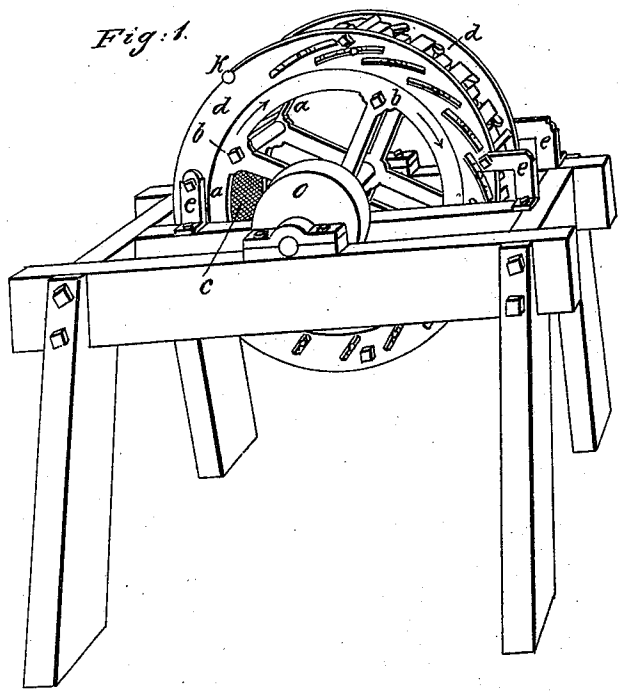
W. GROAT.

Rice Cleaning.

No. 1,745. Patented Aug. 28, 1840.

Fig: 1.



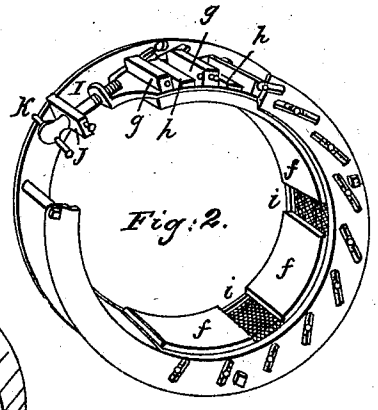


Fig: 2.

Fig: 3.

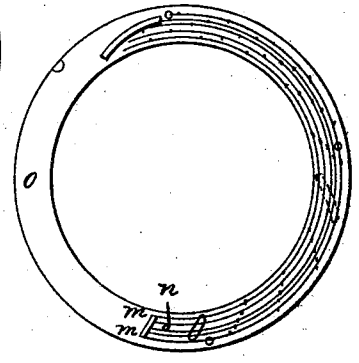
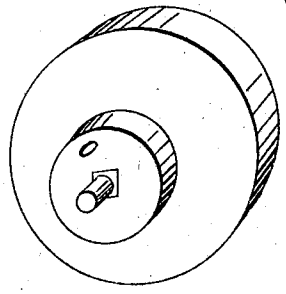


Fig: 4.



UNITED STATES PATENT OFFICE.

WARNER GROAT, OF TROY, NEW YORK.

MACHINE FOR HULLING RICE, &c.

Specification of Letters Patent No. 1,745, dated August 28, 1840.

To all whom it may concern:

Be it known that I, WARNER GROAT, of the city of Troy, in the county of Rensselaer and State of New York, have invented a new and improved mode of hulling, pearling and cleaning rice, barley, oats, and buckwheat and of smutting and cleaning other grains; and I do hereby declare that the following is a full and exact description.

The nature of my improvement consists principally in the construction and application of machinery by which the grain is made to pass between the surface of one body in motion and of another at rest—or both in motion at different velocities or in contrary directions. The one being hard and rough and the other yielding and elastic so that under the regulated pressure for which provision is made as will be shown in the description. Their coöperation will give to the grain the action required, and at the same time allow it to pass without being unnecessarily broken by the process.

A machine for this purpose is represented in Figure 1, of the annexed drawings in which, for the hard and rough surface a cylinder of iron or steel files is made to revolve near a concave surface of caoutchouc or india rubber. Or as a substitute for the files I sometimes provide and use in the same machine a cylinder of stone of like dimensions having the rough granular properties of a common mill stone. I employ either of these at my option.

The inside circular rims *a a*, shown in connection with the arms from the shaft at the center represent the head or ends of the cylinder of files. For a cylinder four feet in diameter which I consider about suitable for common use I provide files about twelve inches long and half an inch square and secure them side by side in their place by means of a circular groove on the inside of each head rim near its periphery about one fourth of an inch deep, and wide enough to receive the ends of the files snugly within them. The end rims are held together by any discretionary number of screw bolts—two of which are shown at *b*, *b*. The inner surface of some of the files are seen at *c*. I prefer having teeth cut on each of the four sides of the files and for this purpose I use the form here described in order that as one side becomes worn another may be turned outward for use. At *d d* are two other rims concentric and in the same plane with the end rims of the cylinder and of the same thickness—being so adapted thereto in circular dimensions as just to allow those of the cylinder to revolve without friction from actual contact. These outer rims are attached to the frame so as to remain stationary as shown by the fixtures *e*, *e*, *e*. Fig. 2 is a view of the same rims detached from the cylinder and frame.

