(No Model.)

S. L. GOULD.

COMPOUND PULP BEATING ENGINE.

No. 310,940. Patented Jan. 20, 1885.

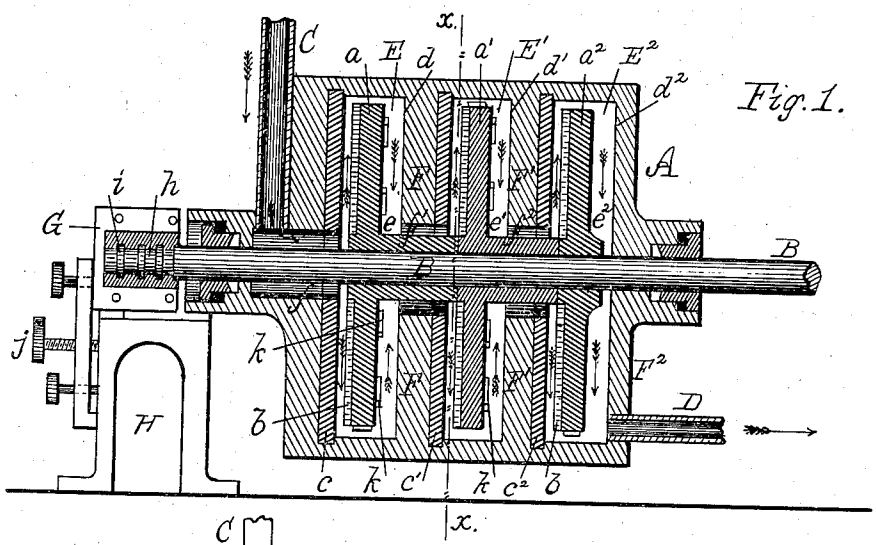


Fig. 1.

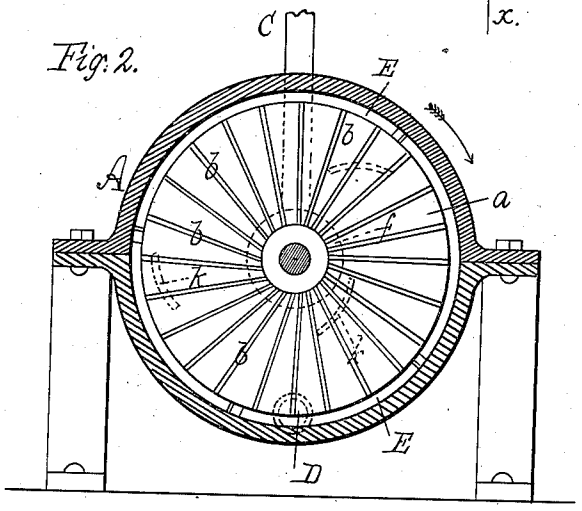


Fig. 2.

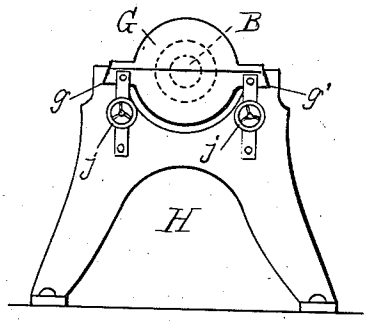


Fig. 3.

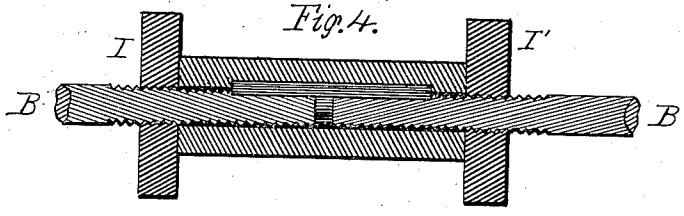


Fig. 4.

Witnesses.
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UNITED STATES PATENT OFFICE.

SIMEON LATHAM GOULD, OF GARDINER, MAINE, ASSIGNOR OF ONE-HALF TO GEORGE W. RUSSELL, OF LAWRENCE, MASS.

COMPOUND PULP-BEATING ENGINE.

SPECIFICATION forming part of Letters Patent No. 310,940, dated January 20, 1885.

