(No Model.)

3 Sheets—Sheet 1.

W. H. F. TOWER.

BEATING ENGINE.

No. 532,501. Patented Jan. 15, 1895.

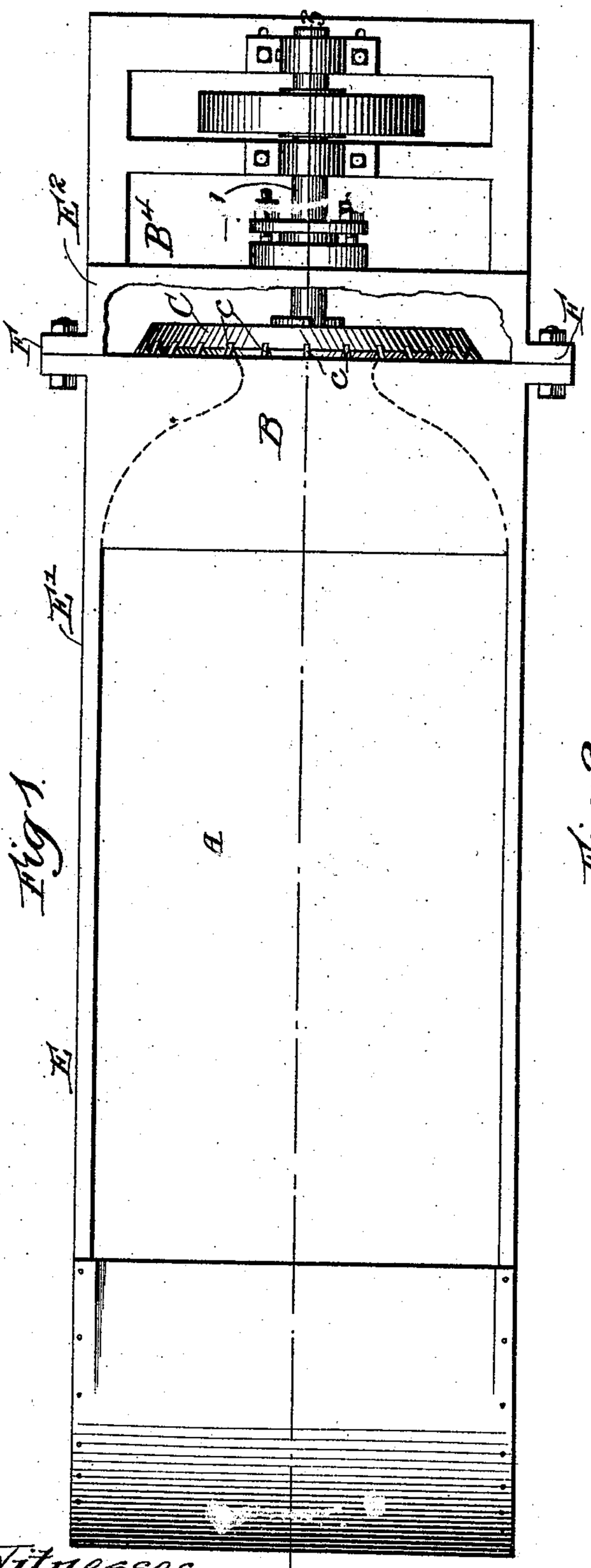

Fig. 1.

