No. 792,395. PATENTED JUNE 13, 1905.

S. C. BUCK.

RICE HULLING MACHINE.

APPLICATION FILED OCT. 19, 1903. RENEWED NOV. 11, 1904.

2 SHEETS—SHEET 1.

Fig. 1.

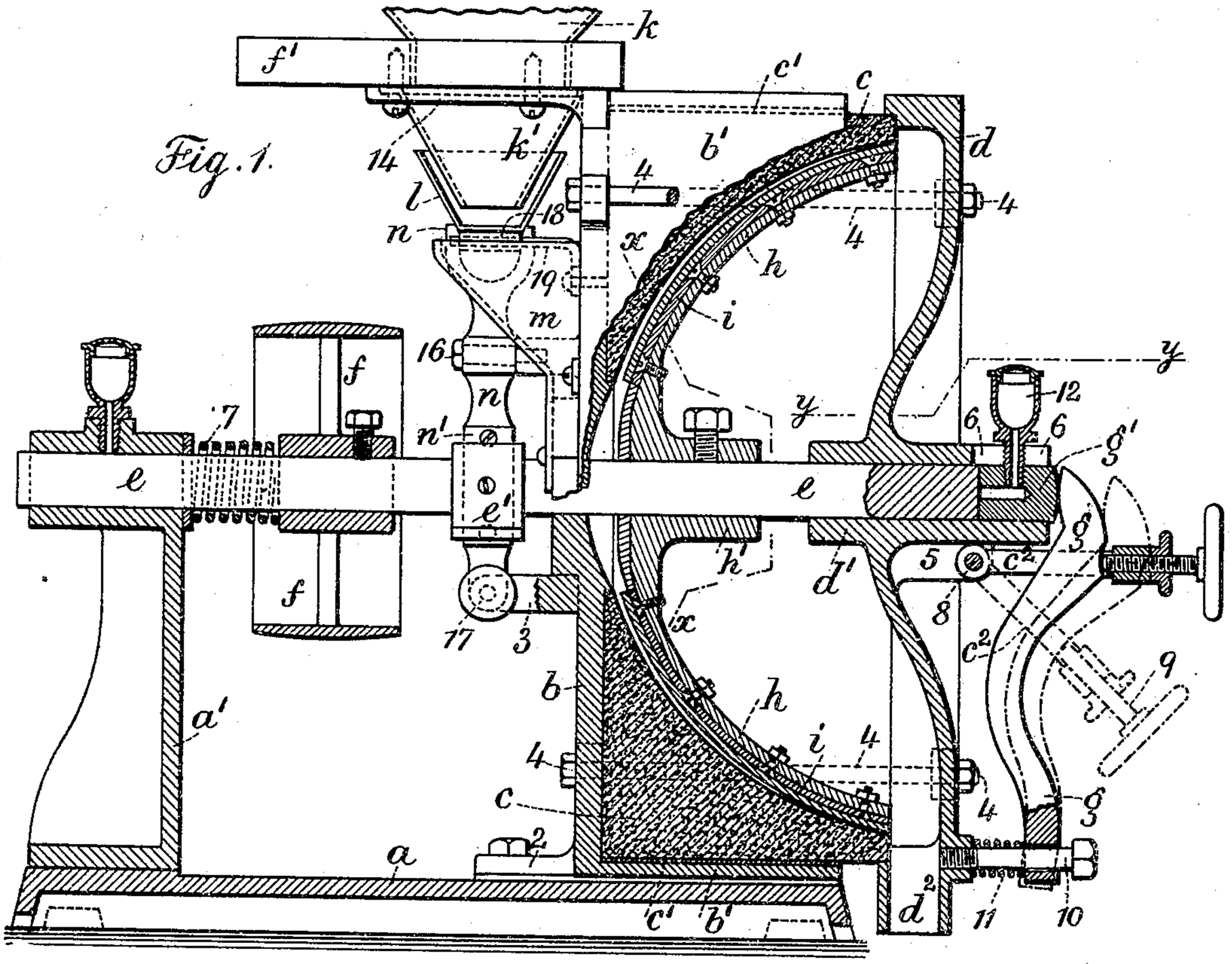
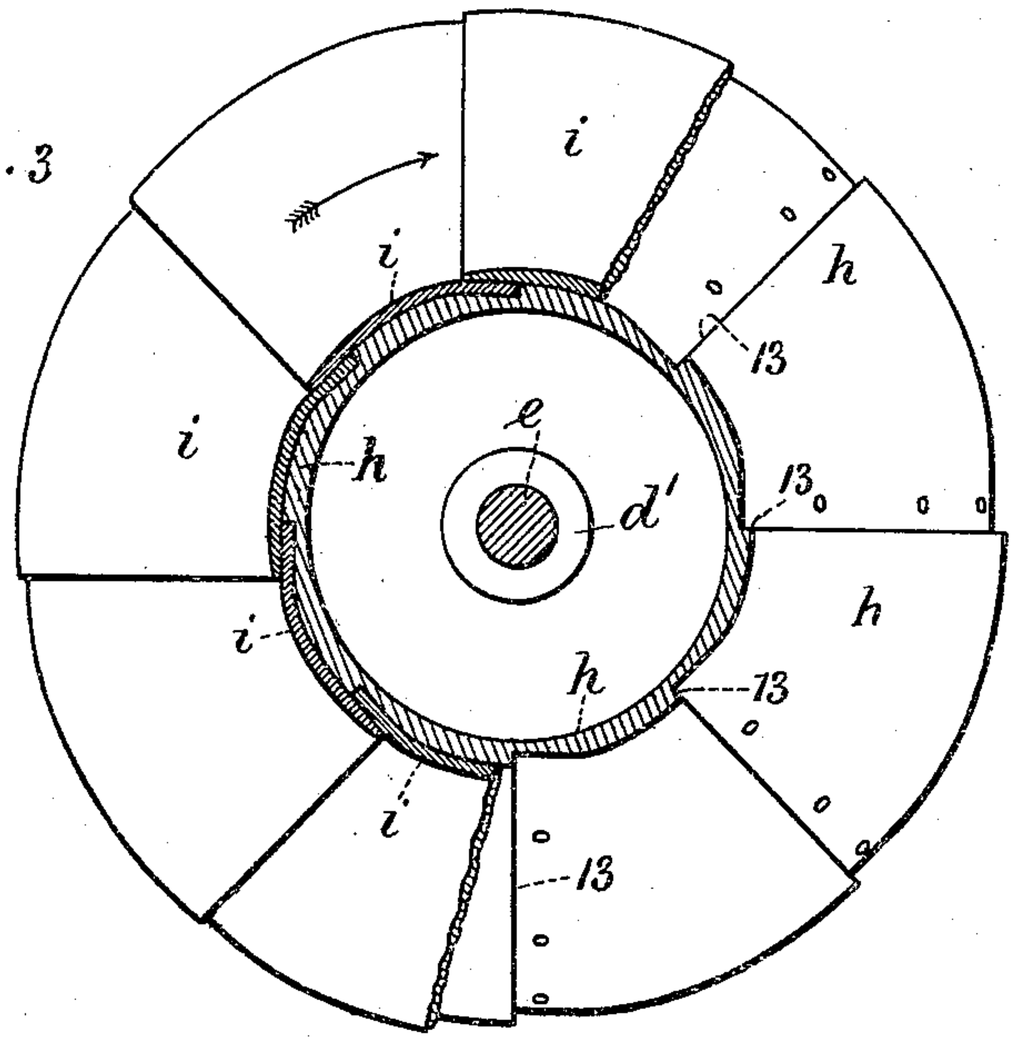


