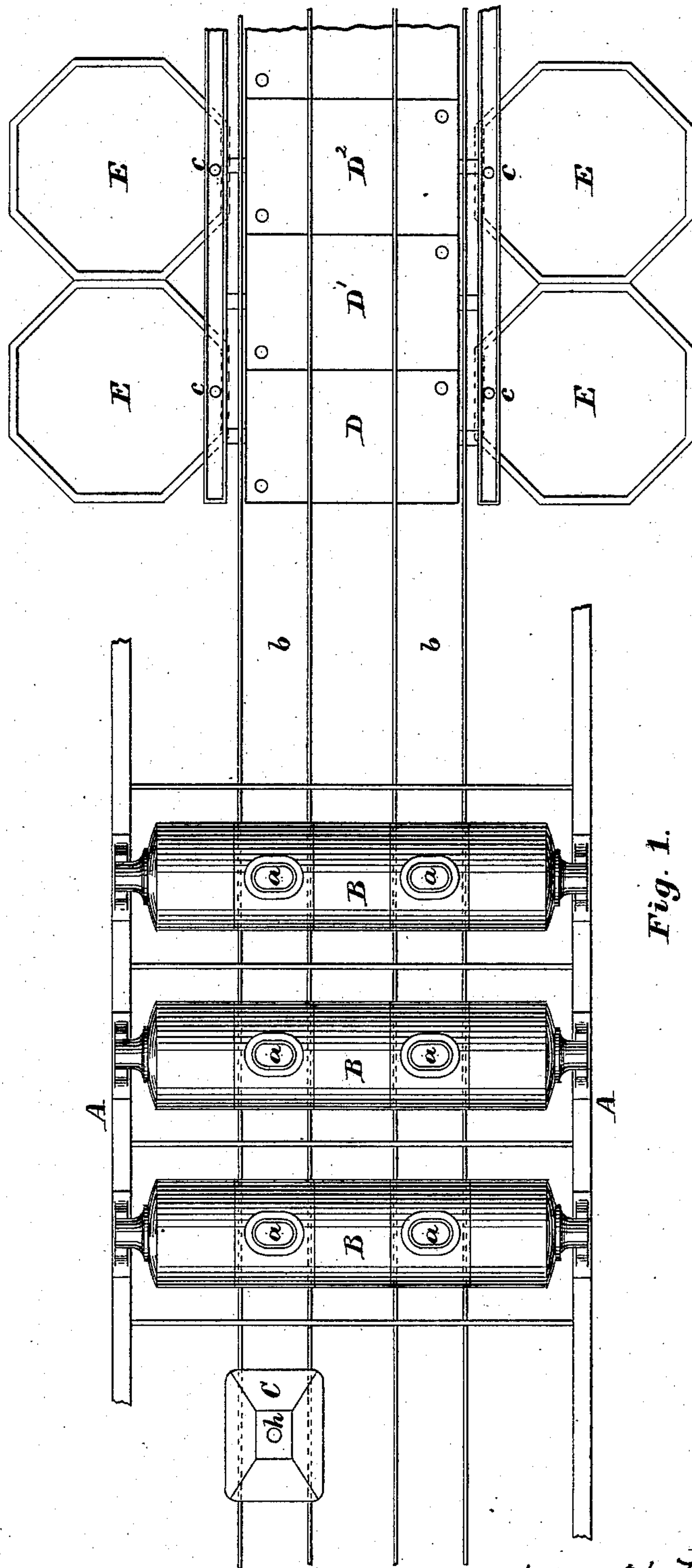


(No Model.)

3 Sheets—Sheet 1.

H. H. FURBISH.
Process of Making Wood Pulp for Paper.
No. 238,227. Patented March 1, 1881.



Witnesses:
W. W. Swan
H. L. Olmsted

Inventor:
Henry H. Furbish
By W. P. Peble for
his attorney.

(No Model.)