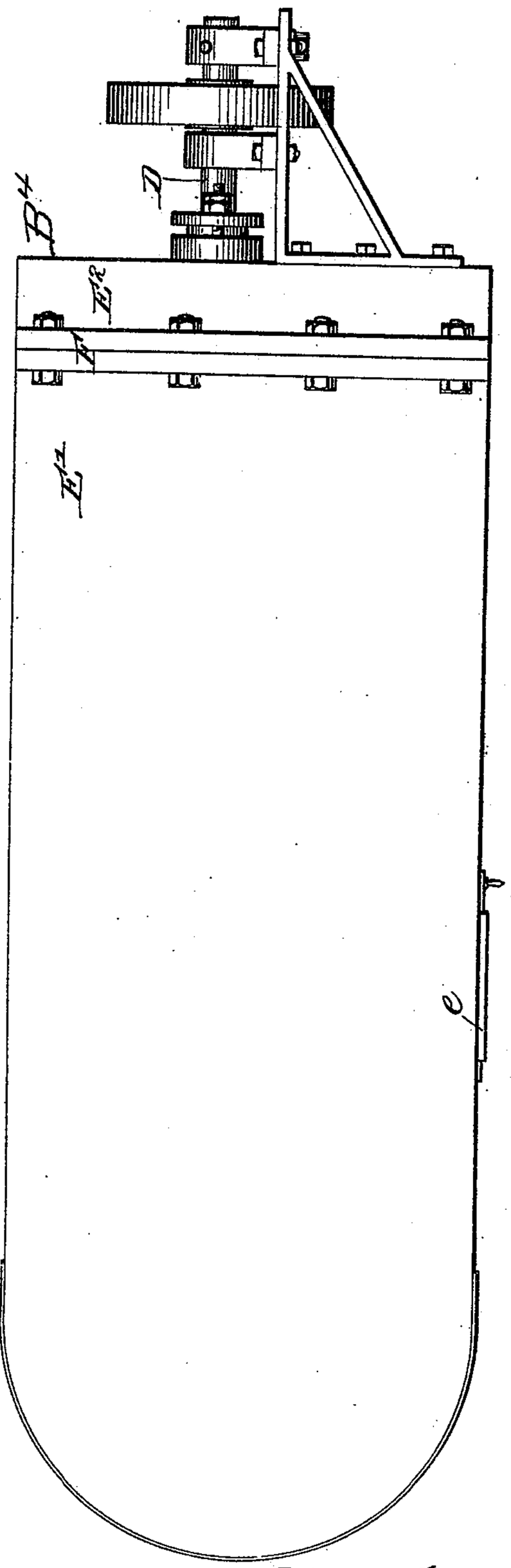

Fig. 2.

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(No Model.)

3 Sheets—Sheet 2.

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BEATING ENGINE.

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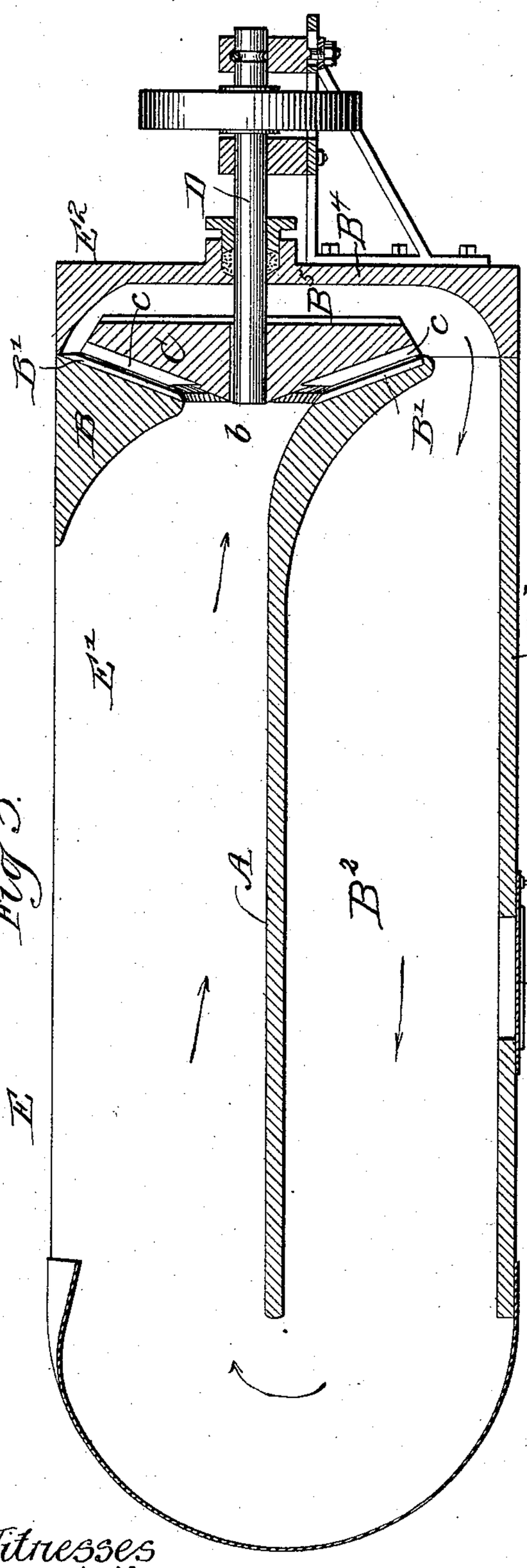

Fig 3.

