. 3, an elevation of the pitman, detached. Fig. 4 is a horizontal section of the end of the pitman, showing the boxes of the crank-pin. Fig. 5 is a fragmentary section in line *x x*, Fig. 2.

Like letters of reference designate like parts in each of the figures.

The common methods of hulling rice, &c., by pounding it in mortars or grinding it between stones requires hard, non-elastic substances to effect the hulling, as the hulling is done chiefly by abrading, disintegrating, or cutting away the hulls, by which means a considerable portion of the grain is broken, cut, and worn away, and wasted. My object is to hull the grain without injuring it, and for that reason I avoid hard, unyielding substances, and choose those that have some degree of elasticity, by means of which I roll the grain back and forth, without cutting or breaking it, until the hull is split and loosened and the kernel freed therefrom.

For this purpose my improved machine consists, generally, of two inclined plane hulling-surfaces, A A′, of wood, the one, preferably, stationary, and the other having a longitudinal reciprocating and slightly swinging or oscillating movement at right angles to the line of inclination, the grain being fed in a thin sheet between the hulling-surfaces at their upper edges, and, after being hulled, discharged at the lower edges thereof.

In a huller patented by me December 16, 1873, I use end wood, or end wood and rubber combined, for the hulling-surfaces. The same hulling or rubbing surfaces can be used to good advantage in my present huller. But I have found that in a huller with the rubbing-surfaces arranged substantially as in my present machine, the side grain of wood is especially adapted for the hulling-surfaces; and, as it is cheaper, easier procured, and easier dressed than end wood, I prefer it for this purpose. I arrange the wood so that the grain of it will run at right angles, or nearly so, to the line of motion of the runner, and then any uneven wear of the surface (up to the point where the whole needs dressing) will only add to the facility for rolling over the grains to be hulled, and increase the efficiency of the machine, as the uneven wear soon brings the surfaces into the best shape for the most efficient work without requiring them to be grooved. It must be borne in mind in this connection that in my huller the hulling is effected not by abrasion or wearing away the hull by friction, but by splitting the hull longitudinally of the kernel, so that the hull will peel off or the grain shell out of it, which effect is produced by rolling the grain over back and forth under more or less pressure.

Having provided the proper rubbing or hulling surfaces, my next object is to apply them in such a manner that machines of any desired capacity can be built. In my patented huller above referred to the hulling-disks, being round, must necessarily be limited in size, and cannot be advantageously used beyond a certain size, and greater capacity can be obtained only by multiplying the disks. To obviate this difficulty, I construct the hulling-disks of my present huller in the form of a long parallelogram, limited in width, but indefinite in length. The disks can thus be made fifty or a hundred, or more, feet long, if desired, according to the amount of work required to be accomplished, and a single machine may be made to do the work of many of any other construction. The machine is thus admirably adapted for large rice-mills driven by steam or water power, &c., although machines can be constructed on this plan on a small scale to be driven by hand or animal power.

a a are the rectangular blocks of which the hulling-surfaces are composed. They are placed side by side in two rectangular frames, B B′, either of which may be made the "runner," or the one to which motion is imparted; but for cheapness of manufacture, and convenience and ease of handling and adjustment, I make the upper one, B, the runner.

The inside or hulling surface of the frames

may be made from ten to twenty inches wide, while their length can be varied from a few feet to almost any length that will permit of the practical operating of the runner or moving frame. The lower hulling-surface, A′, is made wider and longer than the upper one, in order to hold the grain that is being hulled, and to give sufficient space for the peculiar movement imparted to the runner A. C is a rectangular frame, consisting of three parallel beams, *c c c*[1], connected at the upper ends by a cross-beam, *c*[2], and at the lower ends by a plank, *c*[3]. The lower ends of the beams *c c c*[1] are formed with a semicircular recess, *d*, which fit so as to turn on the rounded upper surface of a beam, E, secured to the top of suitable posts E′. The opposite side of the frame C is supported by a standard, F, which passes through the central beam *c*[1], and is adjusted up and down on said standard, and held in the required position by pins *f*, fitting in any of a series of holes in the standard. The frame B′ rests on the plank *c*[3], and is held in place thereon by cleat-blocks *g*, secured to the plank, pins or set-screws *g′* passing through two of said cleats into the ends of the frame B′. The upper frame B is placed above the frame B′, the wooden blocks of the former being held down in the frame by a longitudinal bar, H, extending across the top of the blocks, and secured at the ends by tie-bolts *h*, connecting with the end pieces of the frame B. This permits the lower face of the blocks *a a* to rest upon those in the lower frame, while the frame B itself is supported above the same. J J are two short standards at the upper end of the frame C, provided with notched plates *k*, forming adjustable pivot-edges for two suspension-rods, K, connecting with the ends of the frames B, by which the latter, as it is operated, is held in proper position. I is the hopper, constructed in any suitable manner so as to feed the grain in a thin sheet onto the upper surface of the lower huller. The back side of the hopper is supported by a standard, *i*, fitting and sliding in a mortise in the beam *c*[1], and held in any desired position by a pin, *i′*. L is a pitman attached to the frame B, and connecting with a crank-pin, *m*, at the end of the driving-wheel *n*, by which the required motion is imparted to the runner. A brush, *o*, is attached to each end of the running disk to push the grain back at every stroke, and prevent it accumulating on each end of the lower huller A′. The blocks or disks *a* are so placed in the frame as to be easily removed and replaced when desired for repairs, dressing, &c. They can be made of any desired thickness, and when they have become worn down to the frame B, the set-screws can be loosened and the disks moved forward until they are nearly worn out, while the blocks in the lower frame can be elevated by placing any suitable backing beneath them.