Application filed September 16, 1884. (No model.)

To all whom it may concern:

Be it known that I, SIMEON LATHAM GOULD, a citizen of the United States, residing at Gardiner, in the county of Kennebec and State of Maine, have invented certain new and useful Improvements in Compound Pulp-Beating Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

This invention relates to a class of "paper-pulp engines," so called, for beating under pressure the flow of stock being regulated by the head; and it consists of a compound engine in which a series of annular stationary grinding-beds are arranged to co-operate with a like series of rotary armed heads, the pulp or stock being fed to each head from the center, thence passed to the circumference of the heads by centrifugal force, whence, by pressure, it gravitates toward the center of a chamber formed upon the back side of each head, which is active only upon one side. By this arrangement there is but little if any tendency for the pulp to be thrown from the center on the back side, where it collects and passes through an orifice to the center and active side of the next head, and so on successively until it has been properly reduced and emerges in a suitable state ready to be supplied to the paper-making machine.

This invention further consists in arranging said rolls at different degrees of distance from their stationary beds, and accordingly providing them with different styles of knives, so that stock or half-stock may be furnished and gradually reduced and entirely finished in one single continuous operation.

The drawings accompanying this specification represent, in Figure 1, a vertical central longitudinal section of a pulp-engine embodying my improvements. Fig. 2 is a transverse section on line *x x* of Fig. 1, and Fig. 3 is an end elevation showing the means for operating the sliding box. Fig. 4 represents means of connecting two or more engines on a single line of shafting and means for adjusting the distance of the rolls from their stationary beds.

In these drawings, A represents a closed case, which receives a horizontal revolving shaft, B, located centrally thereof, suitable packing devices being supplied at either end to prevent escape of pulp except through the inlet and outlet pipes C and D. This case is provided with a series of annular recesses or chambers, E E′ E², &c., arranged at right angles to the axis of the shaft, and formed by the partitions F F′ F². Upon the shaft B are securely mounted, at suitable distances apart, a series of circular heads, *a a′ a²*, provided upon their front or active sides with radial cutting bars or knives *b b b*, &c., these knives co-operating with removable circular bed-plates *c c′ c²*, disposed in one side of the chambers, and furnished with bars, as is usual in such cases.

I do not wish to confine myself to the precise construction of the cutters and their bed-plates, as they may be made of any suitable abrading material—such as emery or sand-stone—and equally good results be obtained. The back side of the heads and the corresponding opposite faces *d d′ d²*, &c., of the partitions F F′ F² are always to be some distance apart, to form chambers *e e′ e²* with smooth sides, while the several recesses, E E′ E², are connected one with the other by central holes, *f f′ f²*.

Hitherto in engines of this class the rotary head has been armed on both sides, and the chamber in which it revolves similarly so; hence there is a strong centrifugal force generated by the action of the knives in their rotation, which tends to maintain the pulp away from the center, where it is most desired, and it is to overcome these objections that I have armed the rotary head only upon one side.

My system is essentially as follows: The material to be ground is fed under pressure centrally to the active or armed side of the first head in the series, which is so arranged with respect to its co-operating stationary bed-plate that the stock shall be operated upon properly with respect to the fiber between the two surfaces, whence by the action of the cutting-surfaces and centrifugal force gener-

ated by their rotation, together with the head of the water and pulp, it passes to the outside of the head around its circumference, aided by obliquely-arranged peripheral fins, into the smooth-sided chamber upon the rear side of the head. Here the centrifugal force is reduced to a minimum, and gravity, aided by the pressure upon the pulp from the front side, tends to crowd it toward the center and maintain the chamber filled. I propose to aid the pulp somewhat in its course toward the central feeding-orifices, *f f' f²*, by securing to the back sides of the heads their curved plates *k k*, eccentrically disposed, with their rear ends nearer to the shaft than their front ends, that the rotation of the heads will tend to draw and crowd the pulp toward the center. The central bore or orifice leading from this chamber again conducts the pulp centrally to the active portion of the second head in the series, when a second grinding or reduction process ensues, the pulp moving outwardly and thence passing into the chamber in the rear. This process may be successively repeated as many times as is required to sufficiently reduce the material.