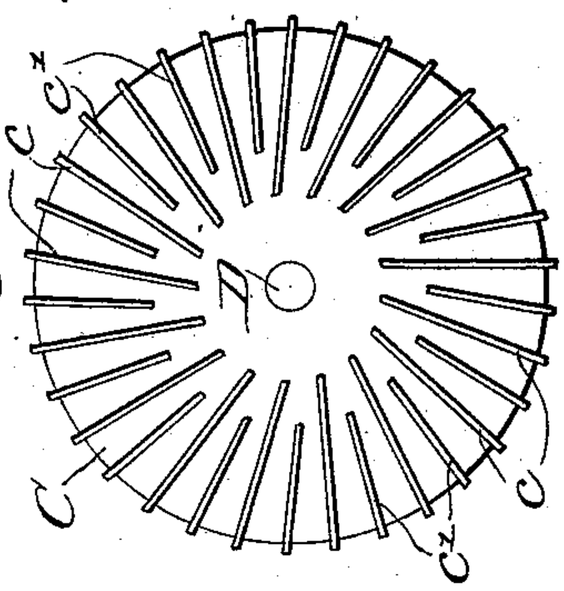

Fig 7.

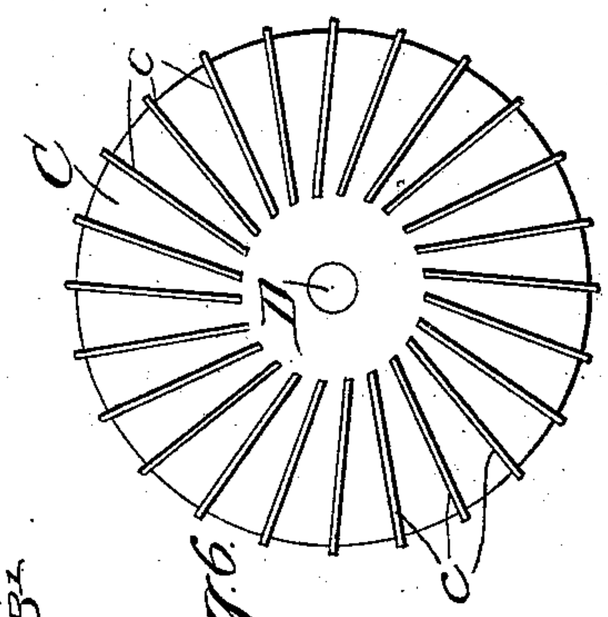

Fig 6.

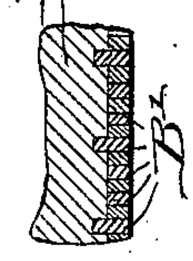

Fig 5.

