(No Model.)

E. R. MARSHALL.

PULP BEATING AND REFINING ENGINE.

No. 475,063. Patented May 17, 1892.

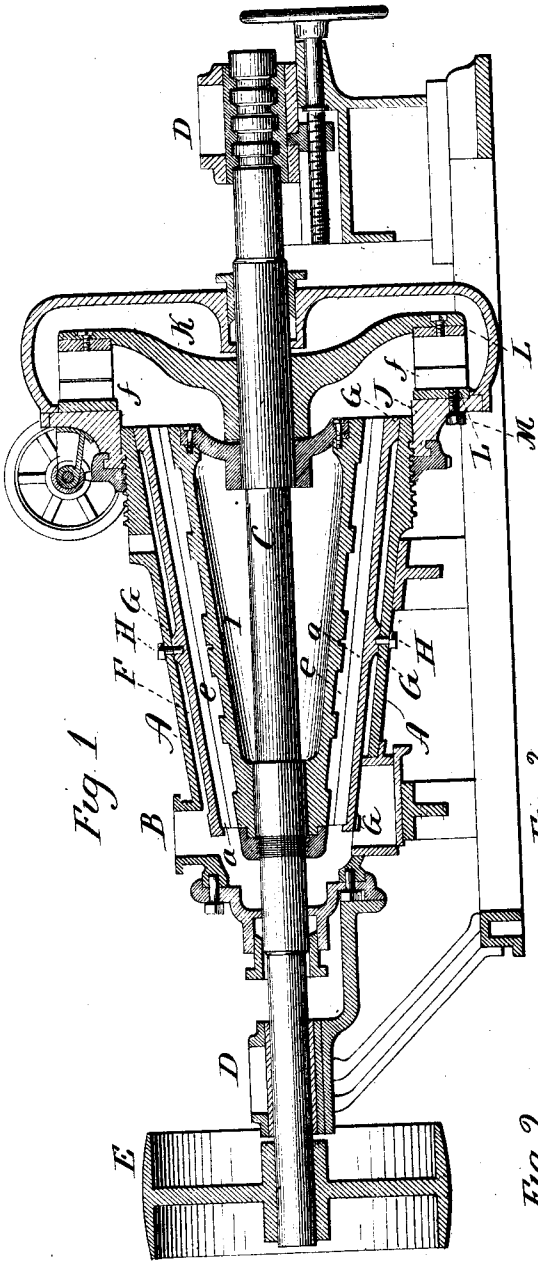

Fig. 1

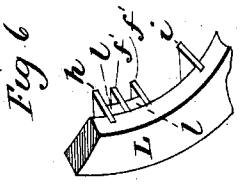

Fig. 6

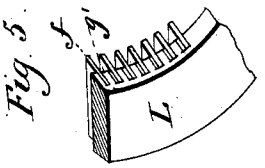

Fig. 5

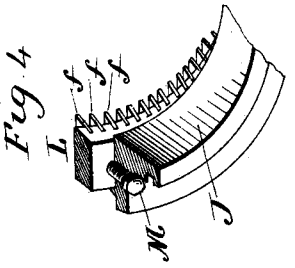

Fig. 4

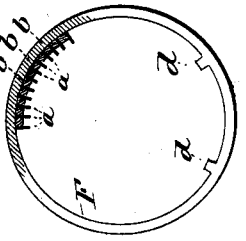

Fig. 3

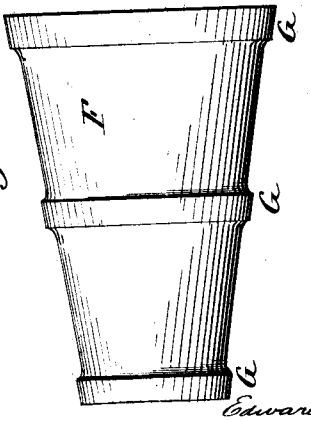

Fig. 2

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UNITED STATES PATENT OFFICE.

