April 15, 1952 P. N. OTTERSLAND ET AL 2,592,594

METHOD OF AND MACHINE FOR TREATING FIBROUS OR CELLULOSIC MATERIAL

Filed Oct. 27, 1948 5 Sheets-Sheet 1

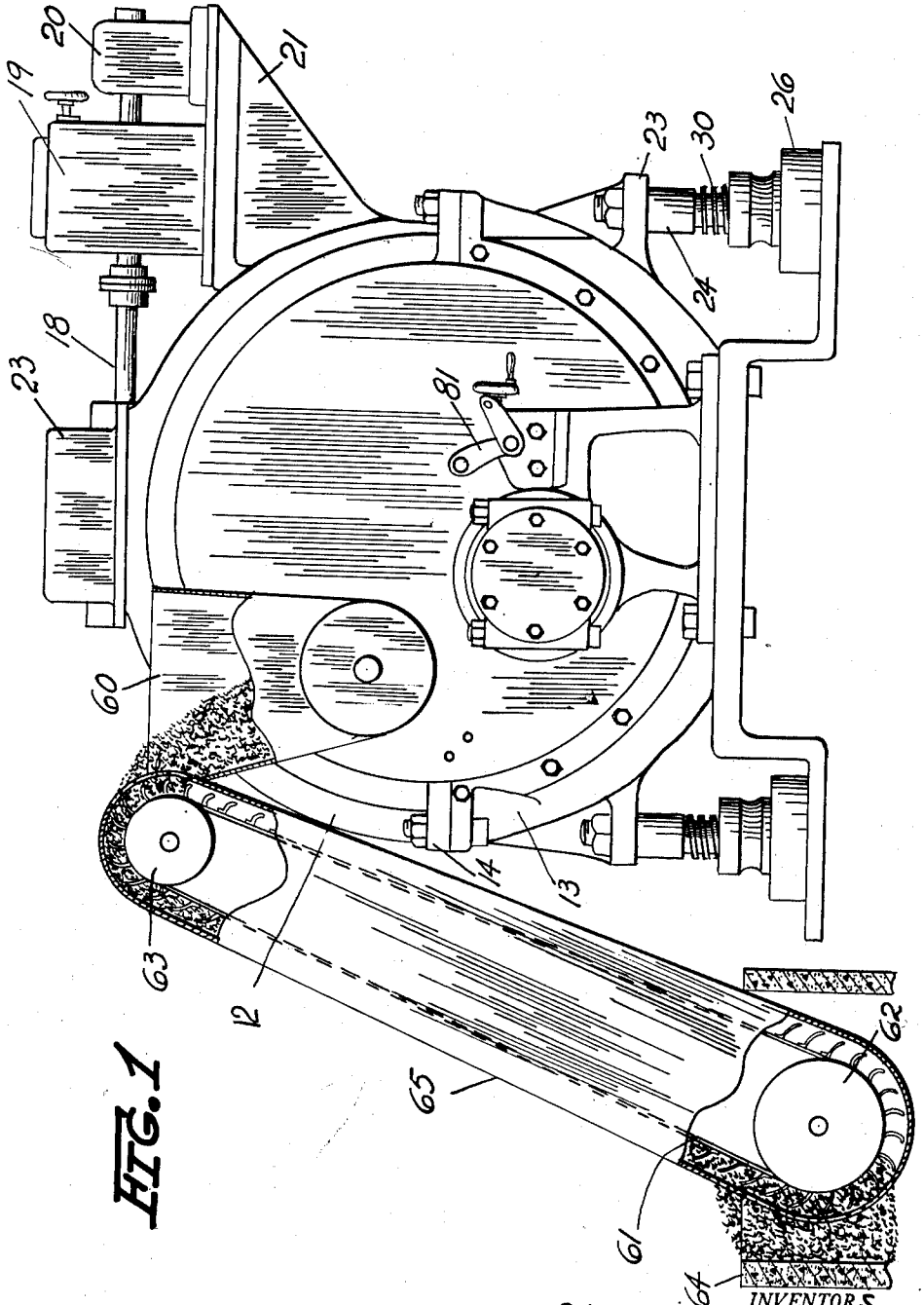


FIG. 1

INVENTORS
Edward S. Lansing
Peter N. Otterslandt
Napoleon Rigaton
By Luther W. Hawley
ATTY

