

J. B. CORNWALL.
ANGLE MILL.

APPLICATION FILED MAR. 4, 1915.

1,144,174.

Patented June 22, 1915.
2 SHEETS—SHEET 1

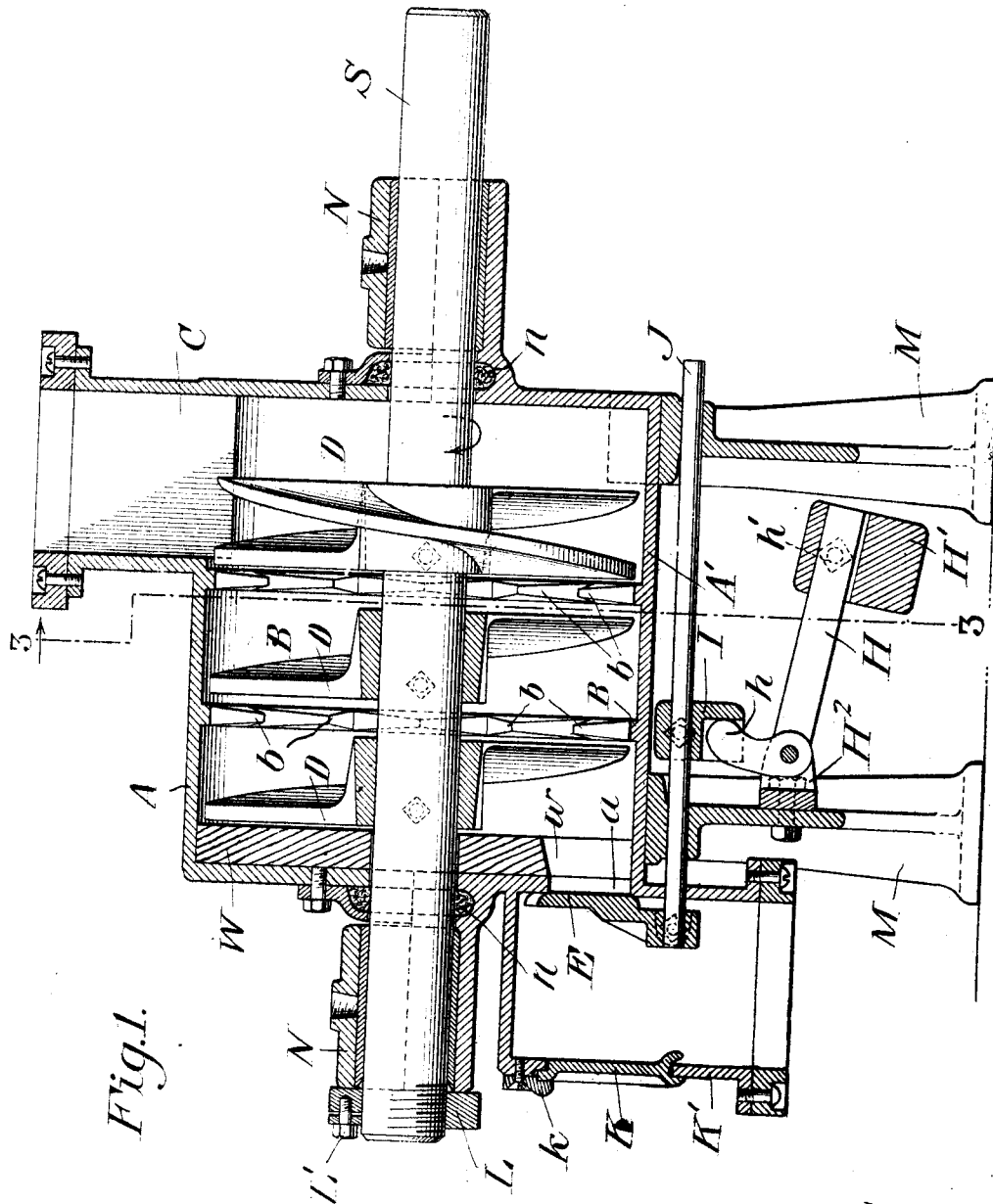


Fig. 1.