EDWARD R. MARSHALL, OF TURNER'S FALLS, MASSACHUSETTS, ASSIGNOR OF ONE-HALF TO FRANK J. MARSHALL, OF SAME PLACE.

PULP BEATING AND REFINING ENGINE.

SPECIFICATION forming part of Letters Patent No. 475,063, dated May 17, 1892.

Application filed May 25, 1891. Serial No. 393,973. (No model.)

To all whom it may concern:

Be it known that I, EDWARD R. MARSHALL, of Turner's Falls, in the county of Franklin and State of Massachusetts, have invented a new Improvement in Pulp Beating and Refining Engines; and I do hereby declare the following, when taken in connection with accompanying drawings and the letters of reference marked thereon, to be a full, clear, and exact description of the same, and which said drawings constitute part of this specification, and represent, in—

Figure 1, a longitudinal central section of a pulp-beating engine embodying the invention; Fig. 2, side view of the cone shell detached; Fig. 3, transverse section of the shell; Figs. 4, 5, and 6, detached views illustrating the construction of the removable rings and cutters for the supplemental beaters or cutters.

This invention relates to an improvement in that class of pulp-beating engines in which the engine consists principally of a frustum-of-cone-shaped case provided with longitudinal ribs or cutters upon its inside, combined with a correspondingly-shaped cone arranged upon a shaft longitudinally through the shell, the periphery of the cone provided with longitudinal ribs or cutters adapted to co-operate with the ribs or cutters upon the inside of the case and so that the material introduced near the smaller end of the case will work through the case toward the larger end and be cut or ground as it passes between the revolving cone and the case toward the larger end of the cone.

In patents granted to Frank J. Marshall, No. 342,802, dated June 1, 1886, and also No. 411,251, granted to me September 17, 1889, there is combined with such an engine a stationary disk or ring at the larger end of the cone, provided on its face with cutters substantially radial—that is, at right angles to the axis of the engine—the ring and its cutters being stationary as to their operation, and combined with which stationary ring-carrying cutters is a revolving disk arranged upon the same shaft as the revolving cone of the engine and so as to revolve therewith, the said disk carrying on its face substantially radial cutters corresponding to the cutters on the said ring, and so that as the cut, ground, or beaten material escapes from the cone it passes between the said stationary disk or ring and the revolving disk and is further cut or ground, this revolving disk and stationary ring operating as supplemental to the engine. It is to improvements in this machine that my invention particularly relates. In that machine the longitudinal cutters for the inside of the case are attached or secured directly to the interior of the case. The removal of the cutters or the replacing them or fitting is a difficult and expensive operation, and particularly is this the case when the machine has been once set up.

The object of the first part of my invention is to construct the machine so that the stationary cutters or beaters of the engine-case may be readily removed and fitted in their place independent of the surrounding case.

To this end the first part of my invention consists in the arrangement of a shell within the main case of the engine and of the requisite conical shape, combined with a series of longitudinal cutters arranged upon the interior of said shell with keys or wedges between successive cutters, so as to bind the cutters upon the interior of the shell, the said shell being removably secured within the main case of the engine.

The object of the second part of my invention is to construct the ring and revolving disk so that their radial cutters may be readily removed or replaced, as occasion may require, and this part of my invention consists in providing the stationary and revolving disks with supplemental rings, the said rings carrying the cutters, and the said rings removably secured to the revolving and stationary disks, all as more fully hereinafter described.

A represents the main or principal case of the engine. It is of the usual conical shape, but of an increased diameter from that of the usual construction. At its smaller end it is provided with an opening B for the introduction of the material to be operated upon. Longitudinally and concentrically through the case a shaft C is arranged, supported in suitable bearings D D, and to which power is applied through a driving-pulley E on the

shaft, or otherwise, and substantially as in the patents before referred to. Within the case A a shell F is arranged of like conical shape to the case. This shell is shown detached in Figs. 2 and 3. At points on its circumference it is constructed with lugs or ribs G, which are adapted to take a bearing upon the interior of the case, and so that it may be secured therein by bolts H or otherwise, the bolts permitting the shell to be introduced or removed through the larger end of the case, but so that the shell may be firmly seated in the case as if practically a part of it.