April 15, 1952 P. N. OTTERSLAND ET AL 2,592,594

METHOD OF AND MACHINE FOR TREATING FIBROUS OR CELLULOSIC MATERIAL

Filed Oct. 27, 1948 5 Sheets-Sheet 2

FIG. 2

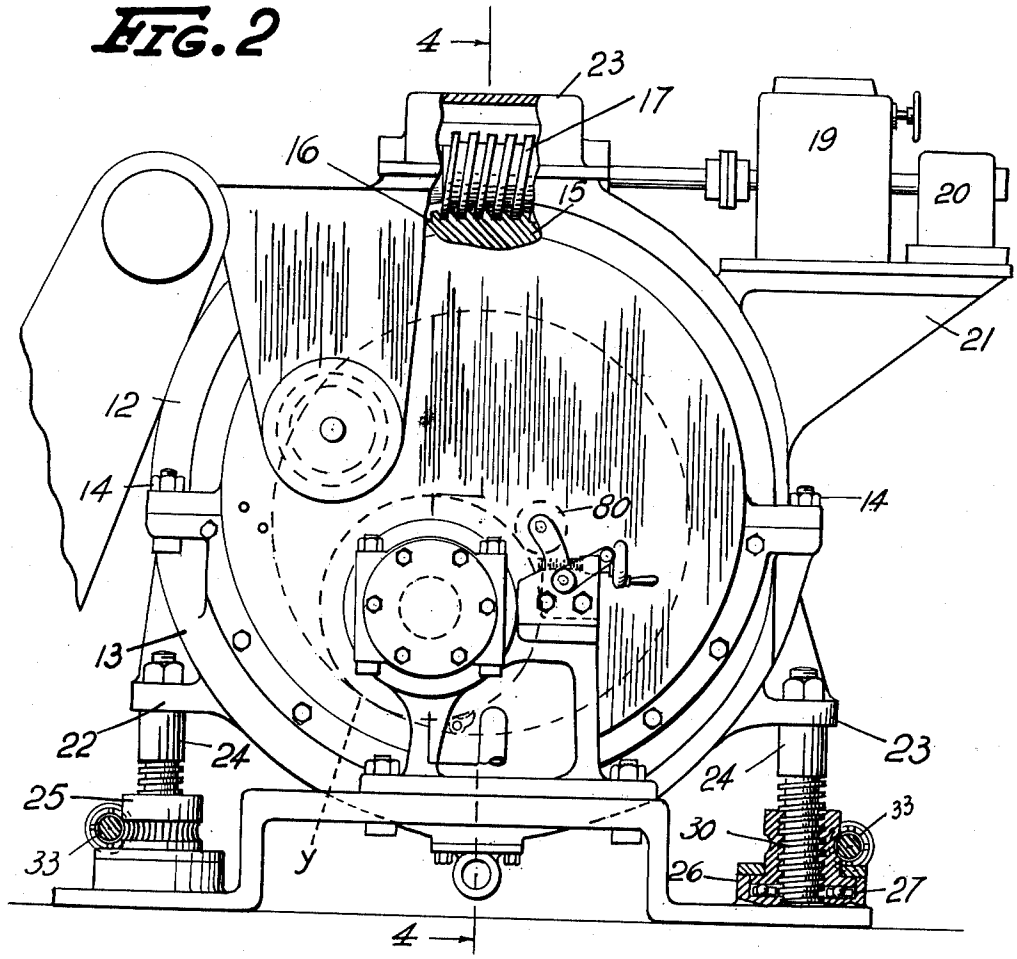
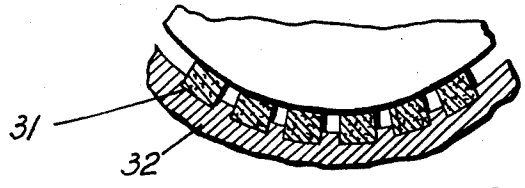


