

No. 720,379.

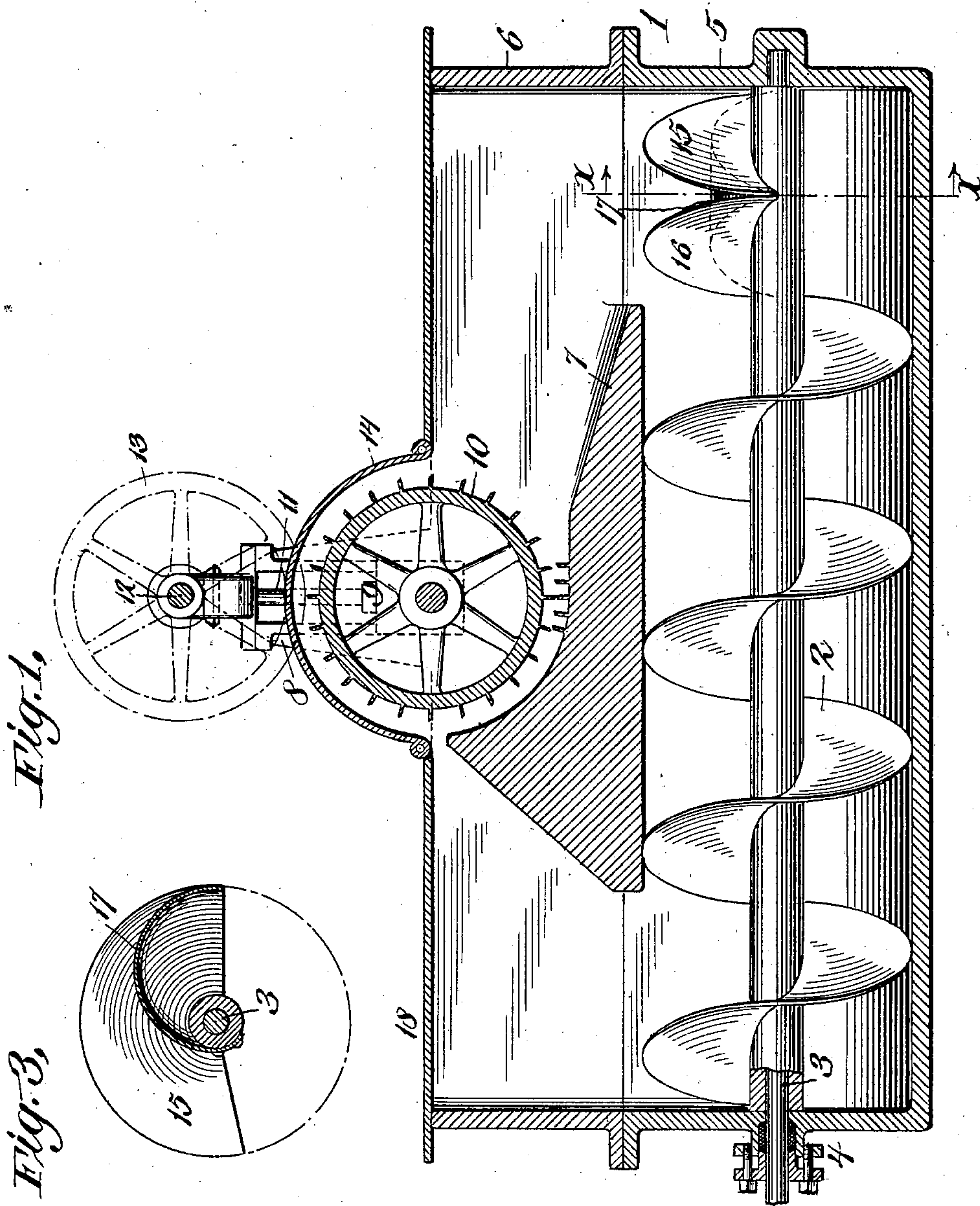
PATENTED FEB. 10, 1903.

F. I. DU PONT.
PULPING MACHINE.

APPLICATION FILED NOV. 24, 1899.

NO MODEL.

