Dec. 30, 1947. S. G. STAPLEY ET AL 2,433,490

PULPING MACHINE

Filed Sept. 9, 1946 2 Sheets-Sheet 1

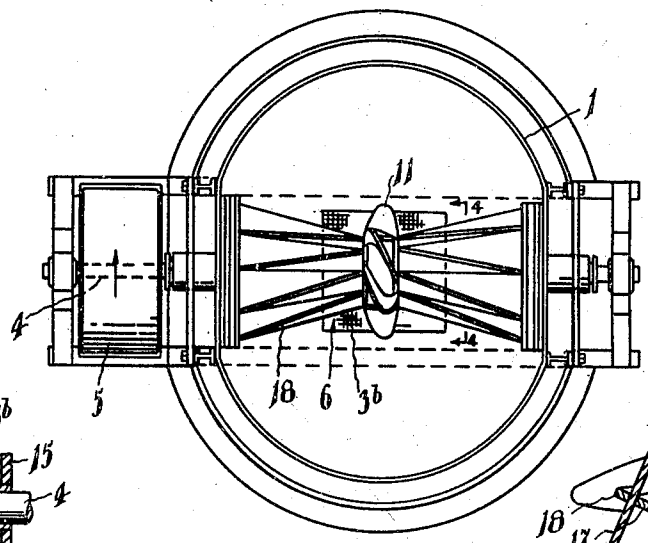


FIG. 1.

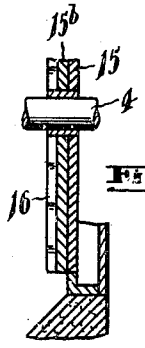


FIG. 3.

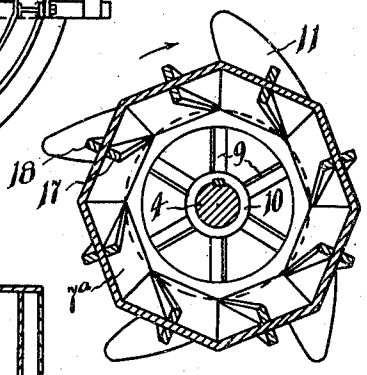


FIG. 4.

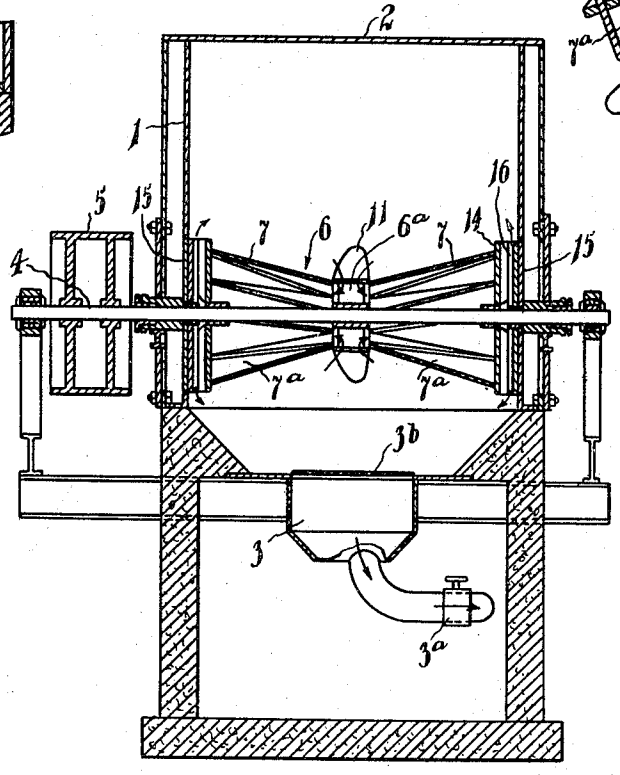


FIG. 2.