FIG. 3



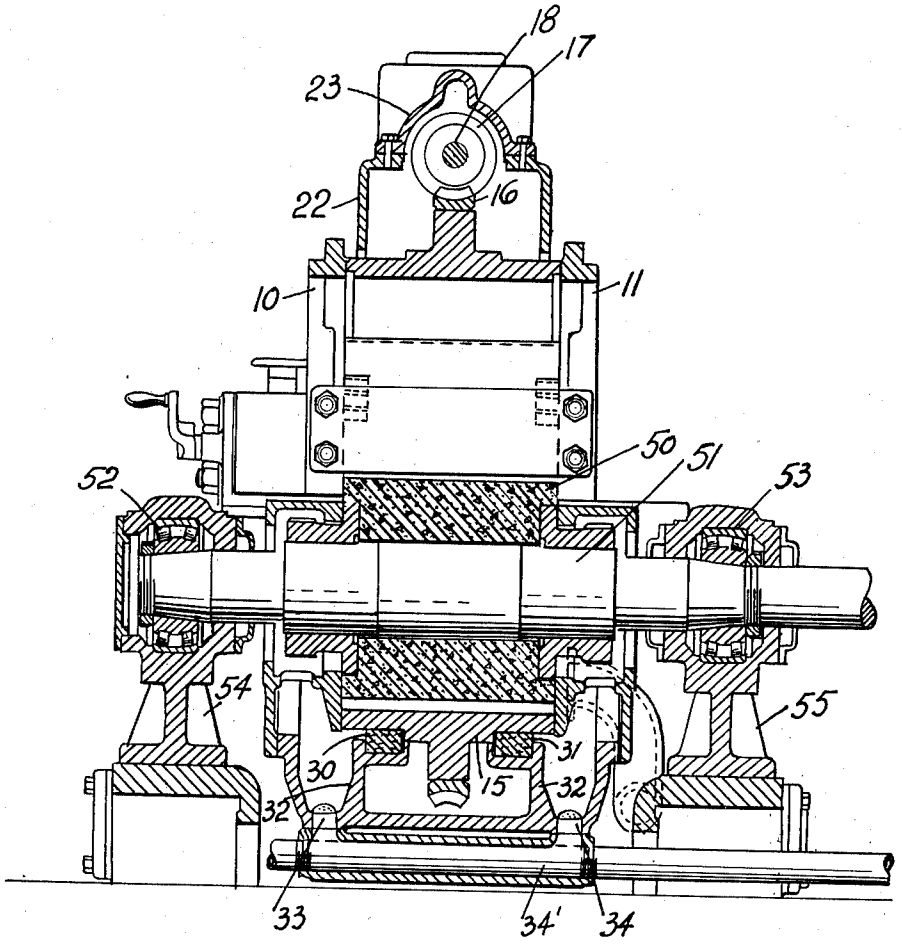
INVENTORS
Edward S. Ramsay
Peter N. Otterland
Napoleon Rigaban
By Cotton, Watt & Hawley ATTY

April 15, 1952 P. N. OTTERSLAND ET AL 2,592,594

METHOD OF AND MACHINE FOR TREATING FIBROUS OR CELLULOSIC MATERIAL

Filed Oct. 27, 1948 5 Sheets-Sheet 3

FIG. 4



INVENTORS
Edward S. Lanning
Peter N. Otterslund
Napoleon Rigaber
By Walter W. Hamilton
Atty.