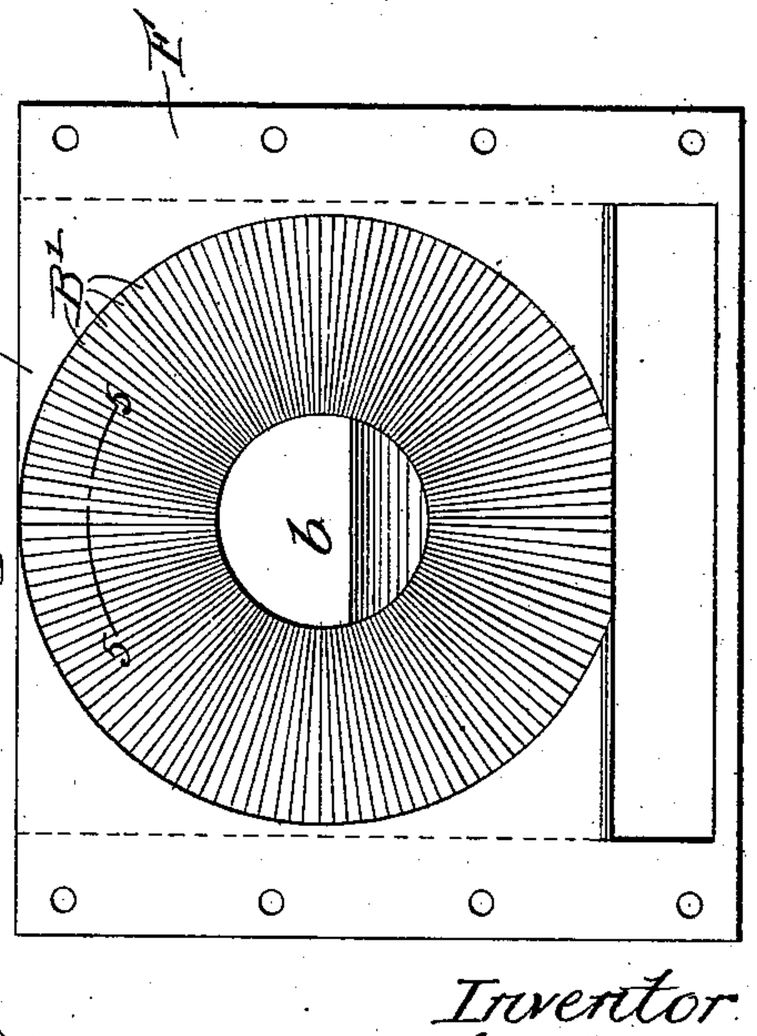

Fig 4.

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BEATING ENGINE.

No. 532,501. Patented Jan. 15, 1895.

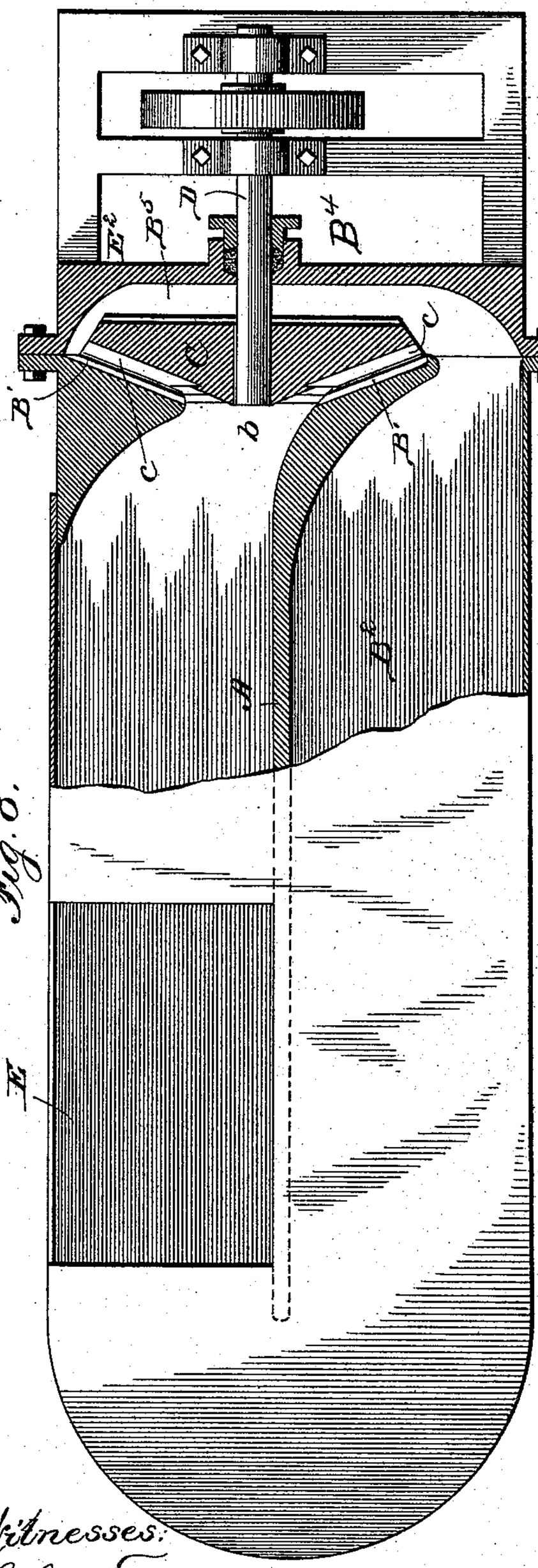

Fig. 8.