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PULPING MACHINE

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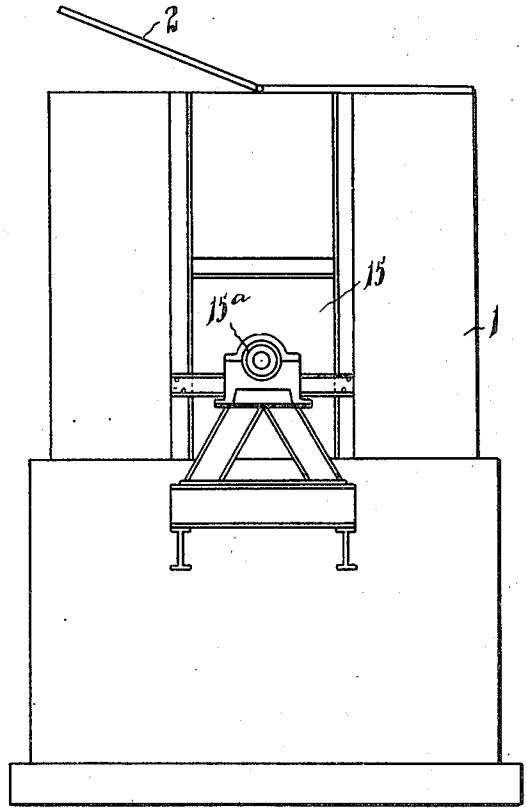


Fig. 3.

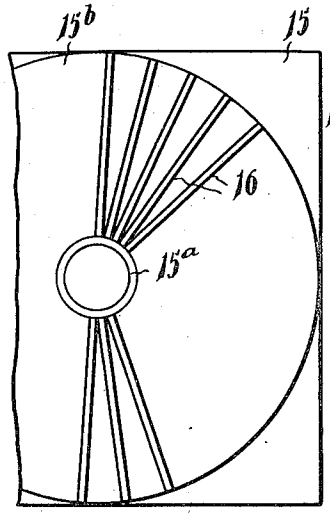


Fig. 5.



Fig. 6.

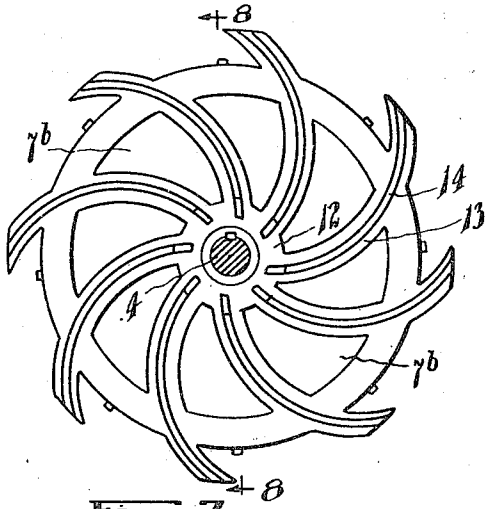


Fig. 7.

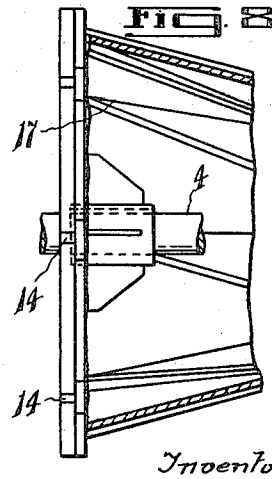


Fig. 8.

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2,433,490

PULPING MACHINE

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14 Claims. (Cl. 92—26)

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This invention relates to an improved pulping machine for use in disintegrating and mixing material, and particularly adapted for use in making paper pulp from fibrous materials such as waste paper, rags, wood fibres and the like.

While numerous types of pulping machines are known, heretofore the most efficient type has been based on an inner roll revolvably mounted within an outer casing so as to form an annular passage therewith, the revolving roll disintegrating the stock which is passed through the annular passage.

The pulping machine made according to my invention, although of a more simplified and economical construction than the aforesaid type, yields better results in terms of quality of pulp produced and rate of production.

