

(No Model.)

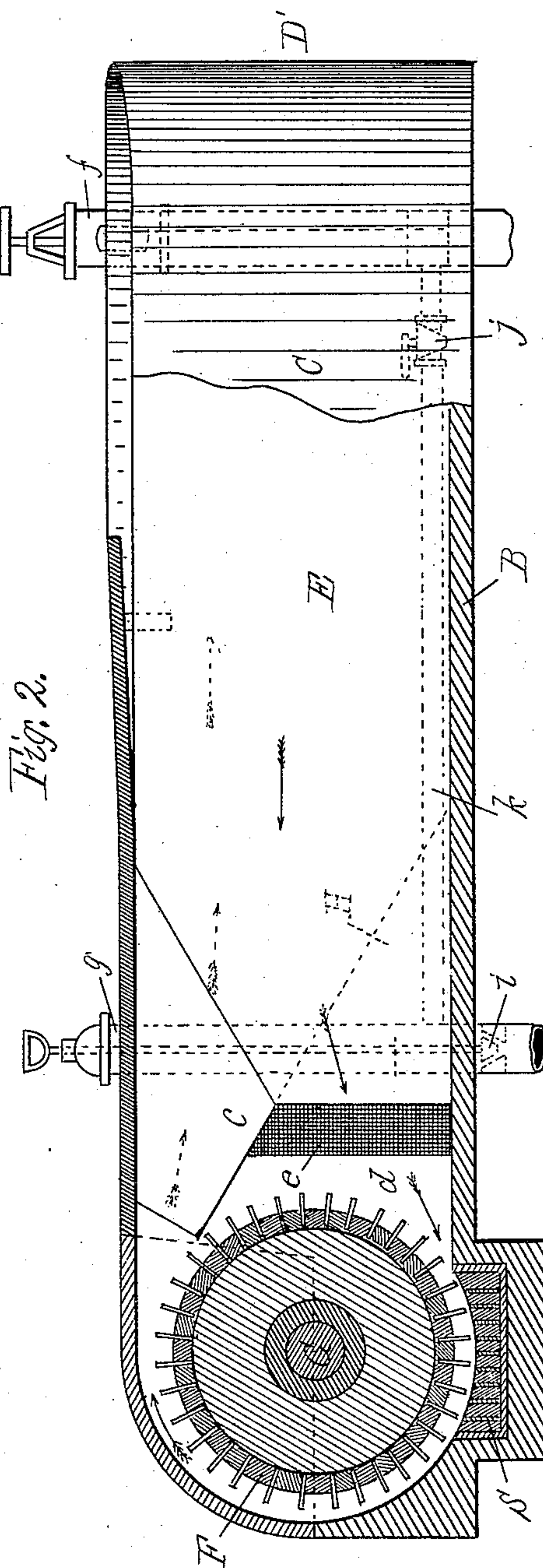
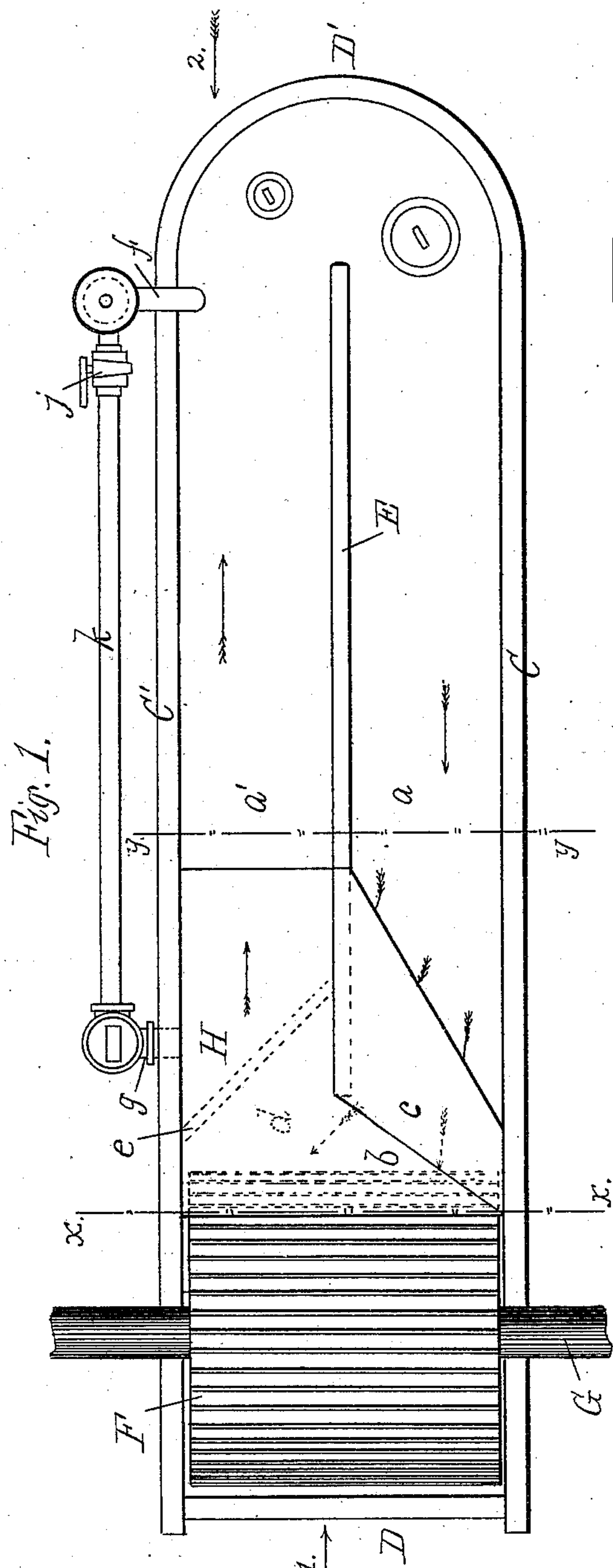
2 Sheets—Sheet 1.