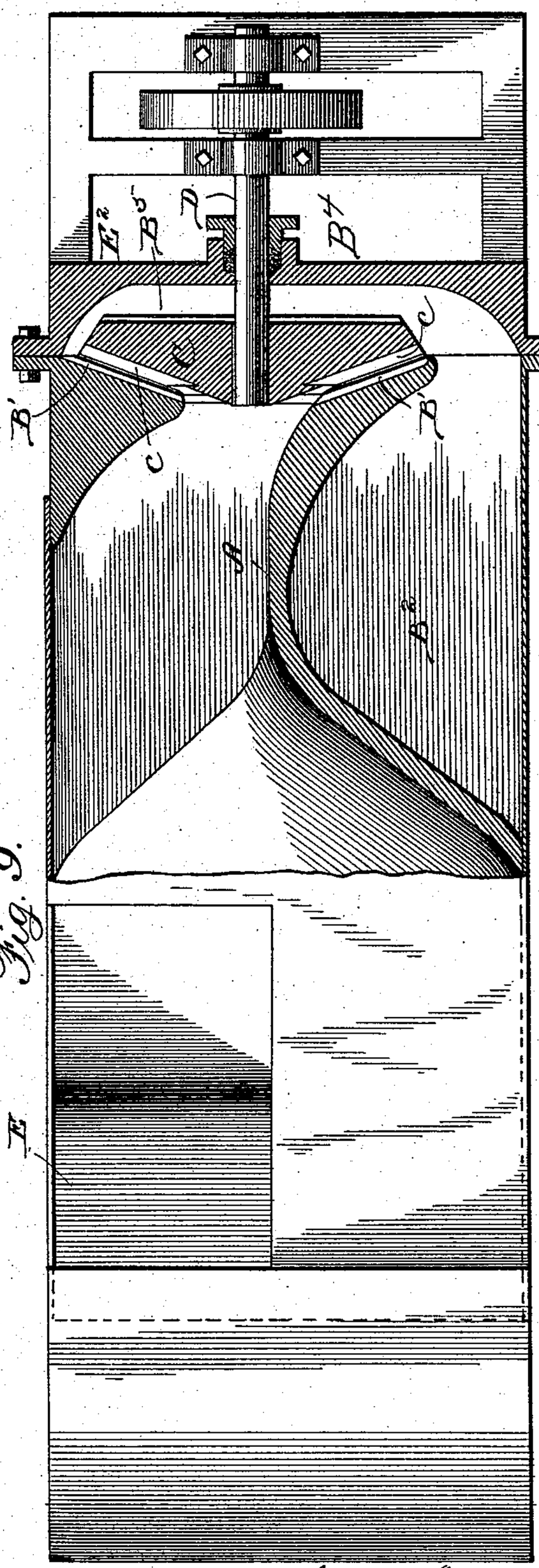

Fig. 9.

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UNITED STATES PATENT OFFICE.

WILLIAM H. F. TOWER, OF MINERAL POINT, WISCONSIN, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, OF TWO-THIRDS TO GEORGE R. TOWER AND PHILLIP ALLEN, JR., OF SAME PLACE.

BEATING-ENGINE.

SPECIFICATION forming part of Letters Patent No. 532,501, dated January 15, 1895.

Application filed April 22, 1893. Serial No. 471,458. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM H. F. TOWER, a citizen of the United States of America, residing at Mineral Point, in the county of Iowa and State of Wisconsin, have invented certain new and useful Improvements in Beating-Engines, of which the following is a specification.

Referring to the accompanying drawings, wherein like reference letters indicate like parts:—Figure 1 is a top plan of my improved beater engine, with parts broken away. Fig. 2, is a side elevation of the same. Fig. 3, is a vertical section on line 3—3 of Fig. 1. Fig. 4, is an end view with the disk and end of the tank removed to show the bed-plate. Fig. 5, is a section in line 5—5 of Fig. 4. Fig. 6, is a front view of the disk, and Fig. 7, is a modification of the same. Fig. 8 is a horizontal plan view partly broken away and showing the mid-feather disposed vertically and also showing the commencement of the feed-orifice at a point other than that shown in Fig. 3. Fig. 9 is a like view showing a spiral mid-feather.

My invention consists broadly in forming a channel in a vat, by means of a mid-feather, a portion of which channel is inclosed to form a confined passage, and so constructing and arranging a cutting plate and support therefor as to provide a contracted feed orifice and a rotatable cutting disk, the material to be pulped being first drawn between the cutting parts, and then forcibly pumped into the confined passage, whereby the velocity at which the material circulates is governed by the speed at which the cutting disk is rotated, while subordinate improvements consist in the arrangement and combination of the parts herein set forth and claimed.