3 SHEETS—SHEET 1.



WITNESSES:

O. H. Maynard
H. A. Fox

INVENTOR

Francis I. du Pont

BY

E. M. Marshall & Son

ATTORNEYS

No. 720,379.

PATENTED FEB. 10, 1903.

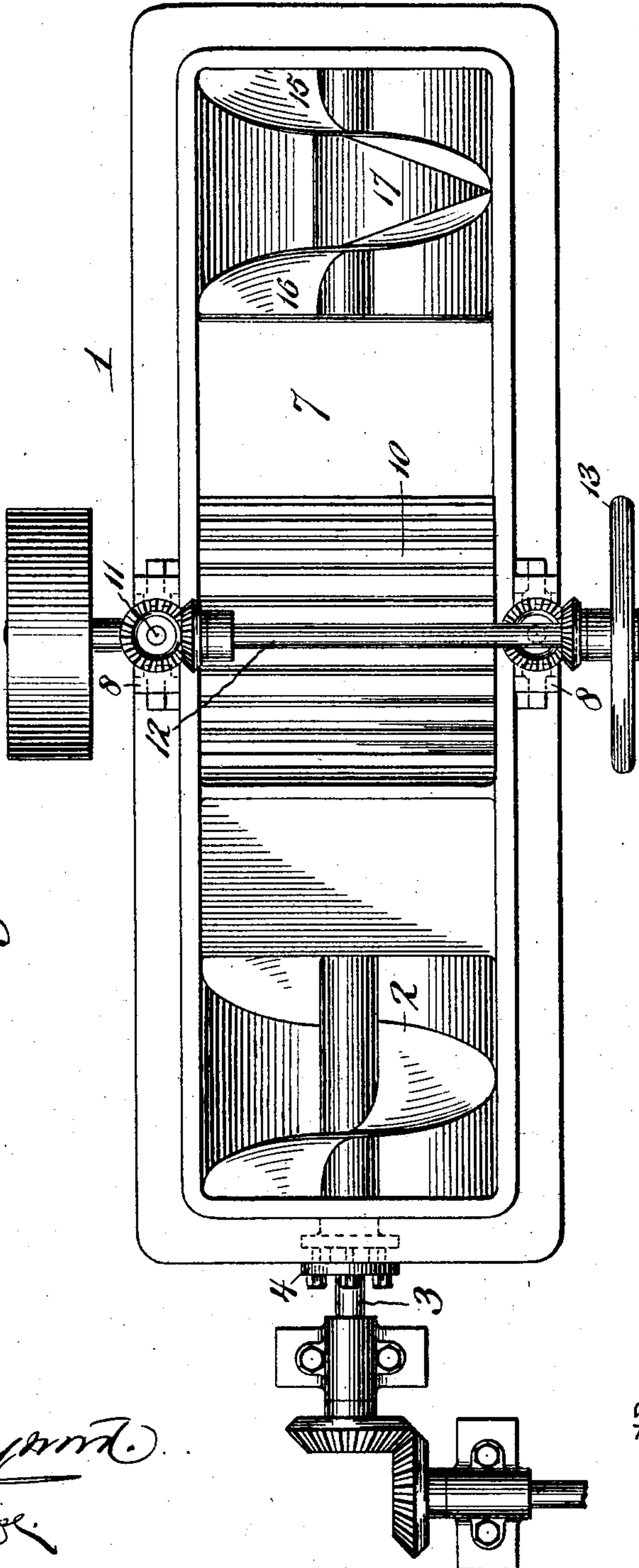
F. I. DU PONT.
PULPING MACHINE.

APPLICATION FILED NOV. 24, 1899.

NO MODEL.

3 SHEETS—SHEET 2.

Fig. 2.



WITNESSES:

N. N. Hayward.
H. Q. Case.

INVENTOR

Francis I. du Pont

BY

E. M. Marshall & Co.

ATTORNEYS

No. 720,379.

PATENTED FEB. 10, 1903.

F. I. DU PONT.
PULPING MACHINE.

APPLICATION FILED NOV. 24, 1899.

NO MODEL.