J. H. HORNE.

RAG ENGINE FOR BEATING PAPER PULP.

No. 347,043.

Patented Aug. 10, 1886.



Witnesses.
H. E. Lodge -
O. K. Roynton

Inventor.
John H. Horne.
J. Curtis, atty

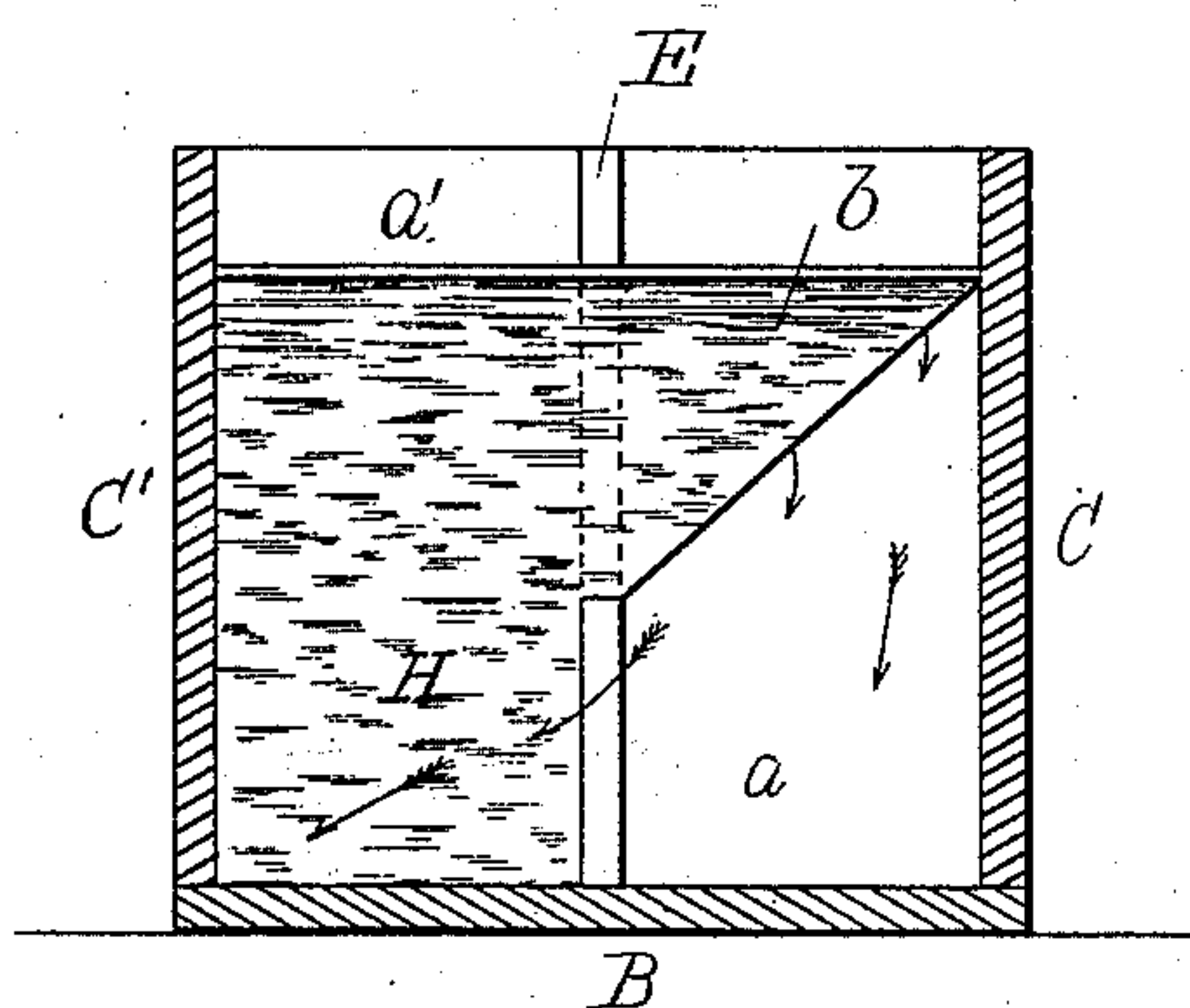
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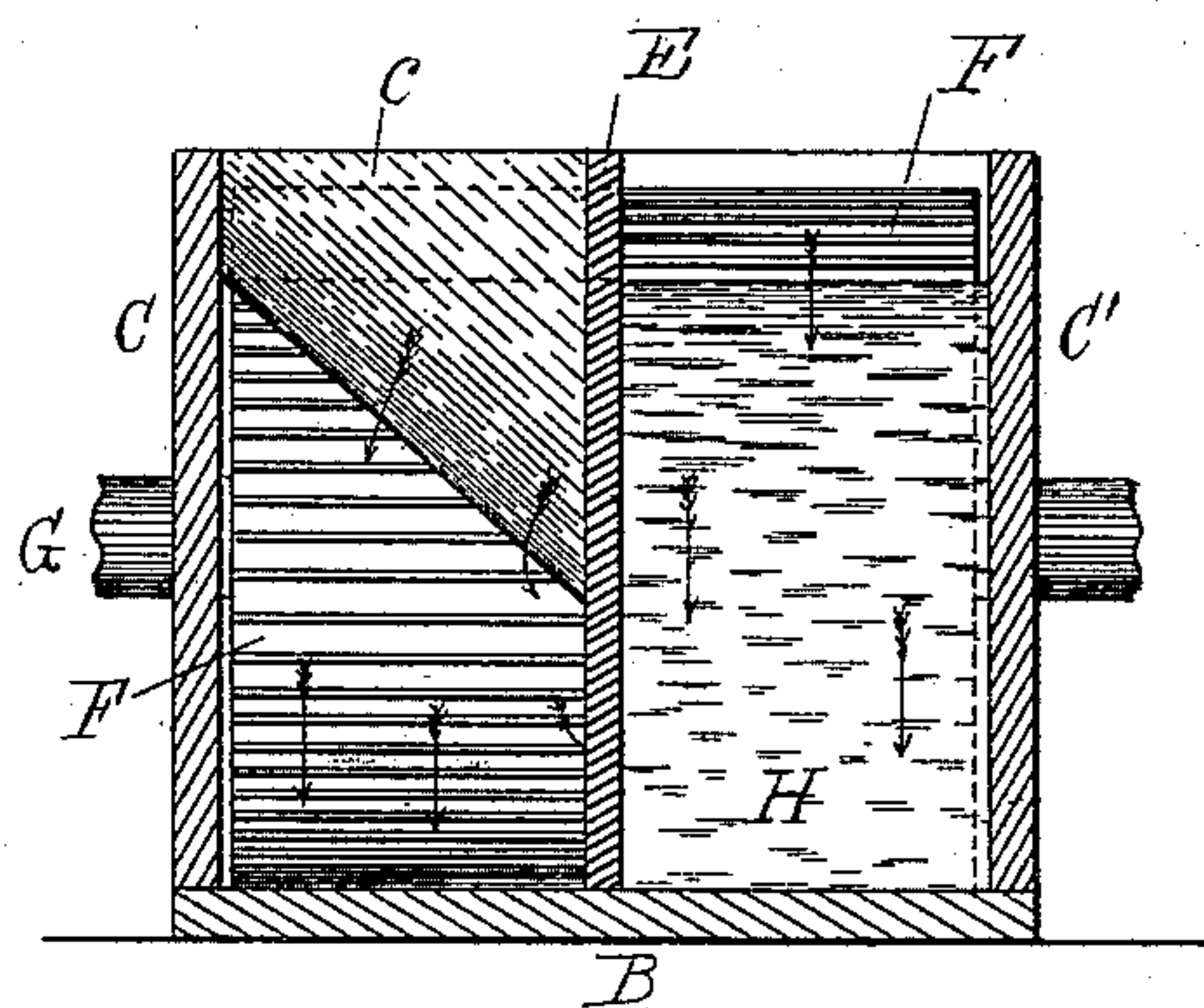
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Fig. 3.