Fig. 3



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2 SHEETS—SHEET 2.

Fig. 2.

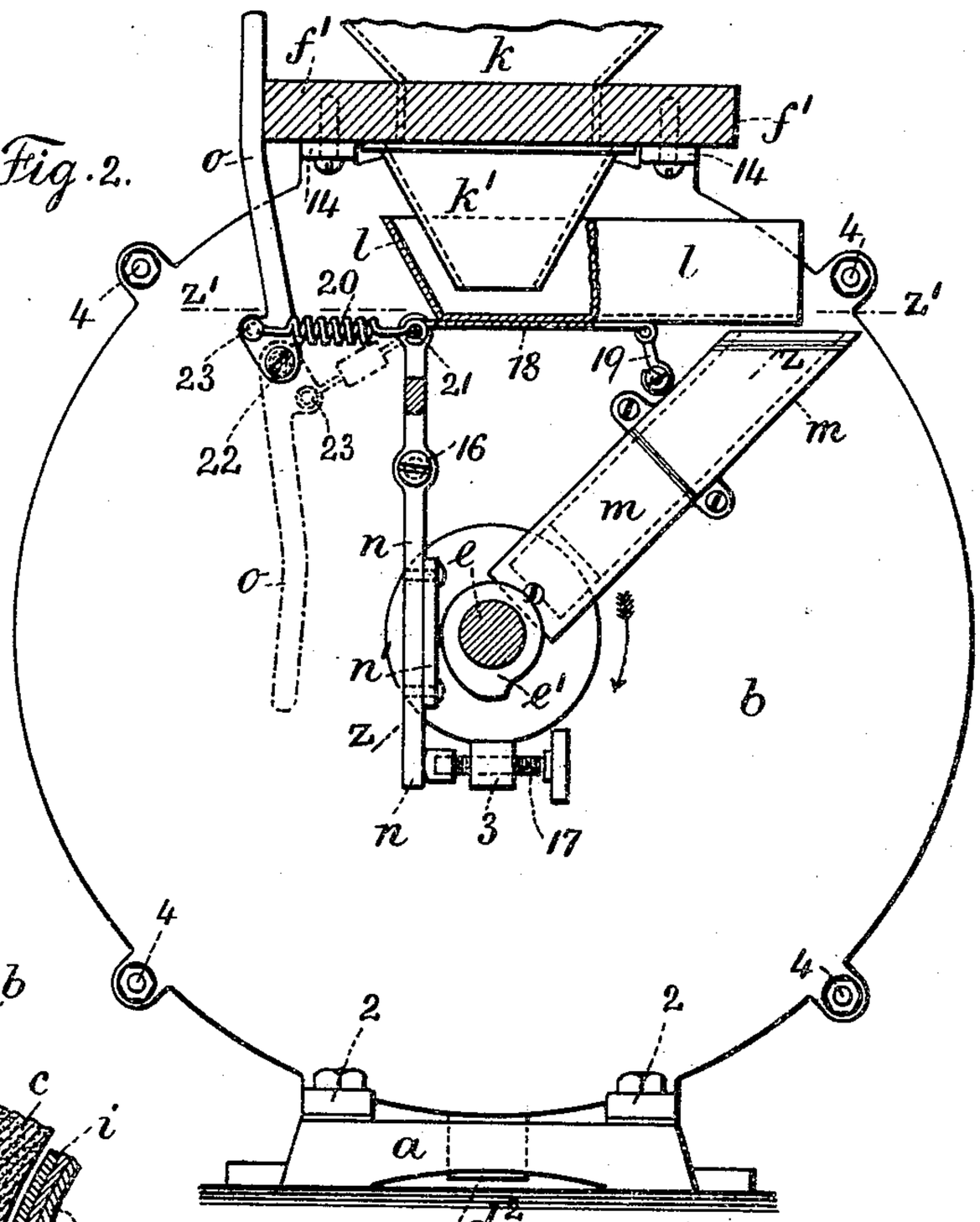
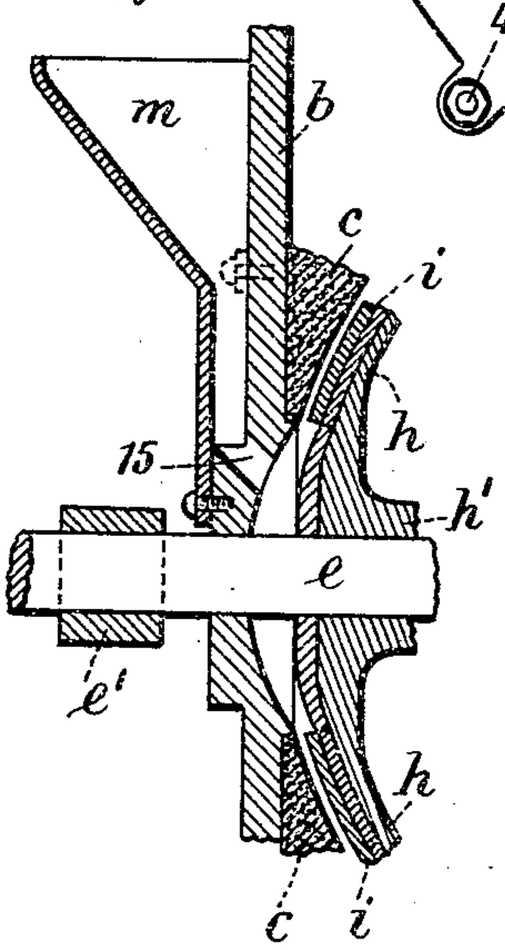