April 15, 1952 P. N. OTTERSLAND ET AL 2,592,594

METHOD OF AND MACHINE FOR TREATING FIBROUS OR CELLULOSIC MATERIAL

Filed Oct. 27, 1948 5 Sheets-Sheet 4

FIG. 5

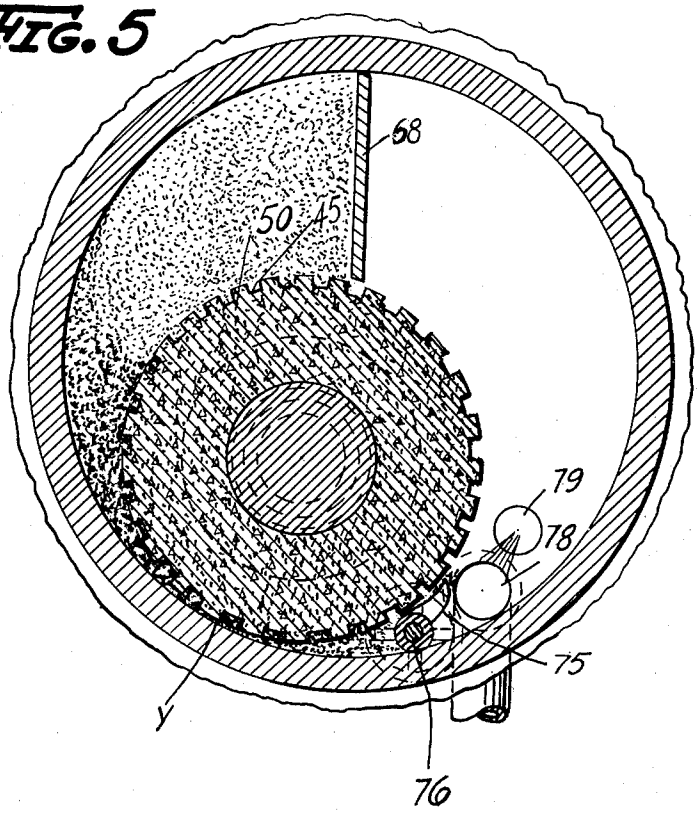
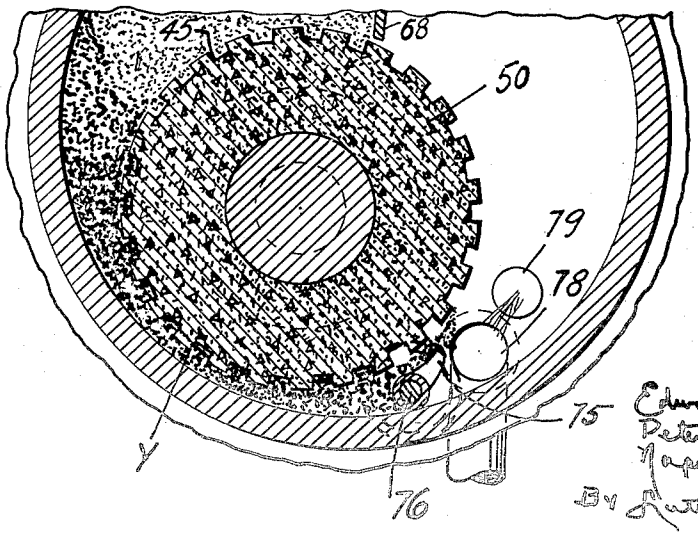


FIG. 6



INVENTORS
Edmund S. Lanning
Peter N. Ottersland
Napoleon Rigsbee
BY Luther W. Hanby
ATTY.