on line x.x.

Fig. 4.



on line y.y.

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UNITED STATES PATENT OFFICE.

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RAG-ENGINE FOR BEATING PAPER-PULP.

SPECIFICATION forming part of Letters Patent No. 347,043, dated August 10, 1886.

Application filed March 22, 1886. Serial No. 196,075. (No model.)

To all whom it may concern:

Be it known that I, JOHN H. HORNE, a citizen of the United States, residing at Lawrence, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Rag-Engines for Beating Paper-Pulp; 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 improvements in rag-engines which are employed in pulping fibrous material prior to its being converted into a thin continuous sheet in the process of making paper. Such engines are usually composed of a tub or vat having straight sides, semicircular ends, and longitudinally divided by a partition or mid-feather. Within the tub is located a beating-roll armed with a series of peripheral bars or cutters and a bed-plate, likewise furnished with knives, the two co-operating together and compelling the stock in process of beating to travel continuously around and within the tub, pass between the stationary and revolving knives, and thereby be reduced to pulp, for the purpose above premised.

One great difficulty hitherto in the construction of these engines, whatever may be the path of travel given to the material contained in them, consists in the fact that the various fibers or bunches of fiber, after being placed within the engine, maintain concentric paths of movement with respect to each other. Thus a piece of stock located near the sides of the tub or one placed near the mid-feather will continue to travel in concentric paths until the engine is emptied, except in case manual labor is applied with a paddle to disturb their courses and compel them to deviate therefrom; hence it is obvious that the fiber traveling the more rapidly will be reduced more quickly, and the "stuff" is of uneven quality.

My invention relates, primarily, to the especial form and cross-section of the tub; secondly, to the arrangement and construction of the back-fall, and, thirdly, to the position of

the screen and the manner of washing the stock while being operated upon in the engine.

The essential object of my invention is to effect a change in the course of the material in the engine automatically and obliquely to the longitudinal axis of the engine during each complete passage thereof around the tub, and thereby thoroughly mix the stock. Thus the particles which are nearest the mid-feather in one passage about the tub, and which therefore traveled the fastest, are directed and changed obliquely across the engine prior to their passage about the roll, and hence they will emerge and are located near the side. Such stock will consequently travel the slowest during the next passage around the tub, since it remains contiguous to the retaining-walls of the latter. This mixing and stirring of the material within the tub is effected primarily by the shape of the tub in cross-section, the width of which is equal to the active face of the roll, or thereabout, the latter located in one end thereof. Thus to effect the desired change in the path of movement of the stock the proportions of the tub are altered, and in cross-section the two passages formed in the tub by the mid-feather are twice as deep as they are wide, or thereabout. Again, the stock is permitted to fill the entire width of the engine just prior to its entrance beneath the roll, and also immediately after leaving the same; hence the mid-feather terminates a short distance before reaching the roll, and the stock, as it approaches the latter, as before premised, is permitted to spread out and fill the entire width of the engine. In other words, in its course about the mid-feather the stock as a body may be said to have a vertical position, or of greater height than width, though traveling horizontally, until the termination of the mid-feather allows it to spread out and assume a horizontal position. The mass of stock is then of greater width than height. The movement or path of travel of the stock can be most aptly compared to the direction and course taken by a cross-belt in traveling between two pulleys, one horizontally and the other vertically disposed. After the passage of the stock between the roll and the bed-plate the particles composing it are directed upon and over the back-fall,

