(No Model.) 3 Sheets—Sheet 1.

O. ZIMMERMANN & G. HAGEMANN.

PULPING OR DISINTEGRATING MACHINE.

No. 537,260. Patented Apr. 9, 1895.

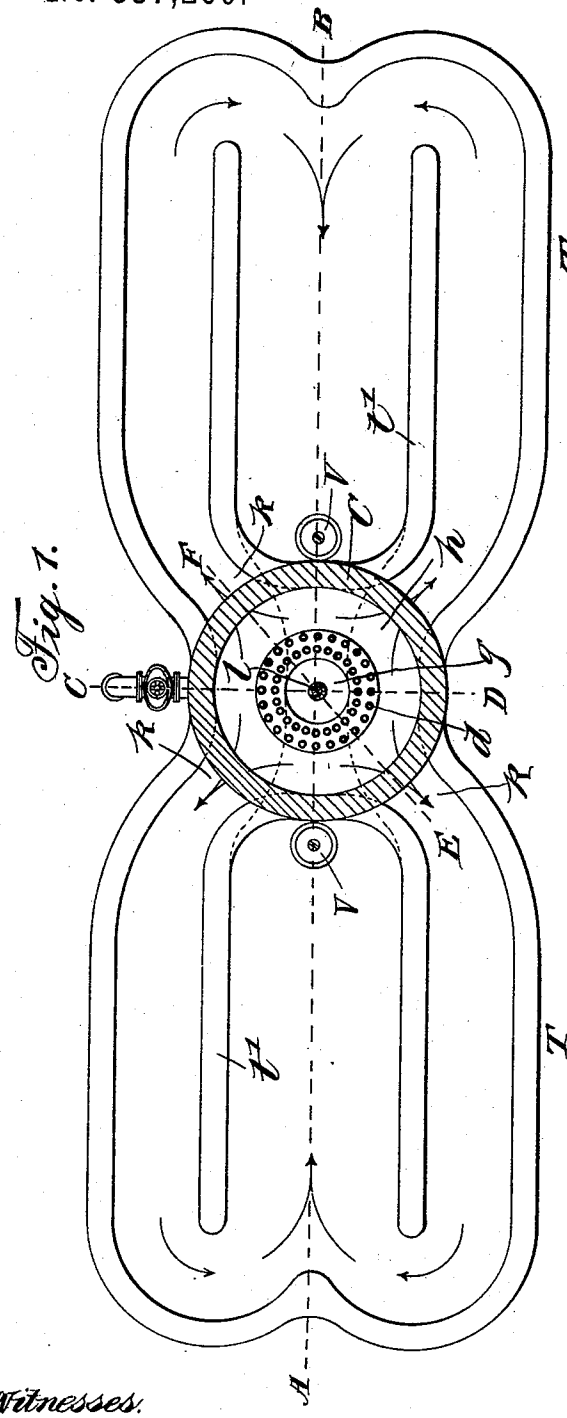

Fig. 1.

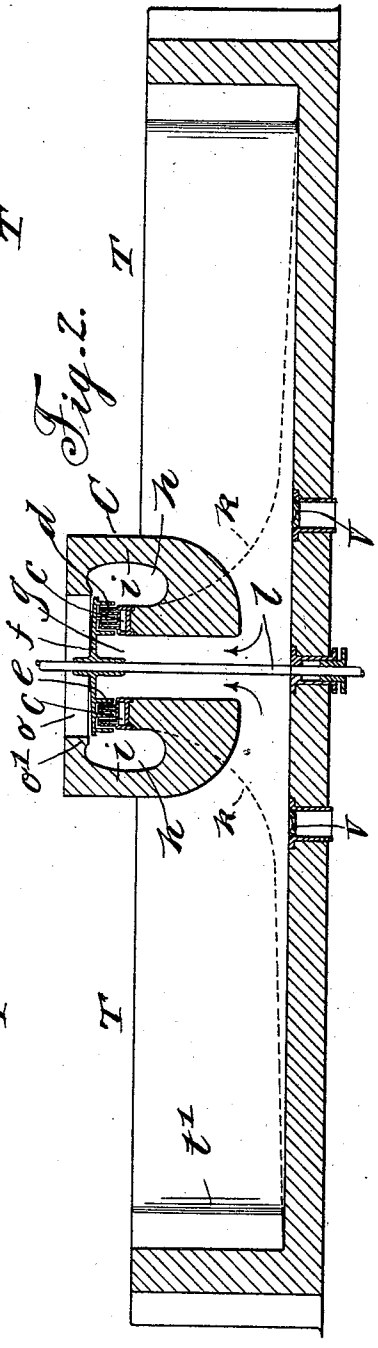

Fig. 2.