April 15, 1952

P. N. OTTERSLAND ET AL
METHOD OF AND MACHINE FOR TREATING
FIBROUS OR CELLULOSIC MATERIAL

2,592,594

Filed Oct. 27, 1948

5 Sheets-Sheet 5

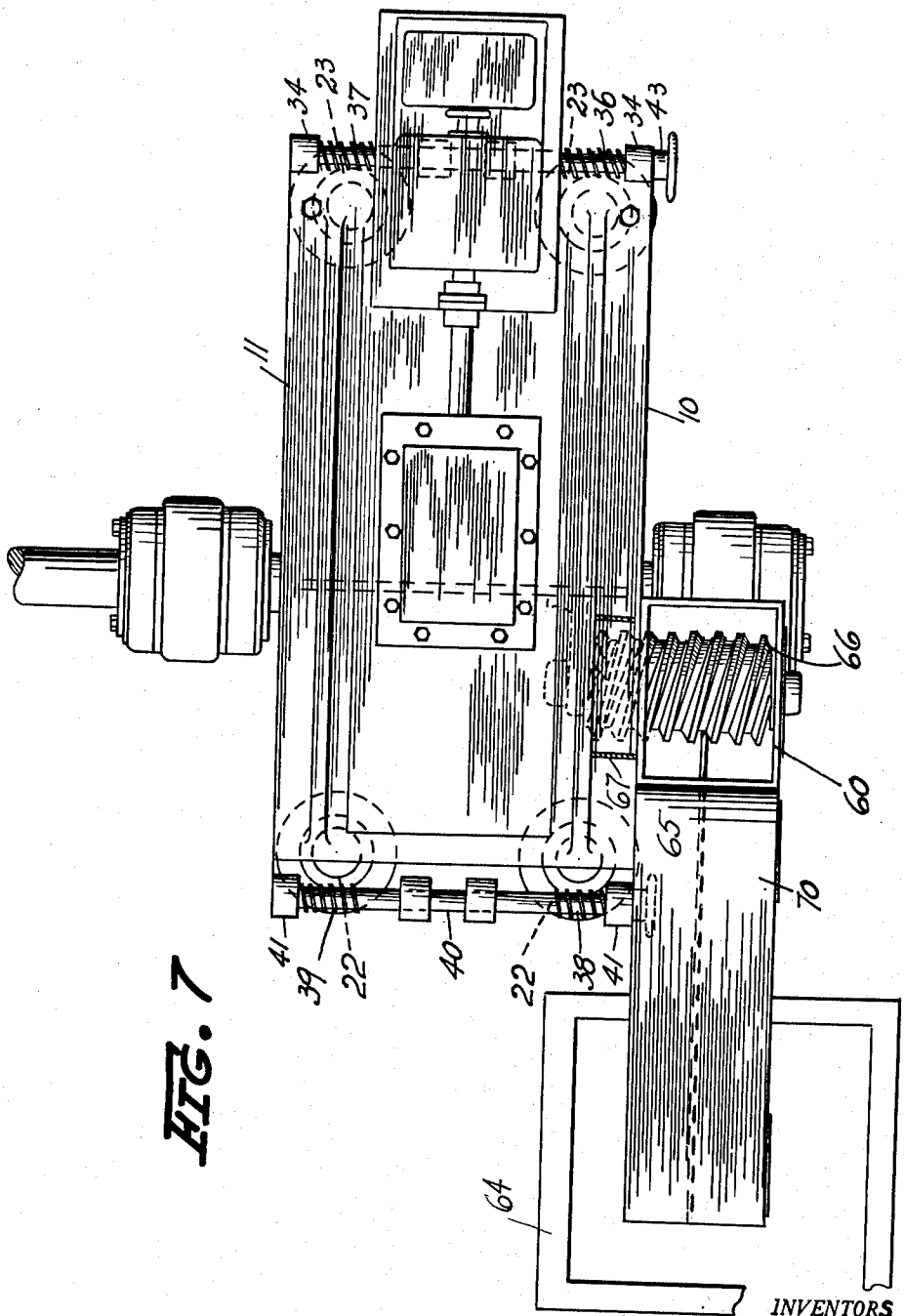


FIG. 7

INVENTORS
Edward S. Lemaire
Peter N. Ottersland
Napoleon Rigaber
By Luther M. Lawley
ATTY.

Patented Apr. 15, 1952

2,592,594

UNITED STATES PATENT OFFICE

2,592,594

METHOD OF AND MACHINE FOR TREATING FIBROUS OR CELLULOSIC MATERIAL

Peter N. Ottersland, Watertown, Napoleon Rigabar, Carthage, and Edward S. Lansing, New York, N. Y., assignors to Taylor Refiner Company, Inc., Watertown, N. Y., a corporation of New York

Application October 27, 1948, Serial No. 56,692

4 Claims. (Cl. 241—28)

1

This invention relates to a method of and machine for treating fibrous or cellulosic material.