Fig. 5.



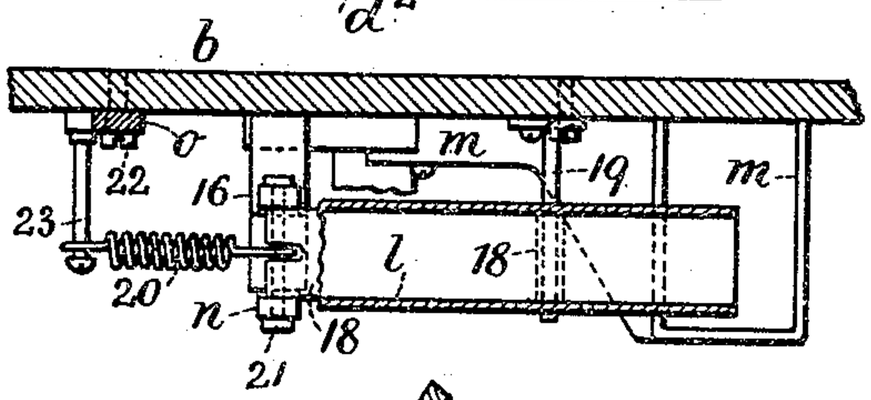
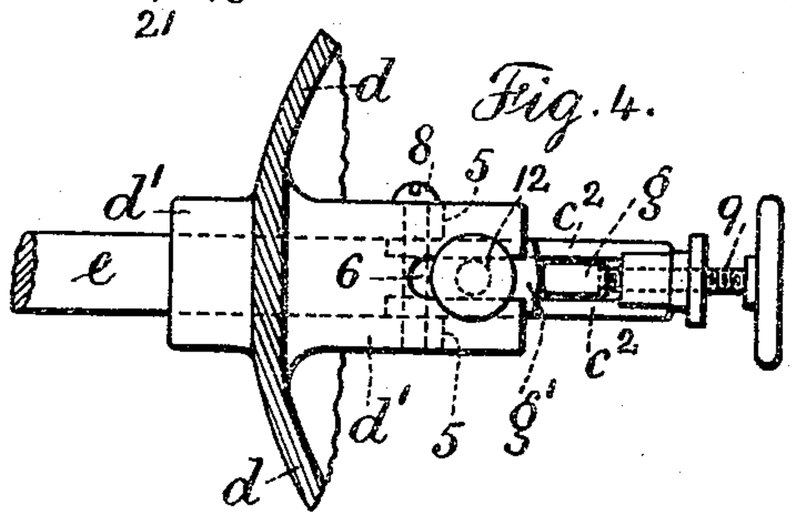


Fig. 6.

Fig. 4.



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No. 792,395. Patented June 13, 1905.

UNITED STATES PATENT OFFICE.

SENECA CLARK BUCK, OF NEW YORK, N. Y., ASSIGNOR, BY MESNE ASSIGNMENTS, TO JAMES O'DONNELL, OF LOUISVILLE, KENTUCKY.

RICE-HULLING MACHINE.