Witnesses

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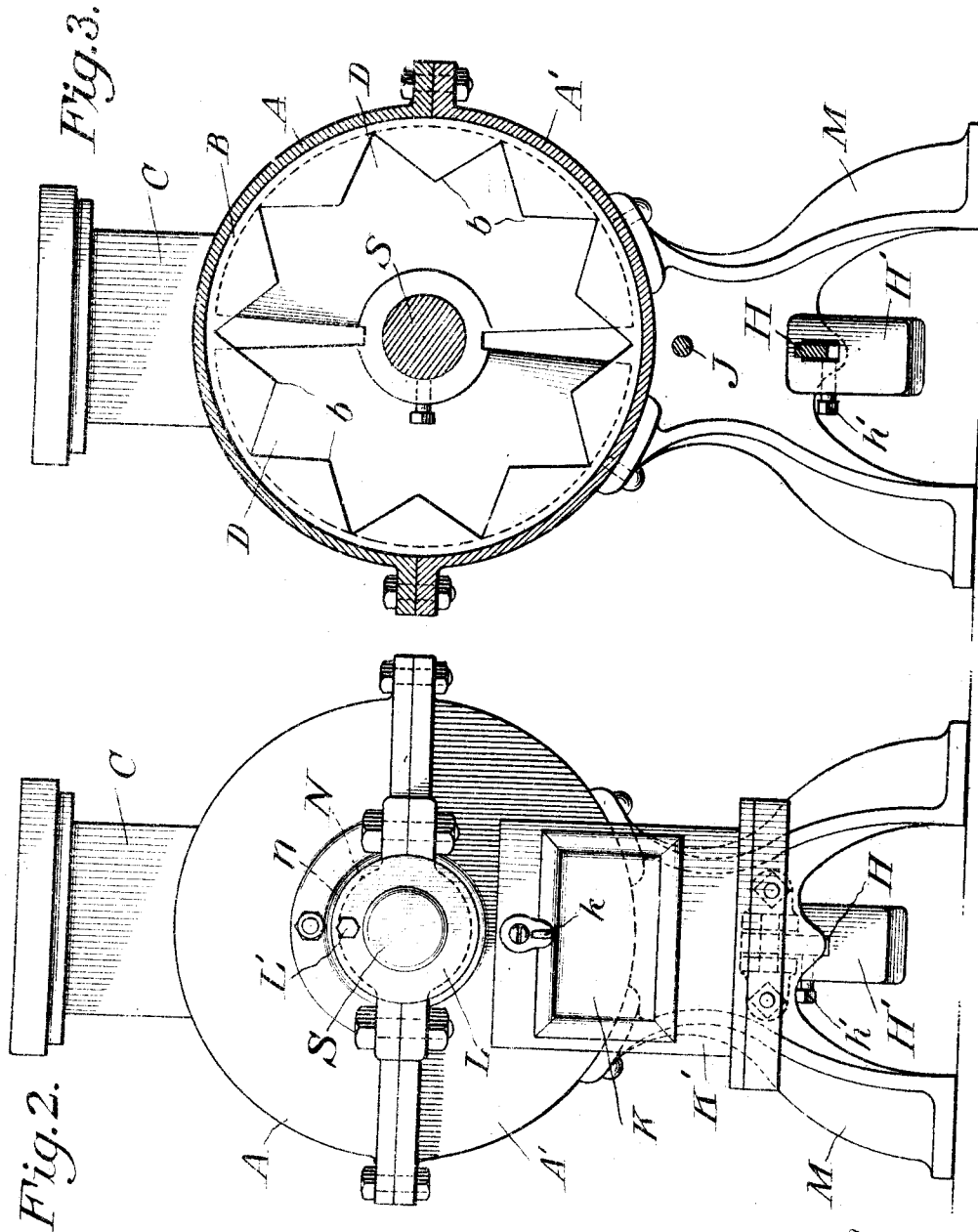
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UNITED STATES PATENT OFFICE.

JOHN B. CORNWALL, OF MOLINE, ILLINOIS, ASSIGNOR TO BARNARD AND LEAS MANUFACTURING COMPANY, OF MOLINE, ILLINOIS, A CORPORATION OF ILLINOIS.

ANGLE-MILL.

I, 144,174.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, JOHN B. CORNWALL, a citizen of the United States, residing at Moline, in the county of Rock Island and State of Illinois, have invented certain new and useful Improvements in Angle-Mills; and I hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, which form part of this specification.

This invention is a novel machine for treating the granulated product of grain in the process of making flour, and which I call an "angle mill," and is designed to finish the product delivered from crushing rolls, by detaching the crushed kernels from the hulls by pressing and rubbing such product so that the separated crushed kernels will pass the sieve cloths in the form of flour.