3 SHEETS—SHEET 3.

Fig. 5,

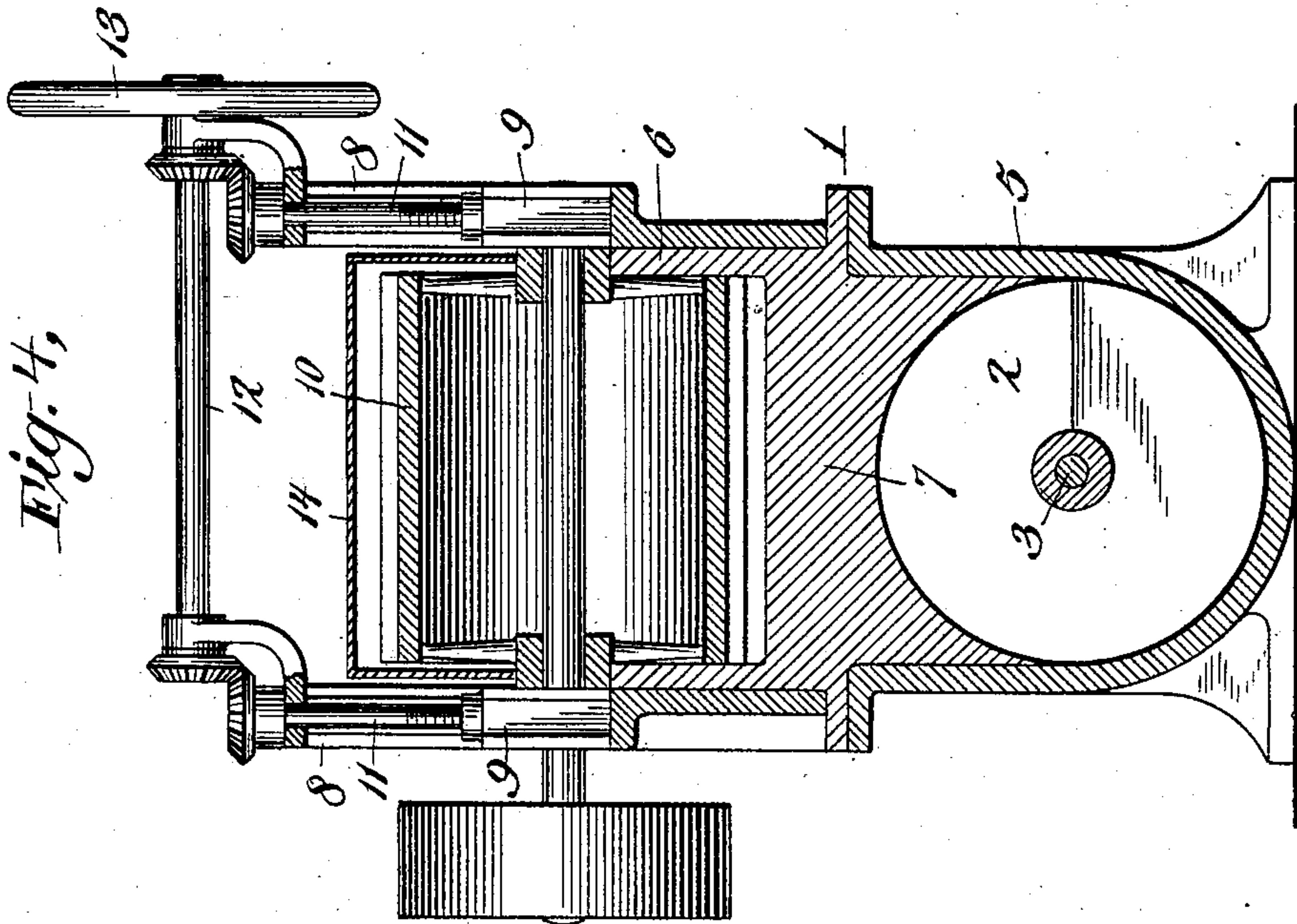