SPECIFICATION forming part of Letters Patent No. 792,395, dated June 13, 1905.

Application filed October 19, 1903. Renewed November 11, 1904. Serial No. 232,293.

To all whom it may concern:

Be it known that I, SENECA CLARK BUCK, a citizen of the United States, residing in the borough of Manhattan, city, county, and State of New York, have invented an Improvement in Rice-Hulling Machines, of which the following is a specification.

Heretofore in this class of machines difficulties have been encountered in fully and successfully removing the hulls from the rice and in retarding the action of the machine to such an extent that the hulling operation was not completely and effectually performed. In carrying out my invention I employ a rotator which in one direction is circular and in axial section substantially semicircular or hemispherical or conoidal, and the same is surfaced with segmental strips of leather, is mounted upon a shaft provided with suitable bearings, and provided with means for revolving the shaft and rotator. Coacting with this rotator is an emery ring or annulus with a concave face, and the adjacent surfaces thereof and of the rotator between which the rice to be hulled passes gradually approach one another or bear a tapering relation to one another toward their peripheries, having the combined effect of hulling the rice with a rolling gradually-increasing but yielding pressure and a gradual lessening of the centrifugal action to the point of delivery. Provision is made for progressively feeding and agitating the rice and delivering the same to the action of the rotator and also for permitting a predetermined longitudinal movement of the rotator and its shaft, as well as for adjusting the relation of the rotator to the surface of the emery-ring, all of which are hereinafter more particularly set forth.

In the drawings, Figure 1 is a vertical section and partial elevation representing my improved rice-hulling machine. Fig. 2 is an elevation and partial section at one end. Fig. 3 is an elevation and vertical section of the rotator on the line $x\ x$ of Fig. 1. Fig. 4 is a sectional plan on the line $y\ y$ of Fig. 1. Fig. 5 is a detached vertical section through the inclined delivery-hopper at the line $z\ z$, Fig. 2; and Fig. 6 is a sectional plan on the line $z'\ z'$ of Fig. 2.

A base a is provided with a standard a' and with a circular disk b, having a circular parallel-sided edge flange b', the disk and flange being secured to the base a by connecting-feet 2, said circular disk having a central hub also forming a bearing and an integral arm 3.

c represents an emery ring or annulus with a concave face received within the flange b' of the disk b, said ring also resting against the disk b, there being by preference a lining c' between the outer surface of the emery-ring c and the inner surface of the flange b' to aid in securely holding the said emery-ring in place.

I employ a metal end head d, the central portion of which is formed as a bearing-hub d'. This head d rests against the outer edge of the emery-ring c and is securely connected to the circular disk b by bolts 4 at intervals, and the same is made with a discharge-throat d^2 at the lower end and lugs 5 from the under surface of the bearing-hub d', said hub also being provided at the upper side and at the outer end with a slot 6. The standard a', the hub d', and the central portion of the circular disk b form bearings for the shaft e, which passes through the same.

A pulley f is mounted upon the shaft e adjacent to the standard a' and employed for rotating the shaft, and between the hub of this pulley and the surface of the standard a' or a plate surrounding the shaft and resting against the standard is a spring 7, the function of which when released is to impart a longitudinal movement to the said shaft and the parts connected therewith, the spring acting expansively. On this shaft there is provided a cam e', the function of which is hereinafter described.

A yoke-bar c^2 is connected to the lugs 5 of the bearing-hub d' by a pivot-pin 8, and an adjusting-screw 9 passes through the outer end of this yoke-bar and bears against the lever g. A tap-bolt 10 passes into a boss upon the lower end of the head d and through an aperture in the lower end of the lever g, and

a spring 11 is placed between the boss of said head *d* and the lower end of said lever. In the outer end of the bearing-hub *d'* of said head there is a centrally-perforated thrust-block *g'*, against the outer end of which the lever *g* bears, while the inner end of the thrust-block *g'* bears against the end of the shaft *e*. An oil-cup 12 passes freely through the slot 6 of hub *d'* into the thrust-block, so that the aperture from the oil-cup communicates with the perforation in the center of the thrust-block.