The mid-feather is designated at A, arranged as shown in a horizontal position and extended longitudinally within the vat; but said mid-feather may, however, be arranged vertically or spirally without departing from the spirit of my invention, as will hereinafter be described. This mid-feather extends horizontally from a point near one end of the vat to the annular support B, for the cutting plate B′, which latter is secured upon said support. This annular support is disposed transversely relatively to the plane of advance of the fed or delivered material and is provided with a central feed orifice *b*, formed by the converging sides of the annular support B, so that the fed material is concentrated and delivered between the rotatably cutting disk C, and the cutting plate B′. The annular support B, is held in position by being secured to or formed with end of the mid-feather in proximity to the reducing mechanism, which latter consists of the cutting disk C, and the cutting plate B′.

The mid-feather A, is located about midway between the top and bottom of the vat and the cutting plate B′ is placed transversely across the vat at right angles to the mid-feather and fills the entire upper part of the vat, except the contracted feed orifice *b*, but leaves a space at the bottom beneath the mid-feather for the passage of the material in its circulation through the confined passage B^2, formed by the said mid-feather and the wall B^3 of the vat, which latter is extended about the free end of the mid-feather.

In the construction as shown in Fig. 3, the channel B^2 may more properly be said as formed by the mid-feather and bottom of the vat, and so much of the side walls as lie between the mid-feather and the said bottom. In Figs. 8 and 9 the passage or channel B^2 is formed by the mid-feather, portions of the bottom and top and one side wall of the vat. If the vat were cylindrical, however, it might be said that the passage were formed by one continuous or single wall constituting the bottom of the vat and the mid-feather.

In the rear of the rotatable cutting disk C, is a channel formed by said cutting disk and the end wall B^4 of the vat, which channel extends from the upper portion of the vat to the passage or channel B^2. This channel, designated by the letter B^5, has communication with the passage B^2 and provides means by which the material pulped by the reducing mechanism and forcibly directed backward therefrom is directed and forcibly pumped downward into the passage B^2.

For convenience, I refer to the end of the vat near the cutting, reducing or pumping mechanism as the rear or back part. The cutting plate B′, is a circular ring and is so formed as to conform closely to the cutting surface of the disk C, the cutting face of said plate B′ being constructed in the well-known way common to such cutting plates, as shown in Figs. 4 and 5.

The center of the disk C is preferably in line with the center of the feed-orifice *b*, and the radially extending knives *c* upon the cutting disk are arranged in a circle closely corresponding to the cutting face of the cutting-plate B′. From a point at or about a point opposite to the circumference of the feed-orifice *b*, the knives on the disk extend inwardly toward the center in a line perpendicular to or at right angles to its axis of revolution, or substantially so.

Fig. 7 shows an improved cutting disk, in which the cutting surface is increased by means of the insertion of short supplemental knives *c′* between the longer knives *c*. This form may be used instead of that shown in Fig. 6.

The corners of the vat are preferably rounded to prevent dead space and consequent settling or clogging of the material in its circulation. The cutting disk is set away from the back end of the vat sufficiently to leave free space for the circulation of the pulp material.

A valve *e* is provided in the vat at any convenient place, to draw off the material.

In the manufacture of my improved device, I make the vat E in two parts E′ E², properly secured together as at F, and packed to prevent leakage. See Figs. 1 and 2. In this form the parts are readily disconnected for the removal or repair of the disk or bed-plate.

The mode of operation is as follows:—When the parts are properly fitted together and adjusted, the material to be pulped is put into the vat, preferably nearly filling it. The disk is then set in motion with a revolving movement which causes a pumping action in which the material is drawn into and through the feed orifice and between the cutting disk and the bed-plate, and is forced backward by the material following and the pumping action of the disk and escapes below the bed-plate near the bottom of the vat, whence it is forced along the channel to the end of the vat, up around the end of the mid-feather and back to the feed orifice, when the operation is repeated. When the material is properly reduced, it is drawn off through the valve *e*, the vat is again charged and the operation is again repeated.

It is found that in this form of construction the same amount of material can be reduced to pulp in much less time than by any of the present machines for this purpose, and that the rapidity with which the material is circulated can be governed entirely by the speed at which the disk is revolved.