According to our invention we provide a pulping machine comprising a container for the stock and a roll revolvably mounted within the container, the roll having a substantially conical central passage extending substantially throughout, an inlet in the roll connecting the interior of the container and the narrow part of the passage so as to admit the stock drawn into the passage by the suction created by the revolving roll, an outlet in the roll connecting the interior of the container and the wide end of the passage for expelling the stock into the container, cutting means mounted on the roll, opposite the outlet, rotatable therewith and serving to expedite the circulation of the stock through the passage, a stationary cutting means mounted opposite the first mentioned cutting means and cooperating therewith to disintegrate the stock, ribs on the inside of the roll for disintegrating the stock and directing it towards the outlet, and ribs on the outside of the roll for beating and disintegrating the stock.

Other features of our invention include a roll having two opposed conical central passages therein, means for preventing clogging of the inlet and means for expediting the flow of stock through the revolving roll.

The novel features of this invention as shown in a preferred embodiment will hereinafter appear in detail in the description that follows and are illustrated in the accompanying drawings in which similar reference characters indicate corresponding parts, and in which

Figure 1 is a plan view of the apparatus with the top of the container removed;

Figure 2 is a vertical section through the apparatus shown in Figure 1, with the top cover of the container in position;

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Figure 3 is a side elevation of Figure 2, showing a door in raised position;

Figure 4 is a section through the rotor on the line 4—4 in Figure 1;

Figures 5 and 6 are elevation and side views, respectively, of the stationary cutter;

Figure 7 is an end view of the roll, showing the rotary cutter;

Figure 8 is a fragmentary section through the roll on the line 8—8 in Figure 7; and

Figure 9 is a fragmentary section showing the rotor shaft mounted in the wall of the container.

In the drawings corresponding numbers refer to corresponding parts in the different figures.

Referring to the drawings, the stock or pulp mixture is contained in a raised container or tank 1 with an opening in the top cover through which the materials are to be passed into the tank and a door 2 for covering and uncovering the opening. On the bottom of container 1 is a drain 3 equipped with a gate valve 3^a for drawing off stock from the container as required. A grill 3^b positioned over the drain controls the size of the solid material drawn off in the stock.

Journalled in the opposite side walls of container 1 is a shaft 4 which is driven in a conventional manner from a pulley 5. Mounted on shaft 4 is a roll 6 which serves as an agitator and disintegrator.

Roll 6 consists of two hollow truncated octagonal conical drums 7, coaxially mounted on shaft 4 and spaced apart at 6^a, and having conical central passages 7^a therein. The drums may be connected by longitudinally positioned bracing rods for greater strength. The conical drums are secured at their inner ends by heavy radial spokes 9 to a sleeve 10 rigidly keyed onto shaft 4. This arrangement provides an inlet into the conical central passages.

A series of radially extending helical blades 11, five in number in the illustrated embodiment, are fixed to the narrow ends of drums 7 and extend diagonally across inlet opening 6^a from one drum to the other. These blades serve to keep the inlet from being clogged by solid stock and to direct the stock into inlet opening 6^a. The blades increase in width from their forward ends to their rear ends, and are curved sharply down at their rear ends.

The wide ends of the drums 7 are open so as to form outlets 7^b. Outlets 7^b with inlet opening 6^a and the central passage 7^a within the drums provide a passageway through which the stock in container 1 can travel. Drums 7 are secured at their large ends by rearwardly curved radial

spokes 13 to a hub 12 rigidly keyed to shaft 4. The spokes 13 extend beyond the peripheries of the drums and have symmetrically arranged raised knife blades 14 fixed to and projecting beyond their outer sides. The knife blades are rotatable with the rolls.

The side walls of container 1 opposite outlet 7b have removable square plates 15 fixed thereto. These plates have central hubs 15a through which the shaft 4 passes and rotates when the plates are in position in the container. Secured to the inner surfaces of plates 15 are circular stationary cutter plates 15b, with bars 16 mounted thereon, which are thus spaced opposite the rotatable sets of knife blades 14 and form the fixed cutter portions of the cutting means for disintegrating the pulp.

Ribs or vanes 17 and 18 are formed on the inside and outside, respectively, of the drums 7, which, as shown in Figure 4, are octagonal, and they extend diagonally from the narrow inner ends of the drums to their wide outer ends. The outer ribs 18 serve to beat and break up the stock when it comes into contact with them. The inner ribs 17 likewise break up the stock and direct it towards the outlets 7b and 8b at the wide ends of the drums.