More particularly stated, the invention relates to a method and machine adapted for treating loose pulp or lap, chemically treated or raw pulp, and for converting such material into a fibrous mass suitable for use in making paper or paper board.

Processes and apparatus now in common use for preparing cellulosic or fibrous material for use in the paper making industry grind and macerate the fibers, resulting in a mass of short fibers. Moreover, processes in common use require materials of low consistency and usually long hours of operation.

This invention has for its salient object to process cellulosic material in such a manner that the fibrous mass resulting from the process will have relatively long, unbroken fibers.

Another object of the invention is to provide a process of treating the material in the nip by crushing the material under heavy pressure and by rolling the mass and rubbing or crushing the fibers against each other.

Another object of the invention is to provide a process adapted for treating or processing loose pulp or lap, and chemically treated or raw pulp, and for converting such material into a fibrous mass having relatively long, unbroken fibers.

Another object of the invention is to provide a method and machine for grinding and refining pulp, so constructed and so worked out that the time required for treatment is very materially reduced.

Further objects of the invention will appear from the following specification taken in connection with the drawings which form a part of this application, and in which

Fig. 1 is a side elevation, partly in section, of a machine constructed in accordance with the invention;

Fig. 2 is a side elevation showing in section the drive for the ring and the raising and lowering means for the casing;

Fig. 3 is a detail sectional elevation showing the support for the ring;

Fig. 4 is a vertical sectional elevation of a machine taken substantially at line 4—4 of Fig. 2, looking in the direction of the arrows;

Figs. 5 and 6 are vertical sections through the ring and roller illustrating the operation of the machine and showing the roller in two positions relative to the ring;

Fig. 7 is a top plan view of the machine.

2

The invention briefly described consists of a method or process of treating cellulosic or fibrous material by feeding moistened material between a rotatable abrasive member and a rotatable feeding member, said members being rotated in a direction to feed the material downwardly, the abrasive member being rotated at a much higher speed than the feeding member and causing the material in the nip to be compressed under heavy pressure in passing through the nip between the rotating members. This will cause the fibers of the material to be rolled and crushed against each other.

Since the material is fed downwardly between the members, the water will drain out of the casing of the apparatus, only an amount sufficient to prevent burning being retained.

In carrying out the process or method of treatment, any desired and suitable apparatus may be employed. It is essential, however, that a pair of rotating members be employed, namely, a feeding member and abrasive member, these members being arcuate and coacting to form a nip at their portions disposed most closely adjacent or in substantially tangential relation.

The two coacting members may consist of a cylindrical abrasive member rotating eccentrically in a cylindrical feeding drum or shell, the cylindrical abrasive surface and the inner cylindrical surface of the feeding member being disposed closely adjacent to form a nip therebetween.

If the abrasive member is disposed in the cylinder, both members will rotate in the same direction and the point or line of closest approach of the members should preferably be disposed above the bottom of the cylindrical feeding member so that the major portion of the water will drain out of the material.

The material to be treated is fed into the machine above the nip or line of proximate contact and moves downwardly into the decreasing nip until it is compressed between the rotating members under very heavy pressure.

The abrasive member rotates at high speed and the feeding member at low speed, causing the fibrous mass to rotate as it is gradually compressed. This causes the fibers to roll against each other and to be compressed against each other under heavy pressure. This treatment does not macerate or cut the fibers and the resultant will have relatively long fibers as distinguished from the shortened cut fibers which result from the usual pulp or wood grinders, such as jordans, beaters, etc.

Moreover, the rough, abrasive surface of the abrasive member, rotating at a higher speed than the ring, effects a combing action on the compressed material.

Further details of the invention will appear from the following description.

In the particular embodiment of the invention and apparatus illustrated in the drawings, there is shown a casing comprising side plates 10 and 11, each side plate comprising an upper section 12 and lower section 13, these sections being bolted together, as shown at 14.