which here extends entirely across the engine and in front of the roll, but contracts as it extends away from the latter, until it unites with the mid-feather, whence it is continued downward between the latter and the side of the engine to the bottom of the tub. This contraction of one-half its width again restores the mass of stock to a general vertical position, and the latter is so maintained until just prior to its return passage beneath the roll. Thus it will be evident that the fibers composing the material in process of being pulped cannot travel in continuous concentric paths of movement, but are changed and forced obliquely of the engine, whereby a thorough mixing of the stock is automatically effected by the spiral motion imparted to it both before and after leaving the roll.

The drawings accompanying this specification represent in Figure 1 a plan, and in Fig. 2 a sectional elevation, of an engine for beating paper-pulp embodying my improvements. In Fig. 1 the cap or cover is removed from the roll. Fig. 3 is a cross-section of the engine-tub on line *x x* of Fig. 1, looking in direction of arrow 1, while Fig. 4 is a similar section on line *y y* in direction of arrow 2.

In said drawings, A represents an engine-tub composed of the bottom B, sides C C', and semicircular ends D D', said tub being longitudinally provided with a mid feather, E, which does not extend close to the face of the roll F, the latter being located in the extreme end of the tub and mounted upon and driven by the shaft G.

From the cross-sections of the engine shown in Figs. 3 and 4 it will be seen that the proportions of the passages in the tub are materially altered from those hitherto employed in machines of this class, and are of greater height than width. Thus the material as a body is vertically disposed, but travels in general horizontal paths of movement. This vertical position is maintained the entire length of the mid-feather, upon each side thereof, or from the point of juncture of the back-fall with the bottom B to where the mid-feather terminates in front of the roll. The tub is divided by the mid-feather E into a U-shaped channel formed by the passages *a a'*, which I term the "supply" and "discharge," respectively. Now, in the arrangement shown, it is evident that the two currents of stock approaching and leaving the roll must be kept separate and distinct; and, furthermore, to obtain the full benefit of the active surface of said roll, the stock must bespread out before passing between it and the bed-plate S on the under side of the roll, while upon the top side of the latter, or when the material emerges and leaves it, an opposite converging effect must be produced to return said stock to its confined discharge-passage *a'*. To effect this object I have constructed a back-fall, H, which is disposed in front of the roll, sloping away from the latter, and tightly fits the passage *a'*, as shown. This back-fall extends entirely across the tub

by means of the triangular piece *b*, the upper edge of which is in close proximity to the periphery of the roll, (see Fig. 2;) but this back-fall now only partially prevents the flow of stock leaving the beating-roll from entering the supply-passage *a* and opposing the flow of stock toward said roll. Therefore I have provided and disposed a partition, *c*, or deflector-plate, which is not only angularly disposed with respect to the longitudinal axis of the roll, but is obliquely situated as to the bottom of the tub, while the upper edge is flush with the top sides of the latter and the mid-feather. Thus the position of this deflector-plate *c* serves two purposes. Located at the termination of the passage *a*, and sloping obliquely toward the bottom of the roll, when the stock approaches and impinges against the under side of said plate, the material is deflected, crowded downward, and given a spiral movement, whence it rapidly passes into the chamber *d*, extending beneath the back-fall H, this chamber, as before stated, being of the full width of the engine. Thus stock close to the mid-feather, when entering the chamber *d*, is crowded toward and spreads to the back side, C', passes under the roll and emerges, and continues its course near the side of the tub C', where its motion is now very slow.

The second purpose effected by the deflector-plate *c* is in converging and directing the material as it passes from the roll downward and compelling it to enter the discharge-passage *a'*, gradually changing the general position of the mass from a horizontal plane or a body of greater width than height while passing around the roll to a vertical plane, or a mass of greater height than width during its passage around and about the mid-feather. Thus it is very evident that the stock by this arrangement is thoroughly mixed and its circulation changed at each successive complete passage about the tub, and it is apparently impossible for any fiber or lock of fibers to maintain the same path of travel during two successive passages, and therefore to those conversant in the process of pulping it is equally clear that the stock will be more evenly reduced; hence less time is required in emptying an engine, since by the methods heretofore practiced the entire contents must be retained until the longest fibers have been properly reduced.