h represents the rotator. In the elevation, Fig. 3, the same is of circular configuration, and in the vertical section, Fig. 1, the same may be styled "conoidal," the said rotator being substantially semicircular or hemispherical. This rotator is provided with a hub *h'* and is secured to the shaft *e*, and its surface is formed with radial shoulders 13, having adjacent recesses, there being perforations for bolts through the rotator in lines adjacent with the shoulders 13. Segmental strips of leather *i* are secured by bolts at said perforations, with one edge of each segmental strip abutting the radial shoulders and the opposite edges overlapping the edges of the adjacent segmental strips.

The upper end of the circular disk *b* is formed with brackets 14, supporting a shelf *f'*. To this shelf is connected a hopper *k*, the lower end of the hopper passing through an opening in the shelf, and beneath the shelf is an auxiliary hopper *k'*. The lower end of the auxiliary hopper, which is tapering, is received in an agitator-trough *l*. The end of this agitator-trough *l* comes over the open upper end of an inclined hopper *m*, which is connected to and extends along the back of the circular disk *b*. The portion of the disk *b* at the center, which is of increased thickness, (see Figs. 1 and 5,) is provided with an aperture 15, the lower end of the casing of the inclined hopper being connected to this portion of the disk, and the rice passing down the inclined hopper *m* passes through the discharge-aperture 15 into the space between the rotator *h* and the emery ring or annulus *c*.

The disk *b* is provided with a pivot 16, upon which is mounted the rocker-arm *n*. This rocker-arm is in the same vertical plane with the cam *e'*, and a bearing-plate *n'* is connected to the rocker-arm for the surface of the cam *e'* to act upon. This bearing-plate may be of any suitable material and is adapted to be renewed from time to time. A regulating-screw 17 passes through the arm 3 of the disk *b*, and its small end is adapted to form an adjustable stop against the free lower end of the rocker-arm *n*. A plate 18 is connected to the under surface of the agitator-trough *l*. At one end this plate 18 is connected to a rocker 19 and at the other end to a pin or arm 21 at the upper end of the rocker-arm *n*, so that the agitator-trough *l* is supported by the rocker 19 and the arm *n*.

A lever *o* is connected to the circular disk *b* by a pivot-screw 22, and a spring 20 is at one end connected to the pin or arm 21 and at the other end to a pin 23 on the pivoted end of the lever *o*, which is so constructed as to have the function of an eccentric. In the position of these parts (shown in Fig. 2) the upper end of the lever *o* comes against one edge of the shelf *f'*, the position of the lever being thus fixed, and the pin 23, being at the left-hand side of the pivot-screw 22, applies a maximum of permanent tension to the spring 20, tending to hold the rocker-arm *n* against the adjusting or regulating screw 17 in the path of the cam *e'*. The action of the cam *e'* in its rotation is to move the lower end of the rocker-arm *n* toward the left hand, Fig. 2, and the agitator-trough *l* toward the right hand, Fig. 2, the rotation of said cam producing a vibratory movement of the agitator-trough, so as to cause a movement of the rice delivered into the trough from the hoppers to move along the trough and to be delivered in a continuous stream of approximately equal quantity to the inclined hopper *m*, by which it is conveyed between the rotator *h* and the emery-ring *c* for the action of said parts in hulling the rice. In the further action of the machine and with the parts in the position Fig. 1 a belt upon the pulley *f* rotates the same and the shaft *e* in turn causing the revolution of the rotator *h*. By this device, which revolves at a high speed, the kernels of rice are separated, are given a centrifugal movement, are brought between the surfaces of the segment-strips of leather *i* and the emery-ring *c*, the effect of the centrifugal action being to throw said particles off at right angles to the vertical plane of the rotator, while the shape of the rotator and the emery-ring act to divert the rice toward the delivery-aperture between the same, tending to move the kernels of rice in a direction at an inclination to the centrifugal action. Consequently a retarding action is produced, which increases toward the delivery-aperture between the rotator and the emery-ring, having the function of imparting to the kernels of rice a greater number of turns about the rotator, and consequently prolonging the hulling action for more effectually performing the same. It will be noticed that the aperture between the rotator and the concave surface of the emery ring or annulus *c* is greatest near the shaft *e* and smallest toward the delivery-aperture between the said parts and adjacent to the end head *d*. Consequently with the progressive movement of the kernels of rice greater pressure is applied as the kernels move toward the delivery-aperture, an increased force thereby being made effective for the perfect hulling of the rice.