Between the plates 10 and 11 there is rotatably mounted a ring 15 having peripherally extending therefrom a worm gear 16, which meshes with and is driven by a worm 17 mounted on a shaft 18 connected to a variable speed driving mechanism 19 driven by a motor 20. The mechanism 19 and motor 20 are mounted on a bracket 21 secured to the machine casing. The worm 17 and gear 16 are enclosed in a casing 22, 23.

The inner surface of ring 15 is abrasive and has peripheral and transverse grooves. This ring is driven in an anti-clockwise direction, viewing Figs. 2, 5 and 6, and very slowly.

The ring 15 is rotatably supported in bearings 30 and 31 mounted in upwardly extending arcuate brackets 32 carried by the bottom portion of the casing. The bottom of the casing is drained through pipes 33 and 34 which lead to a drain pipe 35.

The casing and ring are vertically adjustable in the manner shown particularly in Figs. 1 and 2. The lower casing sections have extending therefrom lugs 22, 22 and 23, 23 at the four corners thereof.

In each lug is secured a downwardly extending screw 24. On each screw is mounted a nut 25 and each nut has on its lower end a flange 26 mounted in a thrust roller bearing 27.

Each nut 25 has a worm gear 35 formed on its periphery. The worm gears on the nuts mounted on the right hand ends of the casing, viewing Figs. 1, 2 and 7, are engaged by worms 36 and 37 on a shaft 43 rotatably mounted in lugs 34, 34. The worm gears on the nuts 25 at the other end of the casing are engaged by worms 38, 39 on a shaft 40 mounted in lugs 41, 41.

By rotating the shafts 43 and 40 in the desired direction, the casing and ring 15 carried thereby and forming a part thereof can be raised and lowered for the purposes hereinafter set forth.

In order to grind and refine the pulp in the casing, a cylindrical stone or roller 50 of abrasive material is mounted in the casing on a shaft 51, which is rotatably mounted in bearings 52 and 53 carried by upright supports 54 and 55 mounted on the bed of the machine. The axis of shaft 51 is eccentric to the axis X or the center of rotation of the ring 15.

It will be noted that at the point Y the periphery of the abrasive roller 50 approaches closely the inner surface of the ring 15 and the clearance between these surfaces can be varied and regulated by vertically adjusting the casing and ring 15 carried thereby, this adjustment being accomplished by the shafts 43 and 40.

The roller 50 and shaft 51 are rotated in an anti-clockwise direction (Figs. 5 and 6) at a much higher speed than the ring 15, thus producing a considerable differential between the peripheral speed of the roller and the speed of the ring. The outer surface or periphery of the roller is preferably grooved transversely of the roller, as indicated at 45 in Figs. 5 and 6. This

aids materially in speeding up the movement of the material and also helps to remove water from the mass being treated.

The fibrous material, to be treated, is fed to a hopper 60 mounted on one side of the machine by an endless conveyor 61 mounted on wheels or sprockets 62 and 63, the conveyor being driven from any suitable source of power. The lower end of the conveyor is disposed in a bin 64 and the material is carried upwardly on the outer lap in a conveyor casing 65 and is discharged at the top of the conveyor into the hopper 60. At the bottom of the hopper 60 is a screw conveyor 66, which feeds the material laterally through the side of the casing. A plate or partition 68 is mounted between the sides of the casing between the upper inner surface of the ring 15 and the periphery of the grinding roller 60. This partition forms a chamber between the walls and between the partition and the nip or point Y, thus confining the material. By regulating the screw conveyor drive, the material can be packed into this space, and the tighter it is packed the more water will be squeezed out. A tube 67 extends from the wall 10 into the casing, around the inner end of the screw conveyor 66. One or both side walls 10 and 11 can be perforated above the nip to let out excess water. Just enough water should be left in the mass to lubricate it and prevent burning. In other words, the mass should be semi-solid.

In order to remove excess material which overflows the hopper 60, a return chute 70 is provided alongside the conveyor casing 65. If desired, the hopper may be removed, leaving an opening in the side of the casing through which logs or other fibrous or mineral material may be deposited in the casing.

