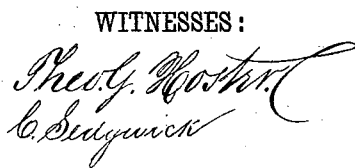


J. E. WARREN.  
PULP BEATING ENGINE.

Patented July 11, 1882.



INVENTOR:  
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# UNITED STATES PATENT OFFICE.

JOHN E. WARREN, OF CUMBERLAND MILLS, MAINE.

## PULP-BEATING ENGINE.

SPECIFICATION forming part of Letters Patent No. 261,107, dated July 11, 1882.

Application filed February 15, 1882. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN E. WARREN, of Cumberland Mills, in the county of Cumberland and State of Maine, have invented a new and Improved Pulp-Beating Engine, of which the following is a full, clear, and exact description.

My improvements relate to the arrangement and setting of the internal filling and knives of pulp-beating engines of the class which combine an internal cone revolving in an outer conical case; and it consists in the novel features of construction hereinafter set forth and claimed.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters of reference indicate corresponding parts in both the figures.

Figure 1 is a longitudinal section of a beating-engine containing my improvements, and Fig. 2 is a partial horizontal section.

A is the outer conical case of the engine, provided at its ends with heads *a a*, and having at the smaller end an inlet-opening, *b*, for the pulp, and at the larger end with an outlet, *c*.

B is the inner cone, fixed on a shaft, *d*, that passes through stuffing-boxes in the heads *a a*, and is supported by suitable bearings that are attached on the outside of the heads *a*. The feed and outlet openings and the shaft-bearings are arranged for a horizontal position; but the engine may be used vertically by changing those parts.

On one end of shaft *d* the driving-pulley is to be placed, as usual. The other end of the shaft is sustained by a sliding box, *e*, and abuts against an adjusting-screw, *f*, by which the shaft and cone B can be moved endwise to compensate for wear of the knives.

On the inner surface of the case A and outer surface of cone B are steel bars or knives *g*. These are arranged on each surface in one or more sections, divided in uniform lengths of the cone, so that each section works against only the corresponding section of the case. The knives are separated by wooden filling-strips *h*, that alternate with the knives, and both the knives and strips are held by dove-

tail ribs or segments *i*, cast on the cone, and similar ribs bolted on the case. Openings, as shown at *l*, are formed in the ribs for the introduction of the knives and filling-pieces, and keys *m* are driven into the openings to secure the whole in place.

To obtain the shear action necessary in grinding the stock, the knives *g* on the cone B, or on both the cone and case, are set at an inclination to the plane of the axis. The angle may be more or less, as required, and to obtain bearings for the knives along their whole length the surface of the cone may be slightly concaved. By the use of straight knives in both the cone and shell set at any required angle with each other or with the plane of the axis of the revolving cone the shearing action is obtained; but in all cases the knives are set with such relation to the direction of motion of the revolving cone that the ends of the knives nearest the inlet shall meet first, and the opening formed by the meeting of said knives being toward the outlet, the pulp is driven forward by the action of the knives toward the outlet, and a regular and uniform spiral motion of the pulp through the engine is induced.

In order to secure economical wear of the knives, those on cone B, when first placed, project beyond the ends of the knives on the case toward the larger end of the cone, such projection being lessened as the cone is set up to compensate for wear. When the limit of wear and adjustment is reached the cone-knives will overlap the case-knives to the same extent, or nearly so. To insure uniform wear and prevent formation of shoulders, the lapping ends are cut away, as shown at *o*, on the lines of wear, and the knives are so graduated in width that when the cone-knives are worn as much as may be they can be removed and placed on the case, thus economizing the use of steel. The wooden filling between the knives is cut away as the steel wears down.

I am aware that in paper-pulp engines the cone and shell have heretofore been provided with knives detachably secured thereto, and I therefore lay no claim, broadly, to such construction.

Having thus described my invention, I claim  
as new and desire to secure by Letters Patent—

1. The combination, with the correspond-  
ing knives *g* on case and cone, of the separat-  
5 ing-strips *h*, the ribs *i*, having openings *l*, and  
the keys *m*, whereby the knives *g* may be de-  
tachably secured, as described.
2. The fixed case-knives *g*, beveled at *o*, in

combination with the overlapping cone-knives,  
adjustable endwise, as and for the purpose so  
specified.

JNO. E. WARREN.

Witnesses:

FRED. W. ADAMS,  
E. B. NEWCOMB.