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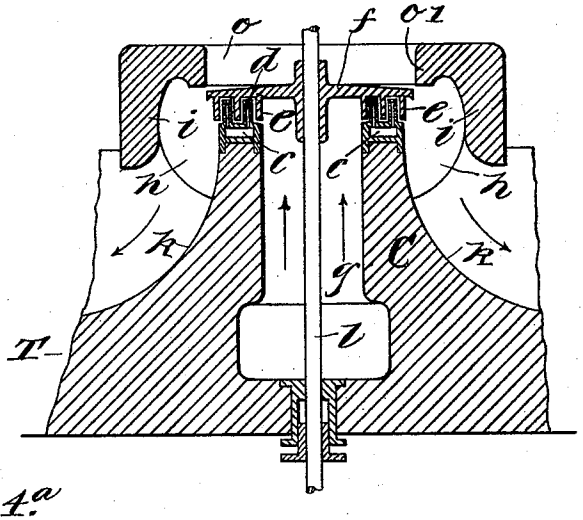

Fig. 3.

Fig. 4a.

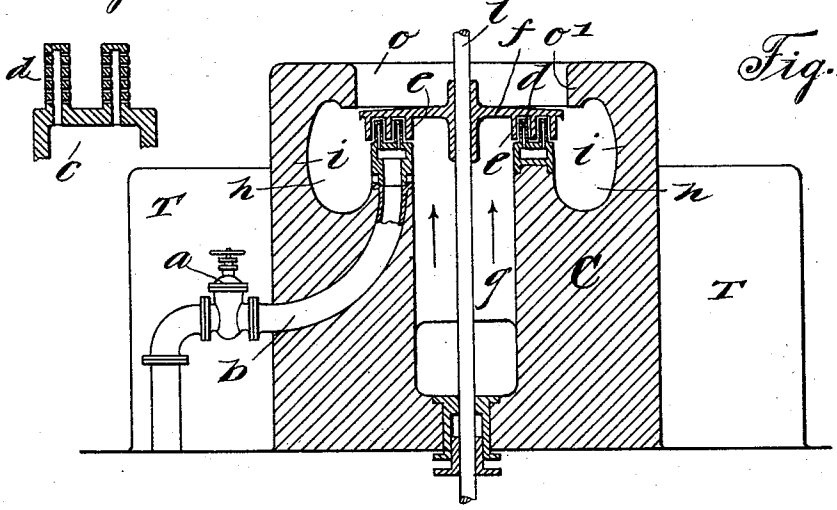

Fig. 4.

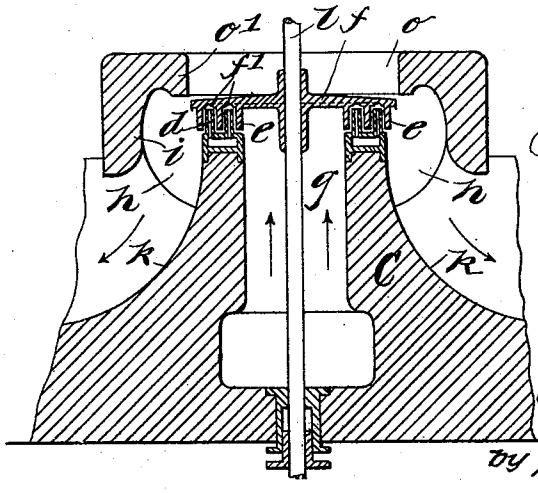

Fig. 5.

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(No Model.) 3 Sheets—Sheet 3.