3 Sheets—Sheet 2.

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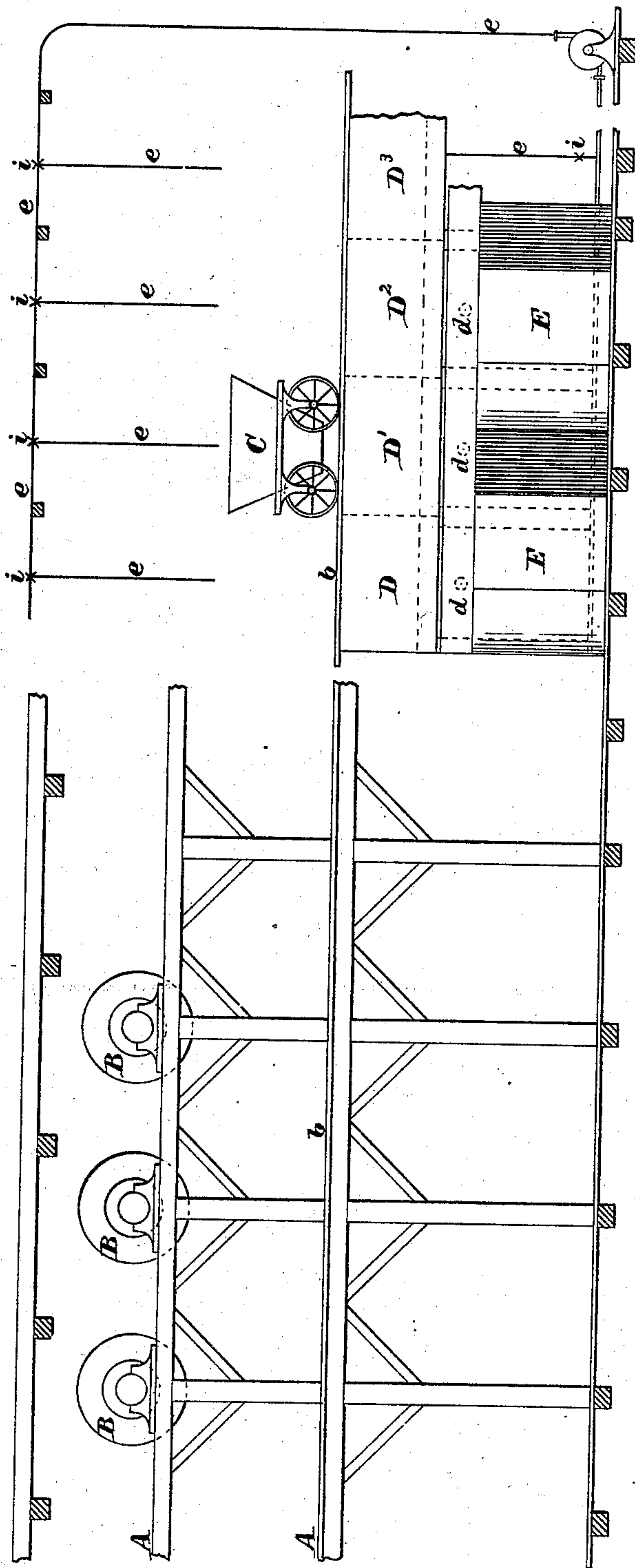


Fig. 2.

Witnesses:

W. W. Swan
H. L. Olmsted

Inventor:

Henry H. Furbish
by W. P. Preble Jr
his attorney.

(No Model.)