It will be apparent from the construction and disposition of the reducing mechanism within the vat that the material which is fed or delivered within the interior thereof is passed first through the contracted orifice *b*, formed in the support B for the cutting plate B′, and is by this contracted orifice concentrated upon the cutting disk C, and caused to pass between the cutting plate B′ and the said disk. It will be observed further that this cutting disk C, and the support B, serve to prevent any of the material, either before or after having been pulped, from passing in any but one given direction, viz: to the rear of the cutting disk C. By virtue of the contracted orifice *b*, and the disposition aforesaid of the cutting disk C and support B together with the longitudinal passage B² extending about the end of the mid-feather, the material is first concentrated, then subjected to the action of the reducing mechanism and forcibly fed or pumped invariably backward or to the rear of the reducing mechanism, passing under forcible pressure in a substantially continuous, unbroken mass of material through the passage B².

The material, which after being pulped is pumped backward on all sides of the cutting disk, is forced into the channel B⁵ and also into the passage B², the material directed through the channel B⁵ also passing into and through the passage B², the whole mass of material being continuously and forcibly pumped along through said passage B². It is also apparent that the contracted feed orifice *b* and the reducing mechanism may be located at the end of the channel above the mid-feather, or at any point within said channel.

In Fig. 8 it will be seen that the commencement of the contracted feed orifice *b* is at a point nearer the end of the mid-feather opposite to the cutting mechanism than is the case as shown in Fig. 3.

In Fig. 9, it will be seen that the mid-feather is spiral in form, the only difference, however, in the resultant operation of this arrangement being that the material is fed more circuitously about the spiral of the mid-feather. It will be observed that with the exception of the features as stated the arrangement and construction of the form of the device shown in said Figs. 8 and 9 are the same.

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

1. In a machine for beating pulp, in combination, a vat, a mid-feather disposed within said vat, an inclosing wall formed by one side of the vat, which wall extends about that end of the mid-feather opposite to or remote from the reducing mechanism, a confined, continuous passage formed by said mid-feather and the adjacent walls along which the material is adapted to circulate, a cutting plate transversely disposed relatively to the plane of advance of the fed or delivered material, a support for said plate, a central, contracted feed

orifice formed in said support and a rotatable cutting disk conforming closely to the cutting plate, said transversely disposed support and cutting disk delivering the material acted upon to the rear of the reducing mechanism, whereby the velocity at which the material circulates is governed by the speed with which the cutting disk is rotated, substantially as and for the purposes set forth.

2. In a machine for beating pulp, in combination, a vat, a mid-feather disposed within said vat, an inclosing wall formed by one side of the vat and which wall extends about that end of the mid-feather opposite to or remote from the reducing mechanism, a confined, continuous passage formed by said mid-feather and the adjacent walls along which the material is adapted to circulate, a cutting plate transversely disposed relatively to the plane of advance of the fed or delivered material, an annular support for said plate, a central, contracted feed orifice formed in said annular support and a rotatable cutting disk conforming closely to the cutting plate, said transversely disposed annular support and cutting disk delivering the material acted upon to the rear of the reducing mechanism, whereby the velocity at which the material circulates is governed by the speed with which the cutting disk is rotated, substantially as and for the purposes set forth.

3. In a machine for beating pulp, in combination, a vat, a mid-feather disposed within said vat, an inclosing wall formed by one side of the vat and which wall extends about that end of the mid-feather opposite to or remote from the reducing mechanism, a confined, continuous passage formed by said mid-feather and the adjacent walls along which the material is adapted to circulate, a cutting plate transversely disposed relatively to the plane of advance of the fed or delivered material, a support for said plate, secured to and held by the mid-feather, a central, contracted feed orifice formed in said support and a rotatable cutting disk conforming closely to the cutting plate, said transversely disposed support and cutting disk delivering the material acted upon to the rear of the reducing mechanism, whereby the velocity at which the material circulates is governed by the speed with which the cutting disk is rotated, substantially as and for the purposes set forth.

4. In a machine for beating pulp, in combination, a vat, a mid-feather, disposed within said vat, an inclosing wall formed by one side of the vat and which wall extends about that end of the mid-feather opposite to or remote from the reducing mechanism, a confined, continuous passage formed by said mid-feather and the adjacent walls along which the material is adapted to circulate, a cutting plate transversely disposed relatively to the plane of advance of the fed or delivered material, a support for said plate, secured to and held by the mid-feather, a central, contracted feed orifice formed in said support and a rotatable, conical cutting disk conforming closely to the cutting plate, said transversely disposed support and cutting disk delivering the material acted upon to the rear of the reducing mechanism, whereby the velocity at which the material circulates is governed by the speed with which the cutting disk is rotated, substantially as and for the purposes set forth.

W. H. F. TOWER.

Witnesses:
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PHIL ALLEN, Jr.