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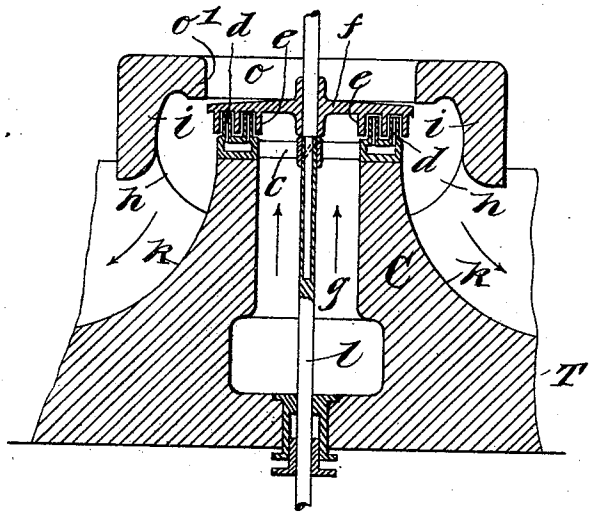

Fig. 6.

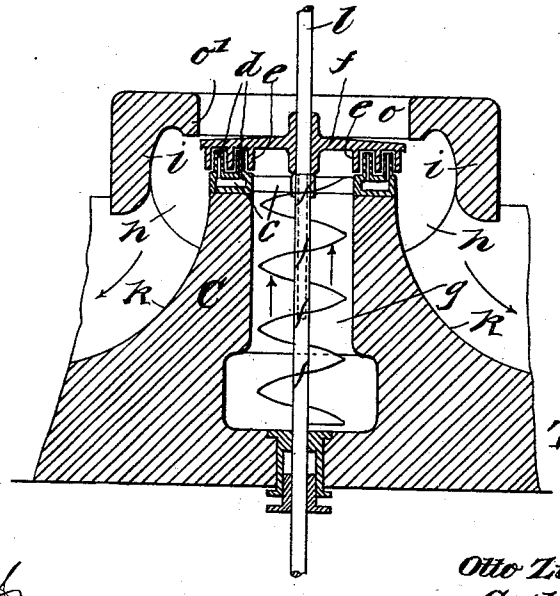

Fig. 7.

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UNITED STATES PATENT OFFICE.

OTTO ZIMMERMANN AND GUSTAV HAGEMANN, OF LUDWIGSHAFEN, GERMANY.

PULPING OR DISINTEGRATING MACHINE.

SPECIFICATION forming part of Letters Patent No. 537,260, dated April 9, 1895.

Application filed September 1, 1894. Serial No. 521,941. (No model.)

To all whom it may concern:

Be it known that we, OTTO ZIMMERMANN and GUSTAV HAGEMANN, subjects of the German Emperor, and residents of Ludwigshafen-on-the-Rhine, Germany, have invented certain new and useful Improvements in Pulping or Disintegrating Machines; and we do hereby declare the following to be a clear and exact description of the invention.

Our invention has relation to pulping engines, and it has for its object certain improvements whereby the operation is carried on in the wet by centrifugal action, the fibers of the cellulose rapidly and thoroughly separated without either reducing or otherwise injuring the same, and whereby a continuous circulation of the stuff to and from the separating or pulping devices can be maintained for any desired length of time, or until a final product of the desired degree of uniformity is obtained; whereby the construction of the engine is materially simplified, and the working parts thereof so arranged that ready access is had thereto at all times, as will now be fully described, reference being had to the accompanying drawings, in which—

Figure 1 is a horizontal sectional view, and Figs. 2, 3, and 4, sections taken respectively on lines A—B, E—F, and C—D, of Fig. 1, of a pulping engine embodying our invention. Figs. 4, 4^a, 5, 6 and 7 are sections showing various forms of the apparatus.

Similar letters of reference indicate like parts wherever such may occur in the figures of drawings just described.

The centrifugal pulping engine consists essentially of a suitable tank or trough, separating devices constructed and operating to perform the function of suction devices also, means for supplying the necessary quantity of water to said devices and for controlling such supply, and suitable discharge valves.

The tank or trough T hereinafter referred to as the trough, illustrated in the drawings, is of the general form of the trough of the rag engine known as the "Hollander," and may be constructed of any suitable material or materials, as wood or metal, or both, or, with the exception of the working elements and valves, of cement, béton, or on the Monier system.

We prefer the Hollander style of trough on account of the absence of dead points or angles in which the pulp is liable to settle, and by which the uninterrupted movement thereof to and from the separating devices is or would be interfered with. It will, however, be understood that we do not desire to limit ourselves to this construction or form of trough, as the latter may have any other desired or suitable form.