Referring to the position of the parts, Fig. 1, the lever g, the yoke-bar c^2, and the thrust-block g' are placed to keep the rotator in working position. From this position the yoke-bar c^2 and adjusting-screw 9 may be moved downward into the dotted position, Fig. 1, thereby releasing the lever g and causing the same to be moved toward the right hand. This movement is effected by the expansive action of the spring 7, which moves the shaft e and the rotator h longitudinally toward the right in the bearings of the shaft, so as to separate the working faces of the rotator and the emery-ring c. It will also be apparent that by the action of the adjusting-screw 9, with the lever g in the position shown in Fig. 1 in full lines, the juxtaposed surfaces of the rotator and emery-ring may be brought slightly nearer together or appreciably separated, the rotation of said screw 9 in one direction compressing the spring 7 and in the opposite direction permitting the spring to act expansively, as hereinbefore described, to separate said surfaces.

From Fig. 1 it will be noticed that the oil-cup 12 passes through the slot 6 in the hub d' of the head d into the thrust-block g'. The oil-cup, therefore, in said slot provides for the longitudinal movement of the said thrust-block and prevents the rotation of the same.

In Fig. 2 I have shown the lever o by dotted lines in its turned-over and downward position, from which it will be noticed that in this movement the pin 23 is brought around nearer to the pin 21 of the rocker-arm n. Consequently the tension of the spring 20 is released and the rocker-arm permitted to swing on its pivot 16, thereby bringing the face of the plate n' sufficiently away from the rotating cam e' so that the same is not affected by the rotation of the cam, and consequently the agitator-trough l is not moved.

I claim as my invention—

1. In a rice-hulling machine, the combination with a support and an emery ring or annulus having a concave surface, of a rotator which in one direction is circular and in axial section substantially conoidal, the space between their surfaces being gradually tapering, largest at the point of entrance of the material and smallest at the point of discharge, the surface of said rotator being provided with radial shoulders, segmental strips of leather secured to the rotator at said shoulders with their opposite edges overlapping and lying close to the rotator, a shaft on which said rotator is mounted, and means for causing the revolution of the same.

2. In a rice-hulling machine, the combination with a support and an emery ring or annulus having a concave surface, of a rotator which in one direction is circular and in axial section substantially conoidal, a shaft on which said rotator is mounted, means for causing the revolution of the same, hopper devices for feeding the rice between the juxtaposed surfaces of the rotator and the emery ring or annulus, an agitating device interposed in said hoppers for effecting the progressive feed of the rice, a rocker-arm connected to the agitator device, a cam on the main shaft for moving the same in one direction, a spring for effecting the return movement, and a lever to which one end of the spring and rocker-arm are connected, said lever adapted to a change in position for moving the rocker-arm out of the path of the cam.

3. In a rice-hulling machine, the combination with a base, of an emery ring or annulus having a concave surface, a circular flanged device receiving the said ring or annulus and adapted for connection to the base or support, a head and bolts passing through lugs of the head and lugs of the circular flanged device for holding the head, the flanged device and the emery ring or annulus in a fixed relation to one another, a shaft, a standard forming a bearing for one end of the shaft, a bearing-hub on said head forming a bearing for the other end of the shaft and said shaft passing through the flanged circular device, a conoidal rotator mounted upon said shaft and having its convex surface in juxtaposition and gradually approaching or in a tapering relation to the concave surface of the emery ring or annulus, and means for revolving the shaft and the rotator.