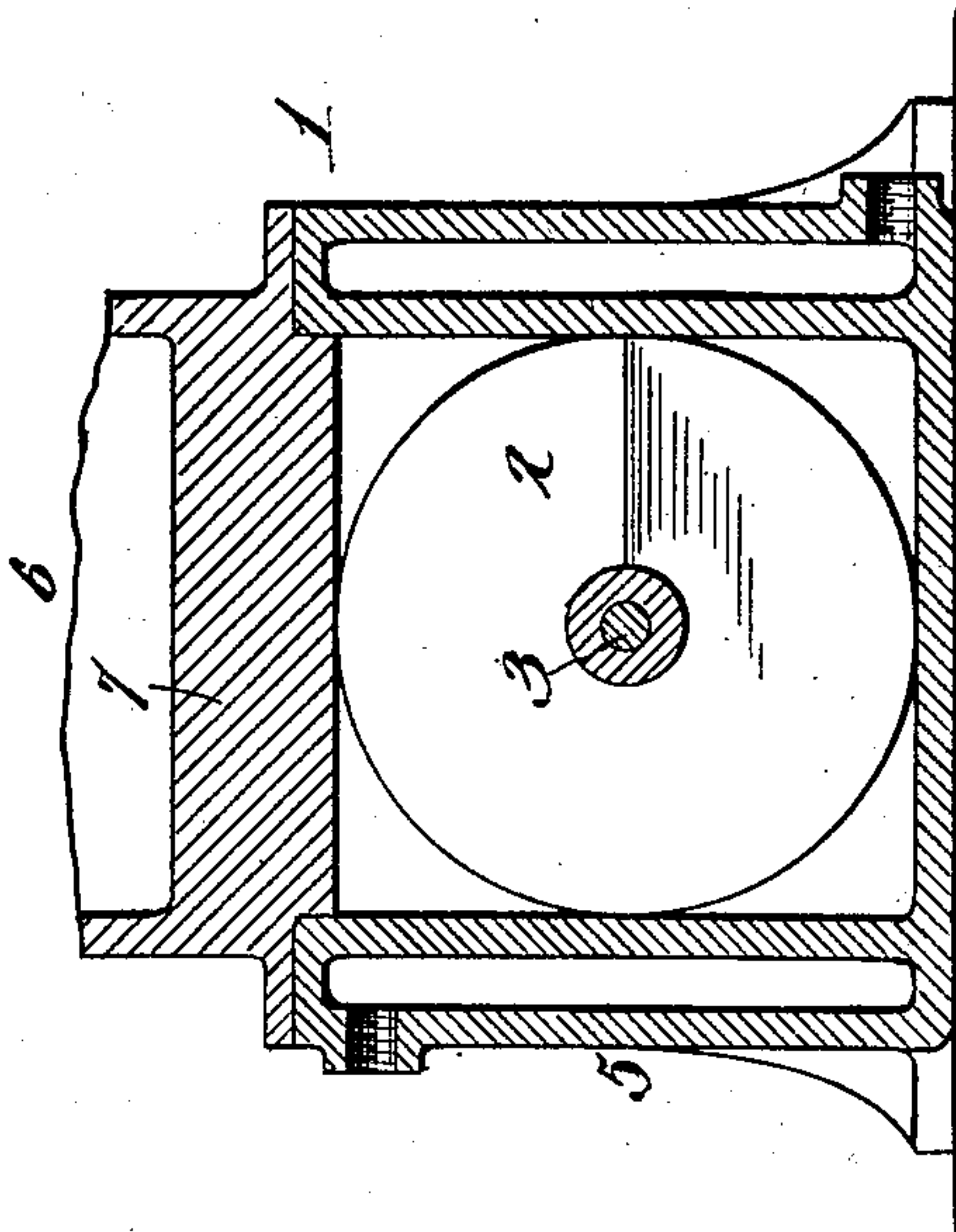