When grain is crushed between rolls the crushed particles of kernels and hulls have a tendency to cling together, not being fully separated, and it is necessary to detach such particles from each other in order to separate the flour from the bran or hulls. This is customarily done by passing the crushed material over sieves to separate such particles of flour as are fine enough to pass through the sieves and then regrinding the remainder. This regrinding will, to a greater or less extent, reduce some particles of the bran or hulls so fine that they can pass through the flour sieves and cause the flour to have a dark appearance. By passing the crushed product from the grinding rolls, and before it is bolted or sieved, through my novel machine, a very much larger proportion of the kernels is enabled to go through the sieves as flour, thereby simplifying the final operations on the product and enhancing the quality of the flour.

My novel machine comprises in brief a chamber in which are located novel partitions and scrolls, or packer screws, alternating therewith, and which press the material through the openings in said partitions toward a yielding valve which regulates the desired amount of pressure applied; and as the material passes through this machine it is rubbed between the faces of the scrolls and opposed stationary parts, with the desirable results above set forth.

A distinctive feature of my machine is that the material is alternately compressed and released as it passes through the ma-

chine so that the particles of kernels are very thoroughly detached from particles of hulls without injurious crushing, as I do not attempt nor desire to crush or grind the product, but merely to separate particles of kernels and hulls that have been already crushed but not separated, as the grinding performed by the rolls, or other grinding mechanism, is sufficient; and if the material is ground too much the flour is injured.

I will explain the invention as embodied in the machine illustrated in the accompanying drawings, and set forth in the claims the features and combinations of parts for which I desire protection.

In said drawings: Figure 1 is a longitudinal sectional elevation of the complete machine. Fig. 2 is an end view thereof. Fig. 3 is a section on line 3-3, Fig. 1.

The machine comprises a body preferably formed of upper and lower halves A and A' provided with exterior flanges, as shown, by which they can be bolted together to form a closed cylindrical chamber. The upper portion A is provided at one end with an inlet C where the material to be treated is introduced. The parts A, A' are provided at their ends or heads with axial bearings N for a main shaft S; said bearings are of ordinary construction and may be provided at their inner ends with annular chambers around the shaft in which waste may be placed to prevent oil working back from the bearings into the interior of the body.

The body is shown as supported upon standards M which have their upper ends concaved to fit the underside of the part A', and may be bolted thereto as indicated in the drawings.

The part A' has a discharge opening *a* at its end opposite the inlet C, which opening may be yieldably closed by means of a valve E fixedly attached to a slidable bar J which is supported and guided in axially aligned openings in the standards M as shown; and on this bar J is secured a depending arm I which can be adjusted on the bar J and fixed by a set-bolt or other suitable means. This arm I is engaged by the short arm *h* of a lever H which is pivoted on a bracket H² attached to the adjacent standard M as shown; and on the long arm of this lever H is a weight H' which may be adjustably secured on the lever by a set-bolt *h'* or other suitable device. The arm I may be pro-

vided with a recess to receive the end *h* of the lever *H*, which prevents the bar *J* from turning and displacing the valve *E*. By these means it will be seen the valve *E* is yieldingly held against and closes outlet *a*, but will open when sufficient material and pressure accumulates within the body.

The valve *E* is preferably protected by a housing *K'* attached to the adjacent end of the member *A'*, said housing being open at its lower end, and the material escaping through outlet *a* may be discharged through this housing into any suitable receiver or conductor. In the outer wall of housing *K'* and opposite valve *E*, is an opening which is closed by a removable door *K*, which can be detachably secured in position by a pivoted latch *k*.

Within the body and mounted upon the shaft *S* are a series of scrolls, or packer blades, *D* which may be of any suitable construction, I preferably use scrolls having one complete spiral. Three such scrolls are used in the machine shown in the drawings, one of these being fixed on the shaft below the feed opening *C*.

Between each adjacent pair of scrolls and within the body is an annular partition *B*, of peculiar construction, each comprising a ring portion having an annular series of approximately triangular inwardly projecting parts *b* on its inner periphery, the apexes of said parts *b* pointing toward the axis of the shaft. Preferably each part *b* is also slightly tapered on its broader sides from its base toward its apex.