3 Sheets—Sheet 3.

H. H. FURBISH.

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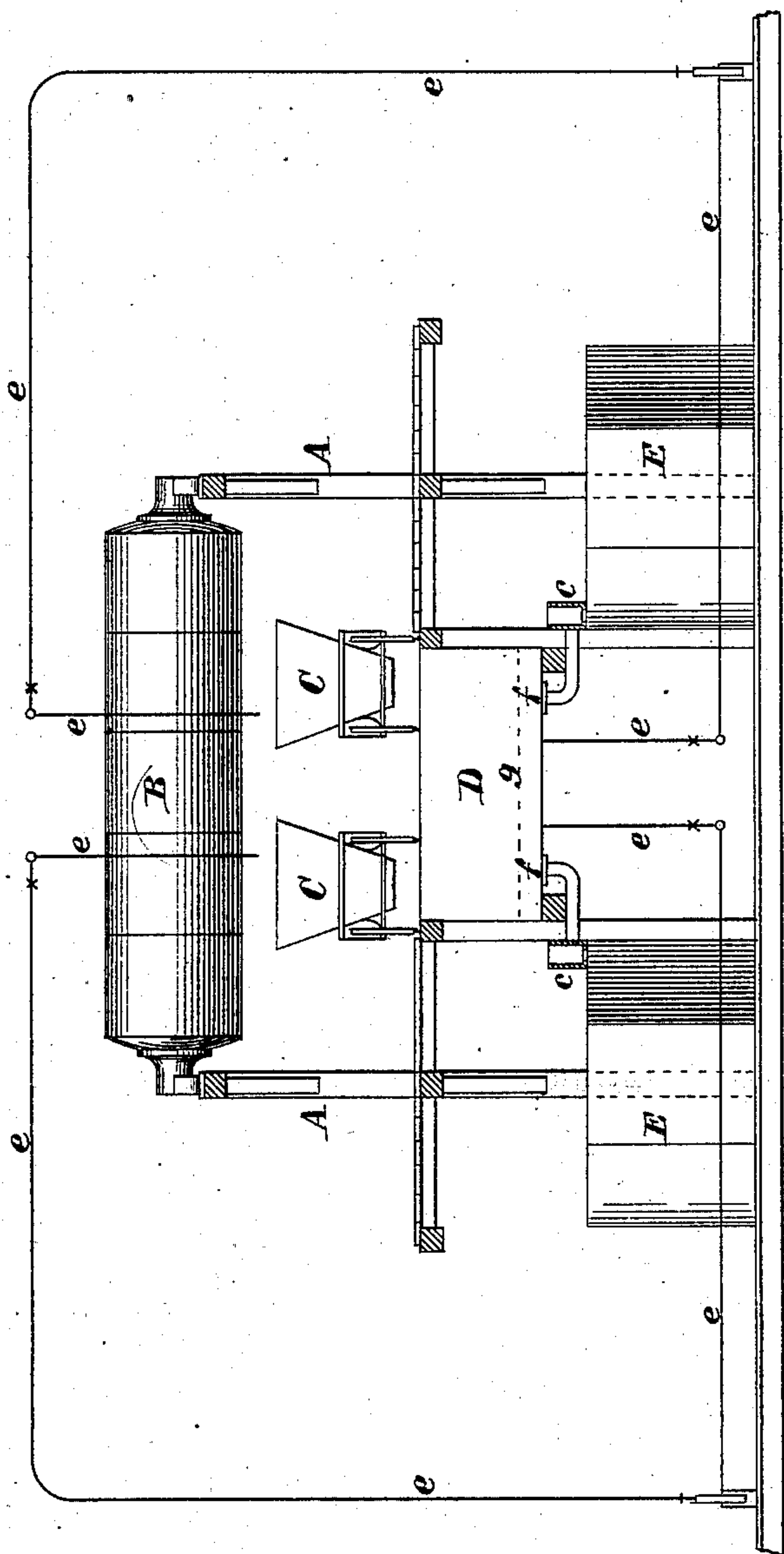


Fig. 3.

Witnesses:
W. W. Swan
H. B. Olmsted

Henry H. Furbish Inventor:
by W. P. Pulte Jr
his attorney.

UNITED STATES PATENT OFFICE.

HENRY H. FURBISH, OF BERLIN FALLS, NEW HAMPSHIRE.

PROCESS OF MAKING WOOD PULP FOR PAPER.

SPECIFICATION forming part of Letters Patent No. 238,227, dated March 1, 1881.

Application filed January 5, 1881. (No model.)

To all whom it may concern:

Be it known that I, HENRY H. FURBISH, of Berlin Falls, New Hampshire, have invented certain new and useful Improvements in the Process of Making Wood Pulp for Paper, of which the following is a specification.