4. In a rice-hulling machine, the combination with a base, of an emery ring or annulus having a concave surface, a circular flanged device receiving the said ring or annulus, and adapted for connection to the base or support, a head and bolts passing through lugs of the head and lugs of the circular flanged device for holding the head, the flanged device and the emery ring or annulus in a fixed relation to one another, a shaft, a standard forming a bearing for one end of the shaft, a bearing-hub on said head forming a bearing for the other end of the shaft, said shaft passing through the flanged circular device, a conoidal rotator mounted upon said shaft and having its convex surface in juxtaposition and gradually approaching or in a tapering relation to the concave surface of the emery ring or annulus, the surface of said rotator being provided with radial shoulders, segmental strips of leather secured thereto with one edge abutting the radial shoulders and with the other edge lapping upon the adjacent segmental strip, means for securing the respective segmental strips to the rotator, and means for revolving the said shaft and rotator.

5. In a rice-hulling machine, the combination with a base, of an emery ring or annulus having a concave surface, a circular flanged device receiving the said ring or annulus and adapted for connection to the base or support,

a head and bolts passing through lugs of the head and lugs of the circular flanged device for holding the head, the flanged device and the emery ring or annulus in a fixed relation to one another, a shaft, a standard forming a bearing for one end of the shaft, a bearing-hub on said head forming a bearing for the other end of the shaft, said shaft passing through the flanged circular device, a conoidal rotator mounted upon said shaft and having its convex surface in juxtaposition and gradually approaching or in a tapering relation to the concave surface of the emery ring or annulus, the surface of said rotator being provided with radial shoulders and segmental strips of leather secured thereto with one edge abutting the radial shoulders and with the other edge lapping upon the adjacent segmental strip, means for securing the respective segmental strips to the rotator, means for revolving the said shaft and rotator, adjustable devices for maintaining and regulating the relation of the juxtaposed surfaces of the rotator and the emery ring or annulus, and devices acting when the latter means are released for imparting a longitudinal movement to the shaft and the rotator to separate said surfaces.

6. In a rice-hulling machine, the combination with a base, of an emery ring or annulus having a concave surface, a circular flanged device receiving the said ring or annulus and adapted for connection to the base or support, a head and bolts passing through lugs of the head and lugs of the circular flanged device for holding the head, the flanged device and the emery ring or annulus in a fixed relation to one another, a shaft, a standard forming a bearing for one end of the shaft, a bearing-hub on said head forming a bearing for the other end of the shaft and said shaft passing through the flanged circular device, a conoidal rotator mounted upon said shaft and having its convex surface in juxtaposition and gradually approaching or in a tapering relation to the concave surface of the emery ring or annulus, the surface of said rotator being provided with radial shoulders and segmental strips of leather secured thereto with one edge abutting the radial shoulders and with the other edge lapping upon the adjacent segmental strip, means for securing the respective segmental strips to the rotator, and means for revolving the said shaft and rotator, a yoke-bar pivoted to lugs upon the bearing of the head, a lever passing through the yoke-bar, means for adjustably supporting the same at its lower end, a screw passing through the yoke-bar and bearing upon said lever, a thrust-block in the hub of the head and between the end of the shaft and said lever upon which the lever bears for adjustably controlling and regulating the relation of the juxtaposed surfaces of the rotator and the emery ring or annulus to one another, a spring surrounding the shaft and adapted when the yoke-bar is released from its aforesaid relation to the lever to move the shaft and the rotator longitudinally and separate said surfaces.

7. In a rice-hulling machine, the combination with devices for separating the hulls from the kernels of rice, of hoppers receiving the rice, *en masse*, and an inclined hopper for delivering the same to the hulling devices, an agitator-trough intermediate to the hopper devices receiving the rice from one hopper and delivering it to the inclined hopper, a rocker-arm, a plate and a rocker upon which the agitator-trough is mounted and supported, a spring connected at one end to the union of the said plate and rocker-arm, a lever to which the other end of the spring is connected, a stop for the lower end of the rocker-arm, and a cam on the main shaft acting against the rocker-arm between its pivot and its lower end to swing the same and move the agitator-trough in one direction, the return movement being effected by the spring.

Signed by me this 16th day of October, 1903.

SENECA CLARK BUCK.

Witnesses:
GEO. T. PINCKNEY,
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