From the bottom of the trough T at the longitudinal center thereof rises a column C in which is formed an axial cylindrical passage *g*, whose upper end terminates below the like end of the column and carries a hollow ring *c* from which project hollow cylindrical pins *d*, arranged thereon in concentric rows. The pins may be open-ended or provided with peripheral perforations, or both, and centrally of the passage *g* is arranged a shaft *l* that has its bearings in the bottom of the trough, and at some suitable point above the same, said shaft carries a disk or wheel *f* provided with concentric rows of downwardly projecting cylindrical pins *e*.

The rows of pins *d* on the hollow or chambered ring *c* are so arranged as to project into the circular spaces between the rows of pins *e* on disk or wheel *f*. The water supplied to pins *d* under sufficient head is sprayed thereby, and together with the revoluble pins *e* on disk *f* not only performs the function of a lifting injector creating a partial vacuum in the passage *g* of column C to lift the material from the trough to the said devices, but also thoroughly separates the fibers of the cellulose. Inasmuch as the aforesaid pins are cylindrical the fiber operated upon is not reduced or cut up, or otherwise injured.

In the upper portion of the column C is formed a circular chamber *h*, surrounding the separator *c f*, said chamber being divided into four compartments by partitions *i*, the compartments communicating by separate passages *k* with the trough T at the foot of the column C on opposite sides thereof, said passages sloping downwardly and outwardly into the trough, as shown in Fig. 3.

The trough T, as shown in Fig. 1, is divided into three parts by a U-shaped partition *t'*, and the passages *k* are so arranged as to lead

into the trough on opposite sides of the column into the passages formed between the outer longitudinal walls *t* of said trough and between the partition walls *t'*, which, as shown, do not extend to the outer ends of the trough, thus forming central return passages between said partition walls that communicate with the axial passage *c* in column C at the foot of the latter, as shown in Fig. 2. In the bottom of the trough on opposite sides of the aforesaid column C, and between the partition walls *t'* are formed discharge openings normally closed by suitable valves V, V, Figs. 1 and 2. The chambered ring *c* is connected by a pipe or duct *b* provided with a suitable controlling valve or stop-cock *a*, with a source of water supply under sufficient pressure or head to cause the water to issue in jets from the orifice or orifices in the pins *d* on said ring. (See Fig. 4ª.)

The column C is open at its upper end, the opening *o* being, however, sufficiently reduced in diameter to prevent the ejection of pulp by centrifugal action, and to more effectually guard against such ejection, the chamber *h* is of greater height than the lower edge of the opening *o*, whereby a downwardly projecting directing flange *o'* is formed that directs or guides such pulp as may be projected against the upper wall of the chamber downwardly into the same.

The operation of our improved pulp engine is as follows: A suitable quantity of cellulose being supplied to the trough T, the shaft *l* is set in motion, and the valve *a* in the supply pipe *b* opened to supply the necessary quantity of water to the hollow pins *d*, which escapes therefrom in jets and is further sprayed or atomized by the rapid circular motion of the pins *e* on disk or wheel *f*, the atomized water being projected tangentially and with considerable violence against the wall of chamber *h* and flowing therefrom in four streams to the trough T. The centrifugal action upon the water produces a partial vacuum in the axial passage *g*, the devices acting upon the principle of the injector, and as soon as the material has absorbed or been mixed with a sufficient quantity of water and the level thereof has risen sufficiently within the axial passage *g* to admit of its being drawn between the ring *c* and disk or wheel *f*, a continuous circulation will be established, and the supply of water to the said ring is cut off. The cellulose during its passage between the pins *d* and *e* is energetically acted upon, opened up, and the fibers separated and projected by centrifugal action against the encompassing wall of chamber *h*, and as said chamber is divided into four compartments the material is equally distributed and flows back to the trough T through the passages *k* and thence in four separate streams two on each side of column C between the outer walls of trough T and the partitions *t'* to the opposite ends of said trough, at which points the streams unite and flow back to the axial passage *g* in column C, and so on continuously, the circulation of the stuff being clearly indicated by arrows Figs. 1 and 2. This is continued until the separation is completed and the desired uniformity in the product is attained.

It will be seen that the construction of the engine is such that access is readily had to any of its parts, that there is no danger or liability to choking of the movable elements, and that the operation of pulping can be effected with a comparatively small expenditure of motive power and at a very rapid rate without cutting or otherwise reducing, or in any manner injuring the fiber.