One of the ways heretofore practiced for reducing wood to pulp for the manufacture of paper has been to boil the wood in a chemical solution consisting, principally, of potash or soda under a high pressure. The wood has been introduced with the chemical solution into cylindrical boilers, which are kept in constant rotation, and the heat has been applied by the introduction of steam in pipes from a boiler, and the temperature of the contents of the rotating boiler raised to that due to steam-pressure of about one hundred pounds to the square inch. When the wood is reduced to pulp and removed from the boiler it is intimately mixed with the chemicals used in its reduction, and forms a black spongy mass, from which the chemicals must be removed by washing.

To enable this process to be used profitably in the manufacture of pulp, it is necessary that the potash and soda employed should be recovered and used repeatedly, and to do this it is necessary to evaporate the water and to remove any gums or resins which may have been dissolved from the wood by exposing the potash, after the water is evaporated, to a high temperature. As the water used in washing the pulp must all be evaporated, it will obviously be an advantage to employ as little water as possible to effect the washing; and as it has been found necessary to subject the pulp to several washings in order to free it completely from the chemicals, the plan has been adopted of using the same water successively for different portions of pulp, the fresh water being first applied to pulp nearly freed by previous washings from the chemicals, and then, in succession, to portions of pulp containing more and more of the chemicals, until it reaches a portion just drawn from the boiler and having the full strength of chemicals. In this way the water is made to take up additional amounts of the chemicals at each washing, and the portions of pulp taken in a reverse order lose at each washing a portion of the

chemicals present. To do this without unnecessary handling of the pulp, pits have been placed under the rotaries, into each of which a charge of pulp might be conveyed directly from the rotary when the process of boiling was completed, and the water has been drawn from one pit to another, so as to wash the pulp of each pit in succession in the manner indicated above.

In order that the contents of each boiler may be discharged into either one of the pits, it is found necessary to use tunnels or chutes placed at the proper time between the rotary to be discharged and a pit.

In practice it has been found expedient to limit the number of boilers to two, and of pits to four or six, owing to the difficulty of conveying the pulp by chutes to the pits. This arrangement of the pits with reference to the rotaries was attended with several evils: first, as already stated, it imposed a limit upon the number of rotaries and pits which could be advantageously used together; second, the limited number of pits limited the number of washings to which the same water could be applied; third, the workmen were subjected to much inconvenience from the heat of the rotaries above them; fourth, in order to secure the necessary capacity of the pits within the limited area which they might occupy, it was necessary to make them deeper than was otherwise desirable; fifth, in discharging the rotaries there was a constant liability of the unwashed pulp to fall into the pits containing pulp washed or nearly washed, and injure its value; sixth, the rotaries, being under the strain of the high pressure of the steam from the water present in the wood or introduced with the wood and chemicals are almost constantly leaking, and the water thus leaking and charged with the chemicals is liable to fall into the pits containing the pulp in the process of washing, or it spreads over the outer surface of the rotaries and forms a scale which is easily detached and falls into the pits. In either case the injury to the pulp is serious.

The object of my invention is to remedy these evils, and to wash the pulp more easily and effectively and with a less amount of water.

The washing is effected by throwing the

washing-liquid on the surface of the pulp, through which it percolates, carrying away in its course more or less of the substances to be removed, and passing off through the filter-bottom of the pit. It is obvious that if the mass of the pulp is very deep the water which is thrown upon the surface of the pulp might, in penetrating the mass a short distance, become so fully charged with chemicals that it would have but little effect upon the mass below. It is desirable, therefore, to reduce the thickness of the mass of pulp so that the washing-liquid shall be effective during the whole of its course through the pulp.

It has been found, in practice, that the amount of water required for washing the pulp is greatly reduced by washing successive masses of pulp with the same liquid, and that this saving is increased by increasing the number of washings. For instance, it was found that when four pits were used in the manner above described, the amount of water required was very much less than it was when the washing was effected by introducing a sufficient quantity of fresh water upon a single charge of pulp. I have found that by increasing the number of washings from four or six to eight or ten I effect an important saving in the amount of water required.

In my improved apparatus I place the washing-pits in a different relation to the rotaries from what they have heretofore occupied, so that I can use any number of rotaries together which I desire, and any number of washing-pits, without having the efficiency of the latter interfered with by the former; and I establish a connection between them, so that the pulp can be easily transferred from the rotaries to the pit by a movable carriage, into which the charges of pulp are received, and from which it may be discharged into any one of a series of washing-pits. The arrangement and combination of rotaries and washing-pits by which I accomplish these results are shown in the accompanying drawings, in which—

Figure 1 is a top plan. Fig. 2 is a linear section, and Fig. 3 is an end view.