In use, the roll is set in motion and the tank is filled with hot water or other liquid. Necessary chemicals, such as caustic soda, are then added followed by the waste paper, rags, wood fibres or other stock material which is to be made into pulp. As the stock or material comes into contact with the roll it is broken up by the action of the outer ribs 18 and is then drawn through the inlet space 6a into conical passages 7a by the suction of the revolving roll. The inner ribs 17 likewise break up the solid stock materials and direct the stock towards the outlets 7b. The curved rotating spokes 13 and knife blades 14 act as impeller blades which serve to increase the rate at which the stock is circulated through the passages 7a. The solid materials in the stock are finely ground between the knife blades 14 and radial spaced bars 16, between which the stock is forced when it is expelled through outlets 7b. It is this cutting means that determines the fineness to which the solid materials are reduced.

The stock movement is indicated by arrows in Figure 2. The direction of rotation of the roll is indicated by the arrow in Fig. 4. It will be observed that the narrow forward ends of blades 11 enter the mass of stock when the roll is rotated and that the shape of the blades gradually increasing in width towards the rear ends prevents the solid materials from catching on the blades and rotating with them. The diagonal arrangement of the internal ribs 17 tends to throw the stock to the outer ends of the drums 7 when the roll 6 is rotated in the direction indicated in Fig. 4.

The stock is drawn off as required through drain 3, which is covered by grill 3b, and valve 3a.

It is to be noted that the pulping machine according to my invention is adaptable to either batch or continuous processes. It can be used for de-fibering any type of paper stock preparation, such as sulphate, soda pulp, waste paper, or rags, but it is especially designed for use in disintegrating waste paper.

While our invention has been described with particular reference to a preferred embodiment, it is to be understood that it is not to be limited thereto but is to be construed broadly and restricted solely by the scope of the appended claims. In particular it is to be understood that the roll need not be made up of two truncated conical drums but can be in the form of a single drum.

What we claim as our invention is:

1. In a pulping machine, a container for the stock and a roll revolvably mounted within the container, the roll having a substantially conical central passage extending substantially throughout, an inlet in the roll connecting the interior of the container and the narrow part of the passage so as to admit the stock drawn into the passage by the suction created by the revolving roll, an outlet in the roll connecting the interior of the container and the wide end of the passage for expelling the stock into the container, cutting means mounted on the roll, opposite the outlet, rotatable therewith and serving to expedite the circulation of the stock through the passage, and a stationary cutting means mounted opposite the first mentioned cutting means and co-operating therewith to disintegrate the stock.

2. In a pulping machine, a container for the stock and a roll revolvably mounted within the container, the roll having a substantially conical central passage extending substantially throughout, an inlet in the roll connecting the interior of the container and the narrow part of the passage so as to admit the stock drawn into the passage by the suction created by the revolving roll, an outlet in the roll connecting the interior of the container and the wide end of the passage for expelling the stock into the container, cutting means mounted on the roll, opposite the outlet, rotatable therewith and serving to expedite the circulation of the stock through the passage, a stationary cutting means mounted opposite the first mentioned cutting means and co-operating therewith to disintegrate the stock, and ribs on the inside of the roll for disintegrating the stock and directing it towards the outlet.

3. In a pulping machine, a container for the stock and a roll revolvably mounted within the container, the roll having a substantially conical central passage extending substantially throughout, an inlet in the roll connecting the interior of the container and the narrow part of the passage so as to admit the stock drawn into the passage by the suction created by the revolving roll, an outlet in the roll connecting the interior of the container and the wide end of the passage for expelling the stock into the container, cutting means mounted on the roll, opposite the outlet, rotatable therewith and serving to expedite the circulation of the stock through the passage, a stationary cutting means mounted opposite the first mentioned cutting means and co-operating therewith to disintegrate the stock, and ribs on the outside of the roll for beating and disintegrating the stock.