In order to prevent the water ejected from the pins *d*, especially when they are open at their outer ends, as in Figs. 5, 6, and 7 from being carried over the under surface of the disk *f*, and projected directly therefrom by centrifugal action into the chamber *h*, without being first atomized or converted into spray by the pins *e* on said disk, we form circular channels *f'* Fig. 5 between the circular rows of pins *e* in the said disk, whereby the flow of water, or of water and cellulose over the under side of the disk is arrested and diverted in a downward direction into the field of operation of the pins *d* and *e*.

It will readily be understood that the described apparatus may be used for all purposes for which the ordinary Hollander is now used; or is it absolutely necessary that the water should be supplied through ring *c*, as it is clear that it can be supplied to the trough at any other desired point. In this case, however, the separating or mixing appliances would not act as suction devices, and suitable means should be provided to lift the material to said devices, as a screw conveyer for instance, as in Fig. 7 or a turbine, or equivalent device below disk *f* on shaft *l*. A revoluble ring *c* as in Fig. 6 may also be substituted for the stationary ring described, whereby the engine will perform the function of a disintegrator, in which case the upper ring or disk can be driven by elements arranged above the column C in such manner that the two wheels will revolve in opposite directions. The lower revoluble wheel may in this case have its spokes constructed in the form of propeller blades adapted to feed the material to the pulping or mixing or disintegrating devices.

Having thus described our invention, what we claim as new therein, and desire to secure by Letters Patent, is—

1. In a pulping engine, the combination with a trough, a hollow column provided with an opening or openings at the foot thereof, said column extending from the bottom of the trough above the normal level of pulp therein, and pulping or mixing devices comprising a stationary element on said column and a co-operating revoluble element, of means for supplying water under pressure between said stationary and revoluble elements,

whereby a partial vacuum is produced within the column, for the purpose set forth.

2. In a pulping engine, a trough divided into three compartments on opposite sides of a central column, said compartments in communication with one another at their outer ends, pulping or mixing devices comprising a stationary element on said column above the level of the pulp in the trough, and a revoluble element cooperating with said stationary element, and separate feed and delivery passages communicating respectively with the central and outer trough compartments on opposite sides of the aforesaid column and leading to and from the pulping or mixing devices, in combination with means for supplying water under pressure to the last named devices whereby a partial vacuum is produced in the feed passages and a continuous circulation of the pulp from and to the central compartments of the trough through the pulping devices and outer compartments of such trough is established, for the purpose set forth.

3. In a machine of the class described, the combination with a trough provided with a vertical passage open at its upper end and communicating with said trough at its lower end, pulping or mixing devices at the upper end of said passage above the level of pulp in the trough comprising a stationary chambered disk provided with hollow perforated pins, *d*, a revoluble disk or wheel provided with solid pins intermeshing with the aforesaid pins *d*, and means for supplying water under pressure to the aforesaid chambered disk, for the purpose set forth.

4. The combination with a trough, a column, as C, projecting centrally from the bottom thereof, said trough divided on opposite sides of the column into three compartments communicating at their outer ends, said column provided with a vertical passage *g* leading to the central compartments of the trough and with a chamber *h* encompassing the upper end of said passage, said chamber in communication with the outer compartments of said trough, of a chambered ring seated on said upper end of the passage above the level of the pulp in the trough and provided with tubular perforated pins, a ring or disk provided with solid pins intermeshing with those on the stationary ring, and means for supplying water under pressure to the chambered ring, for the purpose set forth.

5. The combination with a trough, a column, as C, projecting centrally from the bottom thereof, said trough divided on opposite sides of the column into three compartments communicating at their outer ends, said column provided with a vertical passage leading to the central compartments of the trough, and with a chamber encompassing the upper end of said passage above the level of pulp in the trough, said chamber divided into four compartments in communication with the outer compartments of said trough, of a chambered ring seated on said upper end of the passage and provided with concentric rows of tubular perforated pins, a revoluble disk having concentric rows of solid pins intermeshing with the rows of pins on the stationary ring, and means for supplying water under pressure to the chambered ring, for the purpose set forth.

In testimony whereof we have hereto signed our names in the presence of two witnesses.

OTTO ZIMMERMANN.
GUSTAV HAGEMANN.

Witnesses:
FERDINAND NAUMBURG,
F. ENGLER.