The same letters refer to similar parts in the different drawings.

A is the staging, on which the rotaries B B are hung, and in which they are made to rotate by a shaft and belting. (Not shown in the drawings.) Each rotary is provided with two openings or man-holes, *a a*, through which the materials are introduced, and by which the pulp may be discharged. The man-holes of the several rotaries are placed in lines over roadways, upon which the carriages may be brought under the several rotaries. These roadways *b b* extend out to one side of the rotaries and over the pits where the pulp is to be washed. The roadways must be open above the pits, so that the contents of the carriages may be discharged directly into them. The carriages or cars C C are each provided with an opening, *h*, in the bottom, by which the pulp is discharged into the pits.

D D' D² D³, &c., represent the series of pits. The number of rotaries and the number of these pits which may be used in connection with each other under this arrangement is practically unlimited. The pits are made broad and shallow to facilitate the washing, as before stated, and are each provided with a secondary perforated bottom, *g g*, through which the water drains off into a reservoir below. They are connected by the pipes *c* and valves *f* with tanks E for receiving the washed pulp. The valves *d d* allow the washing-liquid of each pit to be carried at the proper time to the recovering-furnace. The arrangement of pipes represented by *eeee* is connected with a pump, (not shown in the drawings,) and by it and a system of valves, *i i i*, (one below and one above each washing-pit.) The washing-liquid, after it has percolated through the pulp and collected in the pit below the filter-bottom *g*, as before explained, is pumped into the next pit in order. It is obvious that by keeping the valve *i* below any pit, as D', and that above the next pit, D², open and the rest of the valves closed the liquid may easily be pumped from the former to the latter.

The method of working this apparatus is as follows: When the contents of a rotary are sufficiently boiled they are discharged into one of the cars C C and carried to the pits, where they are discharged into the pit last emptied. As the pulp in the car is not in a condition which allows it to flow freely, I throw upon it a quantity of washing-liquid from the pit containing the preceding charge. This liquid, already highly charged with the chemicals, gives sufficient fluidity to the mass to allow it to flow freely into the pit—say D'—and it also begins the washing and removes a portion of the chemicals. On this charge in the pit is poured the washing-liquid which has percolated through the next preceding pit, and which has collected in that pit below the filter-bottom. After passing through this last-emptied charge this liquid is drawn off to the recovering-furnace; but the next quantity of washing-liquid which it receives is used for the first washing of the next charge of pulp drawn from the rotaries. The washing-liquid thus drawn from the next preceding pit D is replaced by a washing-liquid of lower chemical strength, which is taken from the pit D¹⁰, next before it in order, and percolates through the pulp in pit D, in readiness to be thrown upon D' at the next washing. The liquid taken from D¹⁰ is replaced from D⁹, this from D⁸, &c., until D² is reached. This pit is the last in the series, and the pulp has received such a number of washings that the washing is completed by a quantity of fresh water thrown upon it. The pulp thus washed is discharged into the tank E, and the pit D² is thus ready for the next charge from the rotaries, and D³ becomes the last of the series. This process is indefinitely repeated, the position of the pit last emptied and ready for a fresh charge advancing one step at each washing of the series of pits.

I claim—

1. A series of pits for washing wood pulp,
connected with the rotaries for producing the
pulp by means of a roadway and carriages run-
5 ning under the rotaries and over the pits, so
that the pulp from the rotaries can be trans-
ferred to either pit and be subjected to a series
of washings, substantially as herein described,
without liability to damage from the rotaries.
10 2. The above-described process of making
wood pulp for paper, which consists in per-

forming the operations of boiling and washing
in separate apparatus placed at a distance from
each other, and between which connection is es-
tablished by means of a movable carriage, sub- 15
stantially as shown, and for the purposes speci-
fied.

HENRY H. FURBISH.

Witnesses:

SAM. W. BATES,
W. P. PREBLE, Jr.