I make these parts *b* triangular in shape, as the greatest portion of the material being passed through the machine is nearest the outer circumference of the chamber, and the angular parts *b* provide an increasing retarding surface toward the periphery of the chamber or conversely provide an opening for the passage of material enlarging toward the axis of the partition and contracting toward the periphery thereof. The material should not be retarded any longer or to any greater extent than is necessary to compress the material momentarily and then immediately release it, in order to detach the crushed particles of kernels entirely from the crushed particles of bran or hulls. My machine will successfully detach all flour particles from the bran without comminuting the bran, and the parts *b* of said partitions present sufficient surface to insure the detaching of particles that are already nearly broken apart, while the finishing work is done by pressure of the material against the diagonally grained wood layer *W*.

It has also been found that the best shape or proportion to do effective work of the character I desire is to have the parts *b* angular with their apexes toward the center.

This brings the effective working surfaces, also the passage for the material through the partitions, in the most desirable positions, and because of these parts *b* I call my invention an "angle mill."

The rear end wall of the body adjacent the discharge opening *a* is lined interiorly with wood, as indicated at *W*; such lining having an opening *w* corresponding with the discharge opening *a*. This lining is so cut that the grain of the wood is oblique to the axis of the shaft of the cylinder and preferably inclines downwardly and inwardly from the end wall of the body, as indicated in the drawings. I purposely make this wooden lining with the grain of the wood as described to obtain the desired effect in the operation of the machine; and by having the grain oblique, as described, an unabrasive rubbing surface is presented to the material, and at the same time rapid wear of the wood is prevented. It is undesirable to employ iron or metal surfaces at this point, as iron is apt to wear and detach particles of bran which mingle with the flour and make so-called "dark flour," while rubbing the material against wood does not have this effect.

Power can be applied to the shaft *S*, preferably at the end adjacent the feed spout *C*, by any suitable means, not shown. On the end of the shaft *S* adjacent the discharge, may be placed a collar *L* which is screwed onto the end of the shaft and this is preferably a split collar locked by a clamp bolt *L'*. If desired a ball thrust bearing, or other suitable means, not shown, might be inserted between the said collar and the end of the adjacent bearing *N*, to resist end thrust on the shaft due to compression on the material when the machine is in operation.

Simultaneous adjustment of the scrolls *D* relative to the stationary parts *b* is accomplished by adjusting the collar *L* at the end of the shaft, which can be turned to set the scrolls at any predetermined distance from the opposed stationary parts. The set screw *L'* may be tightened to lock the collar against rotation after the scrolls are adjusted.

In operation, the crushed product from the roller mill is fed into the machine through the spout *C*, and the first scroll *D* moves it inward toward the discharge and presses the material against the adjacent partition or parts *b*; the material escapes through the wedge shaped openings between the parts *b* into the next compartment wherein the same process is repeated; when the material finally reaches the discharge end the last scroll presses it against the wooden lining *W*. The material is ultimately ejected through the opening *a*, when the pressure overcomes the resistance of

valve E, which ultimately yields to the pressure placed upon the material by the scrolls and allows the material to pass out into the discharge housing K'. The amount of pressure exerted on the material being regulated by adjusting the weight H'.

While this invention appears to be simple it is quite important commercially and is a distinct addition to the list of machines used in the manufacture of flour. Its essential object and effect is to rub the crushed product lightly, stir it, turn it over under some pressure, and repeat such operations until the adhering particles of previously crushed grain kernels and hulls are separated or detached.

It will be seen that the spaces between the triangular parts *b* practically form notches in the partitions, and the material passes through these notches or spaces between the parts *b*, and is subjected to rubbing against the front faces of the part *b*, or partitions, before it escapes through the notches or spaces between the parts *b*.

What I claim is:

1. In a machine of the character specified, the combination of a casing having a chamber, a shaft in said chamber, a series of scrolls on said shaft, and partitions within the chamber intermediate the scrolls, each partition having an annular series of triangularly shaped parts adapted to provide an opening for the passage of material enlarging toward the axis of the partition and contracting toward the periphery thereof.

2. In a mill of the character described, the combination of a body, an axial shaft extending therethrough, a series of scrolls on said shaft, partitions between the scrolls, each partition comprising an annular series of triangularly shaped parts, adapted to provide an opening for the passage of material enlarging toward the axis of the partition and contracting toward the periphery thereof, and a wooden lining in the rear end of the cylinder opposite the last scroll.