The feed of the material through the nip Y may be regulated and retarded by a gate or dam 75 mounted between the walls 10 and 11 and inside the ring 15. The gate is pivoted and can be regulated by turning the gate pivot shaft 76, which extends through one side wall of the casing. By regulating the position of the gate or dam 75, the pressure on the material being ground can be regulated, and this pressure can be built up by moving the gate toward the grinding roller 50 and by continuing the screw feed into the casing.

Moreover, the feed of the material is expedited by the transverse grooves 45 in the abrasive roller 50. These grooves may be parallel across the roller or may be spiral.

The provision of the transverse grooves does not form a part of this invention and the grooves are not claimed in this application.

The treated and refined material is removed from the casing by a discharge pipe 78, a stream of water from a supply pipe 79 facilitating the removal.

The grinding roller 50 may be dressed by a dressing roll 80 carried by arms 81 and controlled by a handle 82. This dressing roll forms no part of the present invention and need not be further illustrated and described.

In the operation of the process and apparatus it should be noted that the major part of the water will drain from the material being treated before the material passes through the nip, and it is essential for the successful operation of the process, that material with only sufficient moisture to prevent burning be fed downwardly into the nip formed between a rapidly rotating abrasive member and a slowly rotating

feeding member and pass into and through the nip under heavy pressure.

Although one specific embodiment of the process has been particularly described, no limitations are intended other than those imposed by the appended claims.

What we claim is:

1. The method of treating fibrous pulp material which consists of forcibly feeding moistened material downwardly under heavy pressure into a gradually decreasing nip formed between a slowly rotating feeding member and rapidly rotating abrading member, and exerting heavy pressure on the mass of material as it passes downwardly through the nip, said members being rotated in a direction to feed the material disposed therebetween downwardly, the pressure on the material being released immediately below the nip.

2. Apparatus for grinding and refining fibrous pulp material comprising a casing, a concave feeding member therein, a convex grinding roller rotatable on an axis eccentric to the center of movement of the feeding member, means for driving said members in the same direction and in a direction to feed the material downwardly through the nip, the periphery of said roller being disposed in close proximity to the concave surface of the feeding member, means for varying the spacing of the roller and concave surface, and forcible feeding means for maintaining the material, above the position of closest proximity of the roller and concave surface, under pressure.

3. Apparatus for grinding and refining fibrous material comprising a casing having a rotatable feeding ring, a grinding roller of abrasive material mounted for rotation in said casing on an axis eccentric to the ring axis, said roller being so mounted that its periphery is disposed in close proximity to the ring surface, means for rotating the ring and roller in the same direction and in a direction to feed the material downwardly through the nip or point of closest

proximity of the roller and ring, a partition member in the casing extending from the upper peripheral portion of the roller to the inner ring surface, positive feeding means for feeding material downwardly into the space between the partition and the point of closest proximity of the roller and ring for feeding the material under pressure and to maintain said material under compression, and means for vertically adjusting the casing and ring to vary the spacing of the roller from the ring.

4. Apparatus for grinding and refining fibrous pulp material comprising a casing, a concave feeding member therein, a convex grinding roller rotatable on an axis eccentric to the center of movement of the feeding member, means for driving said members in the same direction and in a direction to feed the material downwardly through the nip, the periphery of said roller being disposed in close proximity to the concave surface of the feeding member, means for varying the spacing of the roller and concave surface, and forcible feeding means for maintaining the material, above the position of closest proximity of the roller and concave surface, under pressure, said casing having a water and pulp discharge outlet at the bottom thereof.

PETER N. OTTERSLAND.
NAPOLEON RIGABAR.
EDWARD S. LANSING.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
285,165	Sanford	Sept. 18, 1883
438,633	Marshall	Oct. 21, 1890
616,728	Priest	Dec. 27, 1898
2,220,153	Hoge	Nov. 5, 1940
2,282,887	Roberts	May 12, 1942
2,406,904	Roberts	Sept. 3, 1946