Upon the inside of the shell F the cutters or beaters *a* are arranged. These are blades arranged longitudinally around the case at a short distance apart. To secure the blades, and so that they may stand in substantially radial planes, they are arranged upon the inside of the case, and between successive blades or cutters keys or binding-bars *b* are introduced the said bars or keys and blades, alternating, as seen in Fig. 3, and this series of cutters and bars extends entirely around the interior of the shell E and so that by means of the bars all the cutters are firmly bound within the shell. Instead of making the series of blades and bars to be one continuous series around the shell abutments may be formed in the shell, as represented at *d*, Fig. 3, these abutments each corresponding substantially to one of the binding-bars, and so that the blades with intermediate bars arranged between these abutments *d d* will be firmly bound between those abutments. The shell is fitted with cutters or beaters before its introduction into the case of the engine. It is consequently more conveniently handled and the blades are more conveniently arranged than they could be upon the inside of the case of the engine, and should it at any time be necessary to remove a portion of the blades or replace one of said blades with another the shell is easily taken from the case for this work, thus greatly facilitating repairs.

The shaft C is provided with a cone I, carrying a series of longitudinal cutters or beaters *e*, substantially as in the before-mentioned patents, and which co-operate with the stationary longitudinal blades to produce the grinding or beating the same as in the said patents.

Around the larger end of the case of the engine a ring J is arranged, the plane of the face of the ring being at right angles to the axis of the engine. The said ring is adjustable longitudinally, but stationary circumferentially, as in the said patents, and upon the shaft C, outside the said ring J, a disk K is arranged to revolve with the shaft, the plane of its revolution being parallel with the plane of the ring J. The adjacent faces of the ring or disk are provided with cutters to operate upon the material supplemental to the work of the engine proper, as in the said patents; but instead of securing the cutters or beaters directly to the ring and disk, as in the said patents, the cutters are arranged on independent rings detachably connected to the ring and disk. L represents the cutter-ring for the ring J. In diameter it corresponds to the ring J and so as to set against its face, as represented in Figs. 1 and 4, and is secured thereto by screws M or otherwise, so that it may be detached, as occasion may require. Radially across the face of this ring grooves are cut, and into these grooves cutters *f* are introduced and secured. The cutters may be driven into their seats with sufficient force to retain them in their position, or they may be keyed therein, as seen in Fig. 5, *g'* representing the keys, the grooves for the cutters and keys being made so much thicker than the cutter as the thickness of its key, and so that a cutter set in place the key may be driven home so as to removably secure the cutter to the ring, or the cutters may be secured, as seen in Fig. 6, by setting one cutter, as *h*, into a groove in the ring, and then at a distant point setting a second cutter, as *i*, into a like groove, so as to interlock with the ring, and then arranging the cutters, as *f'*, between the said cutters *h* and *i*, and driving keys *l* between the respective cutters, as clearly seen in Fig. 6, it only being essential to the invention that the cutters shall be removably attached to the removable rings. A cutter-ring L of like construction is removably attached to the disk, as seen in Fig. 1.

At any time when it is desired to repair or renew the cutters the cutter-rings may be removed from the machine and such work conveniently performed.

In the illustration details of construction are shown substantially the same as in the before-mentioned patents, which do not require description in this specification.

From the foregoing it will be understood that I claim nothing in this specification shown or described in either of the before-mentioned patents; but

What I do claim as an improvement thereon is—

In a pulp-beating engine consisting of a conical case and a revolving shaft arranged longitudinally through the said case and carrying a corresponding cone, the cone constructed or provided on its surface with a series of cutters or beaters, the combination therewith of a correspondingly conical-shaped shell arranged within the case and around the said cone, removably secured to said case, and the said shell provided with a series of longitudinal cutters or beaters adapted to co-operate with the beaters or cutters on the surface of said cone, substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

EDWARD R. MARSHALL.

Witnesses:

FRED E. ALLEN,

LEON O. WOOD.