3. In a mill of the character described, the combination of a body, an axial shaft extending therethrough, a series of scrolls on said shaft, partitions between the scrolls, and a wooden lining in the rear end of the cylinder opposite the last scroll, the grain of the wood being inclined obliquely to the opposed scroll, substantially as described.

4. In a mill of the character described, the combination of a body, an axial shaft extending therethrough, a series of scrolls on said shaft, partitions between the scrolls, each partition having an annular series of triangularly shaped parts, adapted to provide an opening for the passage of material enlarging toward the axis of the partition and contracting toward the periphery thereof, and a wooden lining in the rear end of the cylinder opposite the last scroll or

packer screw the grain of the wood being inclined obliquely to the end wall of the body, substantially as described.

5. In a machine of the character specified, the combination of a casing having a chamber provided with a feed opening in one end and an outlet opening in the other end, a shaft extending axially through said chamber, a series of scrolls on said shaft, and partitions within the chamber intermediate the scrolls adapted to provide an opening for the passage of material enlarging toward the axis of the partition and contracting toward the periphery thereof, and a yieldable pressure regulating controlling valve closing said outlet opening.

6. In a machine of the character described, the combination of a casing having a feed opening in one end and an outlet opening in the other end, a shaft extending axially through said casing, a series of scrolls on said shaft, annular partitions within the chamber intermediate the scrolls, each partition having an annular series of triangularly shaped parts projecting toward the shaft adapted to provide an opening for the passage of material enlarging toward the axis of the partition and contracting toward the periphery thereof, and a yieldable pressure controlling valve closing said outlet opening.

7. In a mill of the character described, the combination of a body having a feed opening in one end and an outlet opening in the other end, an axially disposed shaft extending through said body, a series of scrolls on said shaft, and partitions between the scrolls, each partition having an annular series of triangularly shaped parts, the apexes of the parts pointing toward the axis of the shaft and adapted to provide an opening for the passage of material enlarging toward the axis of the partition and contracting toward the periphery thereof, and a yieldable weight-controlled valve closing said opening.

8. The herein described machine comprising a body having a feed opening at one end and an outlet opening at the other end, a valve closing said outlet opening, and means for yieldingly holding this valve in closed position, with a shaft disposed axially of the cylinder, a series of scrolls on said shaft between the feed opening and the outlet opening, a series of notched partitions interposed between the adjacent scrolls and adapted to provide an opening for the passage of material enlarging toward the axis of the partitions and contracting toward the periphery thereof and a wooden lining at the end of the chamber adjacent the outlet opening.

9. The herein described machine comprising a body having a feed opening at one end and an outlet opening at the other end, a valve closing said outlet opening, and means for yieldingly holding this valve in closed

position; with a shaft disposed axially of the cylinder, a series of scrolls on said shaft between the feed opening and the outlet opening, a series of partitions provided with inwardly projecting parts interposed between the adjacent scrolls adapted to provide an opening for the passage of material enlarging toward the axis of the partition and contracting toward the periphery thereof, and a wooden lining at the end of the chamber adjacent the outlet opening having its grain oblique to the axis of the chamber.

10. The herein described machine comprising a cylindrical body having a feed opening at one end and an outlet opening at its other end, a valve closing said outlet opening, a slidable bar carrying said valve, an arm on said bar, and a weighted lever engaging said arm to hold the valve yieldably closed; with a shaft disposed axially of the cylinder, a series of scrolls or packer screws on said shaft between the feed and outlet openings, and a series of partitions interposed between the adjacent scrolls or packer screws and adapted to provide an opening for the passage of material enlarg-

ing toward the axis of the partition and contracting toward the periphery thereof.

11. The herein described machine comprising a cylindrical body having a feed opening at one end and an outlet opening at the other end, a valve closing said outlet opening, and means for yieldingly holding the valve in closed position; with a shaft disposed axially of the cylinder, a series of scrolls on said shaft between the feed and outlet openings, a series of partitions provided with inwardly projecting triangularly shaped parts interposed between the adjacent scrolls and adapted to provide an opening for the passage of material enlarging toward the axis of the partition and contracting toward the periphery thereof, and a wooden lining at the end of the chamber adjacent the outlet openings having its grain oblique to the axis of the chamber.

In testimony that I claim the foregoing as my own, I affix my signature in presence of two witnesses.

JOHN B. CORNWALL.

Witnesses:

CLARENCE E. MALCOLM,
HERBERT P. WILSON.