4. In a pulping machine, a container for the stock and a roll revolvably mounted within the container, the roll having a substantially conical central passage extending substantially throughout, an inlet in the roll connecting the interior of the container and the narrow part of the passage so as to admit the stock drawn into the passage by the suction created by the revolving roll, an outlet in the roll connecting the interior of the container and the wide end of the passage for expelling the stock into the container, cutting means mounted on the roll, opposite the outlet, rotatable therewith and serving to expedite

the circulation of the stock through the passage, a stationary cutting means mounted opposite the first mentioned cutting means and co-operating therewith to disintegrate the stock, ribs on the inside of the roll for disintegrating the stock and directing it towards the outlet, and ribs on the outside of the roll for beating and disintegrating the stock.

5. In a pulping machine, a container for the stock, a rotatable shaft extending across the container, an open-ended hollow truncated conical drum co-axially mounted on the shaft and having a conical central passage extending substantially throughout its length, the rotation of the drum creating a suction adapted to admit the stock at its narrow end from the interior of the container and to expel the stock at its wide end into the interior of the container, cutting means mounted on the drum opposite its wide end, rotatable therewith, and serving to expedite the circulation of the stock through the passage, and a stationary cutting means mounted opposite the last mentioned cutting means and co-operating therewith to disintegrate the stock.

6. In a pulping machine, a container for the stock, a rotatable shaft extending across the container, an open-ended hollow truncated conical drum co-axially mounted on the shaft and having a conical central passage extending substantially throughout its length, the rotation of the drum creating a suction adapted to admit the stock at its narrow end from the interior of the container and to expel the stock at its wide end into the interior of the container, rearwardly curved radial blades fixed to the shaft and to the drum opposite the wide end, rotatable therewith, and serving to expedite the circulation of the stock through the passage, and a stationary cutter with radial blades spaced opposite the first mentioned cutting means and co-operating therewith to disintegrate the stock.

7. In a pulping machine, a container for the stock and a roll revolvably mounted within the container, the roll having a substantially conical central passage extending substantially throughout, an inlet in the roll connecting the interior of the container and the narrow part of the passage so as to admit the stock drawn into the passage by the suction created by the revolving roll, an outlet in the roll connecting the interior of the container and the wide end of the passage for expelling the stock into the container, cutting means mounted on the roll, opposite the outlet, rotatable therewith and serving to expedite the circulation of the stock through the passage, a stationary cutting means mounted opposite the first mentioned cutting means and cooperating therewith to disintegrate the stock, and radially extending helical blades extending across the inlet to prevent the inlet from clogging and to direct the stock into the inlet.

8. In a pulping machine, a container for the stock and a roll revolvably mounted within the container, the roll having a substantially conical central passage extending substantially throughout, an inlet in the roll connecting the interior of the container and the narrow part of the passage so as to admit the stock drawn into the passage by the suction created by the revolving roll, an outlet in the roll connecting the interior of the container and the wide end of the passage for expelling the stock into the container, cutting means mounted on the roll, opposite the outlet, rotatable therewith and serving to expedite the circulation of the stock through the passage, a stationary cutting means mounted opposite the first mentioned cutting means and co-operating therewith to disintegrate the stock, and radially extending helical blades extending across the inlet, the blades increasing in width from their forward ends to their rear ends and curving sharply downwards at their rear ends, the forward ends being adapted to enter the stock when the roll is rotated, the blades being adapted to prevent the inlet from clogging and to direct the stock into the inlet.

9. In a pulping machine, a container for the stock and a roll revolvably mounted within the container, the roll consisting of two drums and having a central passage extending substantially throughout its length, each drum having a conical central passage portion connected to each other at their narrow ends, an inlet in the roll connecting the interior of the container with the narrow portion of the passage so as to admit the stock drawn into the passage by the suction created by the revolving roll, an outlet in each drum connecting the interior of the container and the wide end of the passage for expelling the stock into the container, cutting means mounted on each drum, opposite the outlet, rotatable therewith and serving to expedite the circulation of the stock through the passage, and stationary cutting means mounted opposite each of the first mentioned cutting means and co-operating therewith to disintegrate the stock.