In connection with the engine I have introduced a washer, which is located in a convenient place beneath the back-fall. This washer consists of a reticulated plate or screen of fine wire, *e*, angularly but vertically disposed within the tub, as shown in Fig. 1. This screen is arranged to extend behind the mid-feather, and is thereby protected from the rush of stock about the end of the mid-feather, which might tend to injure or destroy it. The water-supply enters at *f*, while the discharge is shown at *g*, the valve *h* admitting and the valve *i* discharging more or less water to suit the re-

quirements, either to wash out and remove the superfluous chemicals or to render the contents of the engine thick or thin.

In emptying the engine it will doubtless be found very convenient, if not necessary, to cleanse the chamber *d*, in which case the valve *i* is closed, while the intermediary valve, *j*, is open. Thus water is free to flow into the engine by the pipe *k* through the screen *e*, and thoroughly remove any fine pulp which may remain in or about the roll and bed-plate.

The operation of this engine is as follows: The roll being properly adjusted with respect to the bed-plate, water is admitted and the requisite amount of fibrous material or "half-stock" is then supplied. The stock is now advanced by the suction caused by the roll toward the latter, and as it strikes the deflector-plate *c* it is crowded downward and then suddenly allowed to spread out the entire width of the engine and enter in a horizontal position between the bed-plate and roll at all points. Thus the entire face of the roll is active. The stock is carried up and partially about the roll, and is discharged therefrom upon that part of the back-fall contiguous to the knives of the roll, and which here extends the entire width of the tub. Upon delivery on this back-fall said stock is directed and impelled by the back-fall and upper surface of the deflector-plate *c* toward and into the passage *a'*, where the general position assumed by the mass of fiber is vertical or of greater height than width. While passing about the roll, and just before entering and after leaving the latter, the mass of pulp is of greater width than height. Thus a spiral motion or turn is imparted to the stock, and so effects a thorough commingling of and change in position of the particles composing it.

I claim—

1. In a rag-engine, a pulping-tub, in combination with a beater-roll, a bed-plate, and a mid-feather arranged in said tub, the latter being provided with passages of uniform capacity in any cross-section, said passages being of such shape that the pulp approaches the roll in a body of greater height than width, and immediately before reaching the roll is converted into a body of greater width than height, but returns to its first condition after passing over the roll, the result being that the moving column of pulp is given a spiral motion, substantially as set forth.

2. The improvement in rag-engines consisting in a beater-roll and its co-operating bed-plate located in one end of the tub, in combination with said tub, which is longitudinally

divided by a mid-feather into two passages in width equal to one-half the active face of the roll, or thereabout, but at their termination contiguous to the face of the roll equal in width to the latter, substantially as described.

3. In a rag-engine, a tub having a mid-feather, in combination with a beater-roll arranged in said tub at one end thereof, said mid-feather dividing said tub, as shown, and thereby forming a channel which is U-shaped for the greater part of its length, and leaving a space between the end of said mid-feather and said roll which is of the entire width of the tub, substantially as set forth.

4. A rag-engine composed of the beater-roll, with its co-operating bed-plate, located at one end of the vat, and the vat longitudinally divided by the mid-feather and back-fall into a channel which is U shaped for the greater part of its length, the body of which in cross-section is one-half the width of the tub, while the ends thereof, terminating in front of the roll, are the full width of the vat, substantially as herein stated.

5. The combination, with the bed-plate, a beating-roll, the active face of which is equal to the width of the engine, and the tub, in which they operate upon the stock, circulating substantially in horizontal paths of movement, of the back-fall extending across the upper part of the tub and in front of the roll, whereby the stock passing beneath and partially around the roll is concentrated and directed within a passage but half the width of the tub, substantially for purposes set forth.

6. The improved vat for paper-pulp engines, composed of the retaining-walls *C C' D D'*, the mid-feather *F*, terminating some distance from the face of the roll, the back-fall *H*, with its portion *b* extending across the vat in front of the roll, and the deflector-plate *c*, all operating substantially as described.

7. In combination with a rag-engine, the washer *e*, formed beneath the back-fall and provided with a reticulated plate, substantially for purposes herein stated.

8. The combination, with the inlet-pipe *k* and the valves *i j*, of the tub *A* and its washer *e*, located substantially as herein stated, and operating for purposes set forth.

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

JOHN H. HORNE.

Witnesses:

H. E. LODGE,
F. CURTIS.