The arrows in the drawings represent the course of the pulp from chamber to chamber.

This compound engine is especially adapted for "brushing out," so called, wood pulp where the fiber of the material is already sufficiently reduced but a shive remains. In this case the rotating heads would all have the same position with respect to their stationary bed-plates, and the shives which escaped one head would certainly be reduced by some one of the following series of heads. In case harder stock was to be supplied, the first disks and their bed-plates would be furnished with cutters corresponding to the work to be accomplished, and the succeeding ones would be further modified until, perhaps, the last would be simply for brushing the pulp so reduced.

In Fig. 3 I have shown the end of the shaft B, journaled in an adjustable box, G, sliding in ways *g g'*, cut in a suitable supporting-stand H, the interior of this box being provided with a series of annular slots, *h h*, and ribs *i i*, to engage similar ones formed upon the periphery of the shaft. This arrangement is to effect adjustment of the heads *a a' a²* properly with respect to the stationary bed-plates *c c' c²*, since it is evident that movement of the box G must effect, by the interlocking of the parts *h h* and *i i*, similar motion of the shaft, and by means of the hand-screws *j j* against the stand said box and shaft are adjusted to any desired degree.

To unite a pair of these compound engines upon a single line of shafting, I have shown, in Fig. 5, end portions of two shafts, B B, connected by an ordinary spline-and-groove coupling. At each end of the coupling I have secured two nuts, I I', and cut a suitable distance upon the shaft a peripheral screw-thread, upon which the nuts move.

The action of the coupling compels rotation of the shafts in unison, while longitudinal movement can easily be effected by changing the positions of the nuts I I', each of which adjusts its own shaft and consequent change in the distance or place between the rotary heads and their bed-plates. This arrangement overcomes the end friction and wear consequent when the two shafts are each separately stepped, since the end-thrust and friction is borne by the nuts against the coupling, which revolves with the shaft, and the usual resultant friction is eliminated.

I claim—

1. In an engine for reducing paper-pulp, the combination, with a hopper constructed as described, with its stationary bed-plates, of a series of rotary heads so adapted and arranged individually as to successively partially reduce the pulp which is passed to the circumference thereof, and then returned on the rear side to be fed centrally to the next adjacent head in the series, substantially as and for purposes stated.

2. In a paper-pulp engine, the series of centrally-fed rotary heads provided with a front or active and a rear or inactive side, the latter as a means to return the pulp centrally to the active side of the next adjacent head successively throughout the series, substantially as stated.

3. A paper-pulp-reducing engine composed of a case having two or more bed-plates and two or more rotary heads, each co-operating with its own bed-plate, substantially as described.

4. A case provided with two or more chambers connected together by openings *f f* at or near their centers, and two or more bed-plates, combined with two or more rotary heads and a shaft to move them, one of the said bed-plates and rotary heads being in each of the said chambers, substantially as described.

5. A case provided with two or more connected chambers and two or more bed-plates, one in each chamber, combined with two or more rotary heads provided with cutters of different size, to gradually and successively act upon and reduce the paper-pulp passing between them and the heads, substantially as described.

6. A case provided with an inlet for the paper-pulp stock, to maintain the same in a column above the top of the case, and having two or more connected chambers and an outlet, combined with two or more bed-plates and two or more rotary heads, to operate substantially as described, the length of the column in the inlet-pipe aiding in maintaining the circulation of the pulp through the case.

7. The case and its connected chambers, and the bed-plates, one in each chamber, com-

bined with two or more rotary heads provided with cutters at their sides next the bed-plates, and with curved plates *k k* at their opposite faces, substantially as described.

8. The case having two or more connected chambers, and a bed-plate in each chamber, combined with the shaft and its attached rotary plates, each plate being arranged with its face near the bed-plate, the back of the plate being at a greater distance from the wall of the case to form a space through which the pulp may readily pass on its way to the next chamber, as set forth.

9. In a paper-pulp-reducing engine, a case having a series of connected chambers, and a series of bed-plates open at their centers, combined with a rotary shaft and a series of bed-plates, this shaft being extended through the open centers of the bed-plates, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

SIMEON LATHAM GOULD.

Witnesses:

H. E. LODGE,

A. F. HAYDEN.