10. In a pulping machine, a container for the stock, a rotatable shaft extending across the container, a roll revolvably mounted on the shaft, the roll having a central passage extending substantially throughout its length and consisting of two open-ended hollow truncated conical drums co-axially mounted on the shaft with their narrow ends opposite each other and displaced apart, each drum having a conical central passage portion therein, the rotation of the drums creating a suction adapted to admit the stock at the narrow ends from the interior of the container and to expel the stock at the wide ends into the interior of the container, cutting means mounted on each drum, opposite the wide ends, rotatable therewith and serving to expedite the circulation of the stock through the passage, and stationary cutting means mounted opposite each of the first mentioned cutting means and co-operating therewith to disintegrate the stock.

11. In a pulping machine, a container for the stock, a rotatable shaft extending across the container, a roll revolvably mounted on the shaft, the roll having a central passage extending substantially throughout its length and consisting of two open-ended hollow truncated conical drums co-axially mounted on the shaft with their narrow ends opposite each other and displaced apart, each drum having a conical central passage portion therein, the rotation of the drums creating a suction adapted to admit the stock at the narrow ends from the interior of the container and to expel the stock at the wide ends into the interior of the container, cutting means mounted on each drum, opposite the wide ends, rotatable therewith and serving to expedite the circulation of the stock through the passage, stationary cutting means mounted opposite each of the first mentioned cutting means and co-operating therewith to disintegrate the stock, and ribs on the inside of the drums extending diagonally from the narrow inner ends of the drums to their wide ends for disintegrating the stock and directing it towards the wide ends.

12. In a pulping machine, a container for the stock, a rotatable shaft extending across the container, a roll revolvably mounted on the shaft, the roll having a central passage extending substantially throughout its length and consisting of two open-ended hollow truncated conical drums co-axially mounted on the shaft with their narrow ends opposite each other and displaced apart, each drum having a conical central passage portion therein, the rotation of the drums creating a suction adapted to admit the stock at the narrow ends from the interior of the container and to expel the stock at the wide ends into the interior of the container, cutting means mounted on each drum, opposite the wide ends, rotatable therewith and serving to expedite the circulation of the stock through the passage, stationary cuting means mounted opposite each of the first mentioned cutting means and co-operating therewith to disintegrate the stock, and ribs on the outside of the drums extending diagonally from the narrow inner ends of the drums to their wide ends for beating and disintegrating the stock.

13. In a pulping machine, a container for the stock, a rotatable shaft extending across the container, a roll revolvably mounted on the shaft, the roll having a central passage extending substantially throughout its length and consisting of two open-ended hollow truncated conical drums co-axially mounted on the shaft with their narrow ends opposite each other and displaced apart, each drum having a conical central passage portion therein, the rotation of the drums creating a suction adapted to admit the stock at the narrow ends from the interior of the container and to expel the stock at the wide ends into the interior of the container, cutting means mounted on each drum, opposite the wide ends, rotatable therewith and serving to expedite the circulation of the stock through the passage, stationary cutting means mounted opposite each of the first mentioned cutting means and co-operating therewith to disintegrate the stock, and radially extending helical blades extending from one drum to the other to prevent clogging and to direct the stock into the passage portions.

14. In a pulping machine, a container for the stock, a rotatable shaft extending across the container, a roll revolvably mounted on the shaft, the roll having a central passage extending substantially throughout its length and consisting of two open-ended hollow truncated conical drums co-axially mounted on the shaft with their narrow ends opposite each other and displaced apart, each drum having a conical central passage portion therein, the rotation of the drums creating a suction adapted to admit the stock at the narrow ends from the interior of the container and to expel the stock at the wide ends into the interior of the container, cutting means mounted on each drum, opposite the wide ends, rotatable therewith and serving to expedite the circulation of the stock through the passage, stationary cutting means mounted opposite each of the first mentioned cutting means and co-operating therewith to disintegrate the stock, and radially extending helical blades extending from one drum to the other, the blades increasing in width from their forward ends to their rear ends and curving sharply downwards at their rear ends, the forward ends being adapted to enter the stock when the roll is rotated, the blades being adapted to prevent clogging and to direct the stock into the passage portions.

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