Fig. 4,

WITNESSES:

W. H. Hayward
H. A. Case

INVENTOR

Francis I. du Pont

BY

E. M. Marbleson

ATTORNEYS

UNITED STATES PATENT OFFICE.

FRANCIS I. DU PONT, OF WILMINGTON, DELAWARE.

PULPING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 720,379, dated February 10, 1903.

Application filed November 24, 1899. Serial No. 738,167. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS I. DU PONT, a citizen of the United States, residing at Wilmington, in the county of Newcastle and State of Delaware, have invented certain new and useful Improvements in Pulping-Machines; 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.

My invention relates to improvements in machines for pulping cotton and other fibrous substances and is particularly intended for use in the manufacture of guncotton and for carrying out the process described and claimed in my application for Letters Patent for a process of nitrating cellulose and other similar substances, filed November 2, 1899, Serial No. 735,580. In this process the cotton is pulped while immersed in the acid-bath; but the pulping-machine herein described is also adapted for use in the manufacture of paper and, in fact, for all purposes for which pulping-machines are employed.

My invention consists in the use, in connection with the cutters or pulping devices, of a screw conveyor located beneath said devices and adapted to transfer the material treated from one side of the cutting apparatus to the other, in the novel means employed for preventing accumulation of solid material at the discharge end of the conveyor, and, generally, in the novel combination, construction, and arrangement of the parts.

The objects of my invention are, first, to improve the construction of pulping-machines, so that they may be capable of pulping material, such as nitrated cellulose, which is relatively heavy in comparison with the fluid, such as water, in which it is customarily immersed while the pulping is going on; second, to provide a pulping-machine adapted for pulping cellulose while immersed in a bath of nitrating acid; third, to prevent accumulation of solid material at the discharge end of the conveyor employed, and, fourth, to make the pulping-machine simple, compact, efficient, and comparatively inexpensive. These objects are attained in the invention herein described, and illustrated in the drawings which accompany and form a

part of this specification, in which the same reference-numerals indicate the same or corresponding parts, and in which—

Figure 1 is a central vertical section of the pulping-machine. Fig. 2 is a plan view thereof. Fig. 3 is a detail section of the conveyer-screw on the line *xx* of Fig. 1. Fig. 4 is a transverse section of the machine, and Fig. 5 is a similar view showing a modified form of tank.

In the drawings, 1 is the tank of the machine. It is preferably formed of two sections, the lower of which, 5, contains a conveyer-screw 2, mounted upon a shaft 3, having bearings in the said tank 1 and projecting through a stuffing-box 4 at one end thereof, while the upper section 6 of the tank contains a bridge 7, provided with a cutting-bed. Said upper section 6 is provided with uprights 8, slotted to receive movable bearing-blocks 9, in which is journaled a cutting-roll 10. Screws 11 are provided for moving these bearing-blocks and the roll 10 upward in their guides, said screws being geared to an operating-shaft 12, provided with a hand-wheel 13. The cutting-bed and cutter-roller 10 are of ordinary construction. A cover 14 is provided for inclosing the roll 10 and preventing splashing of fluid. The conveyer-screw 2 is mounted as a sleeve upon the shaft 3, but is suitably keyed thereto. Said shaft 3 may be rotated by any convenient and suitable means.

In the use of screw conveyers working within tanks closed at the ends, as is the case in this machine, much difficulty has been experienced from the accumulation of the solid or semisolid material against that end of the tank toward which the conveyor moves such material. To overcome this difficulty, I have provided the screw 2 with a short reverse thread 15 at the delivery end of the screw. This reverse thread terminates at its point of intersection with the main thread 16 of the screw. In order to prevent solid matter from wedging in the V-shaped space between these threads 15 and 16, I provide a suitable fillet 17 in such V-shaped space. As shown particularly in Fig. 3, this fillet is curved in such manner as to offer no perceptible resistance to the rotation of the screw and to offer no crevices for the accumulation of the material

being pulped. The effect of the reverse thread 15, resisting as it does the forward motion of the stream of fluid or semifluid material forced forward by the main thread 16, is to cause said material to rise instead of accumulating at the left-hand end of the tank. A continuous and steady circulation of the material being treated and of the fluid is thus produced and uniform disintegration of the material being pulped insured.