It is obvious that if the disks were set horizontally, the grain would not feed itself through. It is also obvious that in such a position the full weight of the upper disk would rest upon the lower one. To obviate these difficulties and gain certain great advantages, I incline them by means of the adjustable frame C, as before described. By this means the grain is fed through by the force of gravity, and the pressure of the upper huller diminished. Different kinds and conditions of grain require varied manipulation. New grain will not bear so much pressure without breaking as old grain. Upland rice requires slower feed and greater pressure than lowland. Manifestly, the huller should be adjustable in these respects, so that each kind and condition of grain can have its own proper manipulation.

The hulling-surfaces A A′ being adjustable to any desired inclination, as before described, enables me to readily adapt my machine to the kind and condition of grain to be operated on, to regulate the amount and rapidity of feed, and the amount of pressure upon the grain, as may be required.

It is obvious that the running disk might be made to run upon ways or upon friction-rollers; but I prefer, for many reasons, to hang it upon two or more rods or hangers, which run parallel to the main frame, and are pivoted to the upper side thereof, as before described. By this means a peculiar reciprocating and oscillating motion is imparted to the running disk, which facilitates the passage of the grain between the hulling-surfaces, and assists in the hulling by giving the grain a peculiar twist at every reciprocation of the runner. The weight of the runner can be adjustable in various other ways, as by means of springs, weights, and pulleys, &c.; but I prefer the method described as the most simple and efficient.

The rods K also enable me to get the required motion with the least possible loss of power by friction. The series of pivot-blocks enable the rods to be moved down as the hulling-blocks wear away, so as to keep them always in the plane of the frame B.

Although the hopper is adjusted with the frame C, it is also capable of an independent adjustment, by means of the standard *i* or other suitable device, which enables the feed of the grain to the hulling-surfaces to be diminished by lessening the inclination of the hopper, while at the same time the feed through the huller can be increased, and the pressure upon the grain diminished, by increasing the inclination of the hulling-surfaces, as occasion may require.

My machine can be arranged at one side of a room, and thus occupy but little space, and it can be constructed so that two or more sets of hulling-disks can be placed under each other, and be operated in the same frame.

In operating one of my machines when the runner is of considerable length, the weight is such as to bring a heavy strain upon the actuating parts, and require a great expenditure of power to overcome the inertia of the runner, both in starting and arresting the same at each extreme of its movement. To obviate this difficulty, and to gradually overcome this

inertia, I provide the head of the pitman with yielding boxes, by arranging a spring back of each box. Although a spiral or any other suitable spring may be employed, I prefer to use a block, *s*, of india-rubber. To adapt these rubber blocks to the pitman, I make the latter of a wooden body, *t*, to give it the required stiffness, with a metallic pivot-block, t^1, at the end where it connects with the frame B′, and another metallic block, t^2, at the opposite end, forming a socket to receive the end of the wood *t*. A wrought-iron rod, *u*, passes along each side of the pitman, and around the block t^1, and through lugs formed with the block t^2, and thence through the boxes *v*, and an end block, t^3, where they are provided with nuts *u′*. *s* are the rubber blocks fitting in recesses formed in the blocks t^2 t^3 and the box *v*, by which they are securely held in place. These rubber blocks allow a slight relative movement of the box *v* at either extreme of movement, whereby the jar and strain on the parts are materially lessened, and the power required to drive the runner very much diminished.

While I prefer to give the runner the compound motion hereinbefore described, yet this is not absolutely essential, as a reciprocating motion in a right line given to the runner is all that is required to render the machine effective.

It is obvious that the construction of many of the parts of the machine can be considerably varied without changing the principle or mode of operation of the machine. Any other suitable material than wood may be used as the hulling-surfaces, although I prefer to use the latter.

What I claim as my invention is—

1. A rice-huller consisting of two inclined plane hulling-surfaces, to one of which a reciprocating motion at right angles to the line of inclination is given, substantially as hereinbefore set forth.

2. The combination, with the two inclined hulling-surfaces, of the suspension-rods K, by which the peculiar oscillating movement herein described is imparted to the runner as it reciprocates, substantially as and for the purpose hereinbefore set forth.

3. A rice-huller consisting of two inclined plane hulling-surfaces, composed of ungrooved wooden blocks, with the grain running in the direction of the inclination of the huller, while the runner thereof has a reciprocating motion in a right line, or nearly so, and at right angles to the direction of the grain of the wood, substantially as and for the purpose hereinbefore set forth.

4. The combination, with the inclined frames B B′, of a pivoted adjustable frame, C, for supporting and adjusting the inclination of the hulling-surfaces, substantially as and for the purpose hereinbefore set forth.

5. The combination, with the frame C and frames B B′, supported thereby, of the suspension-rods K and notched pivot blocks or plates *k*, substantially as and for the purpose hereinbefore set forth.

6. The combination, with the hulling-surfaces and adjustable frame C, of the hopper I and adjusting-standard *i*, substantially as hereinbefore set forth.

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