At *f f f*, are represented sections of the concave surface used with the cylinder. In constructing them I provide a piece of sheet iron a very little less in width than the space between the rims, and in length equal to about two thirds of the circumference of the cylinder and attach to its outside surface at discretionary but equal distances apart—say at every six or eight inches of its length, by means of screws or rivets, an iron bar about three fourths of an inch square—extending in a crosswise direction as far beyond each edge of the sheet iron as the plate of each rim is thick, in order, that when placed between them, these projecting ends, being rounded to about half an inch in diameter, as at *g*, *g*, may enter into and occupy the slots or oblique openings provided for them in the rims as shown in the drawings. I then, in order to add to the elasticity and as a means of fastening, provide a piece or pieces of leather and attach the same to the inside surface of the sheet iron by screws passing through perforations, made therein for the purpose and into pieces of wood or iron placed across it on the outside between the iron doors above described, as seen at *h*, *h*, and add to the inside surface of the leather a coating of caoutchouc which I put on in the state of decomposition usually employed for like purposes or in its crude state and cement it in the usual way or secure it as well as the leather to the sheet iron in any other common mode of fastening. At *i*, *i*, this elastic surface or bed is divided into sections of discretionary length for the purpose of admitting small wire screws which I place over narrow parallel openings through the sheet iron for the admission of air or the escape of dust or as substitutes for these I sometimes make small perforations through the sheet iron.

In cleaning smut from wheat or for other grain requiring stronger action, I attach files also to the inner surface of the sheet iron between different sections of the elastic surface which I divide for that purpose, fix-

ing two or more in a place at discretion and securing them by rivets or any other common mode of fastening, and adapting them in thickness to the adjoining sections of of caoutchouc and leather. These I use or not at my option. So also in constructing the bed, instead of the arrangement above described, I sometimes place the leather next to the cylinder and for some kinds of grain I use either of these materials (the leather or the caoutchouc) without the other adopting either mode at discretion. With these provisions and appendages the sheet is suspended between the rims by introducing the projecting ends of its cross bars within the stops provided for them in each.

The practical operation of this machine requires that the elastic surface when adjusted to the cylinder be fixed in its whole extent at one uniform distance from it, whether that distance be less or greater. To effect this, I provide a screw as shown at *j* extended through an opening in the cross bar thus as presented, which for the purpose is supported at each end in a circular notch provided for it in the upper edge of each rim as shown at *k*, Figs. 1 and 2, by which the bar is allowed to turn upon its own axis as any variation in the direction of the screw may require. The screw is turned by a lever handle through its head and is secured to the bar in the usual way, by an enlargement as a shoulder on that side and a pin through its shaft on the other. From this it is extended in length so as to pass through a nut, supplied with a screw thread and connected with the upper end of the sheet iron as shown at 1; by means of which, continuing the screw one way, the sheet iron with its appendages is drawn toward it and on turning it the other way is removed from it. Consequently, the cross bars attached having their ends within the inclined slots in the side rims are thereby borne obliquely to or from the cylinder amounting to the degree of inclination of the slots in which they are respectively confined and the extent of their movement therein. And it will be perceived that in this operation the longitudinal movement of each bar within the slots, from any given action of the screw is successively diminished when compared with that which is next upon it, in proportion to its increased distance from the screw and therefore, in order to pass with it simultaneously, in the manner here pointed out from the line of one circle to another concentric therewith, requires that the angle of inclination of the slots to and from such circle be also increased successively in the same proportion. I therefore, in laying out and constructing the slots so as to produce this circuit with accuracy, draw two circular lines upon the side of the rim concentric with its circle as represented at *m*, *m*, Fig. 3. As near one edge of the rim and at such distance apart as to answer as the lines on which each slot in its lengthwise extension is to terminate. Between these I also draw a discretionary number, generally three additional lines parallel with them, for purposes which further description will explain. I then lay out the slot most remote from the screw as at *n* extending from the outer to the inner of these lines *m m* and fix the angle of its inclination at discretion. This done, I mark off with a dividing instrument upon each of these lines, beginning at one of the side lines of this slot as many points as there are to be slots in the rim, exclusive of that already laid down at *n*, all at equal distances apart. Those marked on the outside and inside lines *m*, *m*, serve as the points at which the corresponding side line of each slot to be then located is to terminate or toward which it is to be directed until it runs into the circular ends of the slot as shown in Fig. 3. Its course from one to the other of these terminating points is indicated by the intermediate points upon the parallel lines between them. This gives one of the side lines of each slot, with its length and inclination graduated from the slot first laid down at *n*. The other side is parallel to it. I make the slots about half an inch wide. Laid out in this way, they are, at every point of their length, when measured on circular lines concentric with the cylinder, but in no other direction, equidistant from each other—and as the end of the cross bars are fixed at the same relative distance apart, it is evident that they cannot be even introduced within the slots, or be wound one way or the other by the action of the screw, after being introduced, but as they range in a line in exact conformity with some one of such consecutive circles coming within the limits of the slots. And also, that when the elastic bed is by these means adjusted to the cylinder, it is held by the screw and the oblique outside edges of the slots so as to present the resistance to its action which the process requires. The direction in which the cylinder is made to revolve is shown by the arrows upon its rim in Fig. 1.

Fig. 4 represents the cylinder of stone as used when substituted for that of the files—and O, in Figs. 1 and 4, the pulley by which they are respectively operated.

I introduce the grain between the head of the screw and the upper end of the sheet iron by means of a hopper and shoe of common form, except being extended in width so as to put in the grain equally over the entire length of the cylinder. The shoe is agitated for this purpose in any of the known methods connected with the cutting machinery that are adapted to such a pur-

pose and the feed is regulated in a like common manner. Before introducing the grain to the machine, as well as after it has passed through it, I employ riddles, screens, fanners or the like, of common construction and in connection with the machinery or otherwise as the grain or process may as a matter of judgment require.

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

1. The manner of constructing a cylindrical surface of files or of stones and a yielding and elastic surface or bed made by the union of caoutchouc and leather and of employing the said cylinder and bed in connection or cooperation with each other in the manner and for the purposes above described.

2. And also the placing of files at discretion between different sections of such elastic head and using the same in like connection with the cylinder, for like purposes, as also above described.

WARNER GROAT.

Witnesses:
DANIEL WHITING,
ARCHIBALD BULL.