Heretofore the machines ordinarily used for pulping guncotton have been of practically the same construction as those customarily employed in pulping paper-stock, consisting, essentially, of an oval trough, in one side of which a cutting-bed and revolving cutter-roller are located. Such pulping-machines work satisfactorily for pulping paper-stock, but do not work as satisfactorily for pulping guncotton, particularly when the fluid in which the guncotton is immersed is water, for the guncotton being much heavier than paper-stock tends to sink to the bottom of the trough, so that it is somewhat difficult to maintain proper circulation of the guncotton. In my improved machine, however, there is no difficulty of this sort, because the conveyer-screw completely fills the cylindrical lower portion of the tank 1, in which it works, thereby forcing the guncotton forward, even though it sinks to the bottom of the tank. Since the screw conveyer extends from one side of the pulping mechanism to the other, so that the cotton need but rise from the conveyer to the pulping mechanism on one side and need but descend directly to the conveyer on the other side, it is not necessary to create a strong current in the liquid to keep the cotton in circulation. The conveyer itself insures efficient circulation of the cotton, preventing it from depositing upon the bottom of the tank. For this reason but little power is required to drive the conveyer. When the cotton is pulped in acid, since the acid is much heavier than water no difficulty is experienced in keeping the cotton in circulation, and therefore the lower portion of the tank 1 may be rectangular in cross-section, as shown in Fig. 5, and the tank may also be jacketed, so that by circulating water through the tank its contents may be kept at any temperature desired; but that form of tank the lower portion of which is cylindrical, as shown by cross-section in Fig. 3, is equally adapted for use for pulping in acid and may also be provided with a water-jacket.

The operation of my machine is as follows: The tank 1 having been filled with the fluid, either water or acid, in which the pulping is to be conducted, the cutter-roller 10 and conveyer 2 are caused to revolve, and the cotton to be pulped is introduced at the left-hand end of the machine by raising the cover 18. This cotton, with the fluid in the tank 1, is drawn downward by the conveyer 2, carried through the passage beneath the bridge 7, and delivered at the right-hand end of the

machine, the cotton being carried between the cutter-roller 10 and the knives of the cutting-bed, so that it is pulped. The operation of the conveyer 2 produces a very active circulation of the cotton and also of the fluid in the tank, preventing the cotton from accumulating at the bottom of the tank and causing it to pass between the cutter-roller 10 and its cutting-bed repeatedly until the pulping is complete. The reverse thread 15 of the conveyer prevents accumulation of the pulp at the end of the tank, forcing the pulp upward. The fillet 17 prevents the cotton from wedging between the threads 15 and 16.

I do not limit myself to the use of the particular form or arrangement of conveyer illustrated and described or to other details of combination and construction.

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

1. In a pulping-machine, the combination, with a tank containing a cutter-roller and a bridge, beneath the roller, having a cutting-bed, a passage being provided beneath the bridge, of a conveyer located in said passage and extending throughout the length thereof, and adapted to transfer the material treated from one side of the bridge to the other.

2. In a pulping-machine, the combination, with a tank containing pulping devices, and having a circulating-passage for conducting the material treated from one side of the pulping devices to the other, of a conveyer extending throughout said circulating-passage and substantially filling the same, and adapted to maintain circulation of the material treated therethrough.

3. In a pulping-machine, the combination, with a tank containing pulping devices, and having a circulating-passage for conducting the material treated from one side of the pulping devices to the other, of a conveyer extending throughout said circulating-passage and running in close proximity to the side thereof at which the material to be treated tends to collect, and adapted to maintain circulation of such material through said passage.

4. In a pulping-machine, the combination, with a tank containing pulping devices, of a screw conveyer located within said tank, having a main thread for conveying material from one side of the pulping devices to the other, and a reverse thread, at the discharge end, for preventing accumulation of material at that end, and having, in the angle between said threads, a fillet by which the wedging of material between said threads is prevented.

5. In a pulping-machine, the combination, with a tank containing pulping devices, of a screw conveyer having a main or forward thread and at the delivery end a reverse thread, and having a fillet in the angle between said threads by which wedging of material between said threads is prevented, the outer surface of said fillet having such form

in transverse section, as would be described
by a point moved outwardly from the shaft to
the periphery of the conveyer, upon such
transverse sectional plane, during the partial
5 rotation of the screw conveyer.

6. In a pulping-machine, the combination,
with a tank containing pulping devices, of a
screw conveyer having a main or forward
thread, and, at the delivery end, a reverse

thread, and having a fillet in the angle be- 10
tween said threads by which wedging of ma-
terial between said threads is prevented.

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

FRANCIS I. DU PONT.

Witnesses:

JOHN W. MACKLEM,
EUSTIS W. GREEN.