

1,375,285.

H. E. ELLIS.
PULP BLEACHING APPARATUS.
APPLICATION FILED MAR. 12, 1920.

Patented Apr. 19, 1921.
4 SHEETS—SHEET 1.

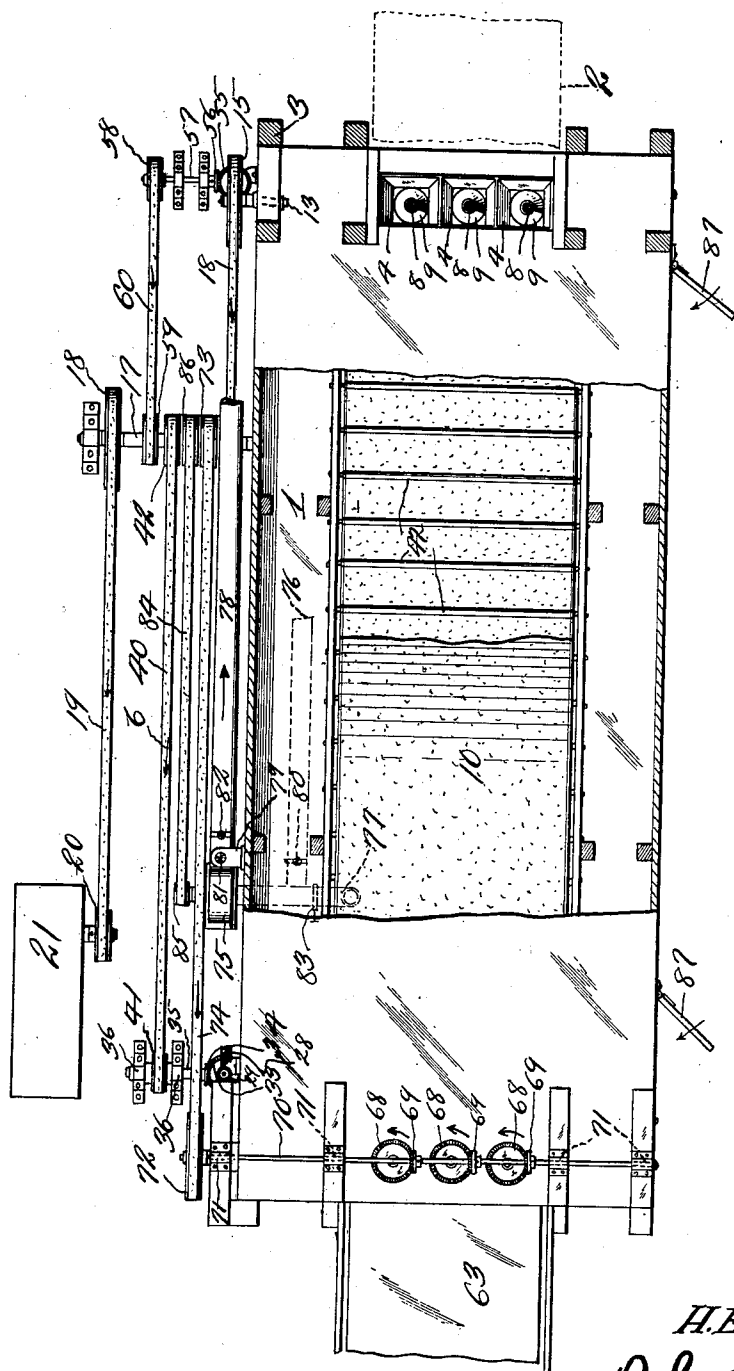


Fig. 1

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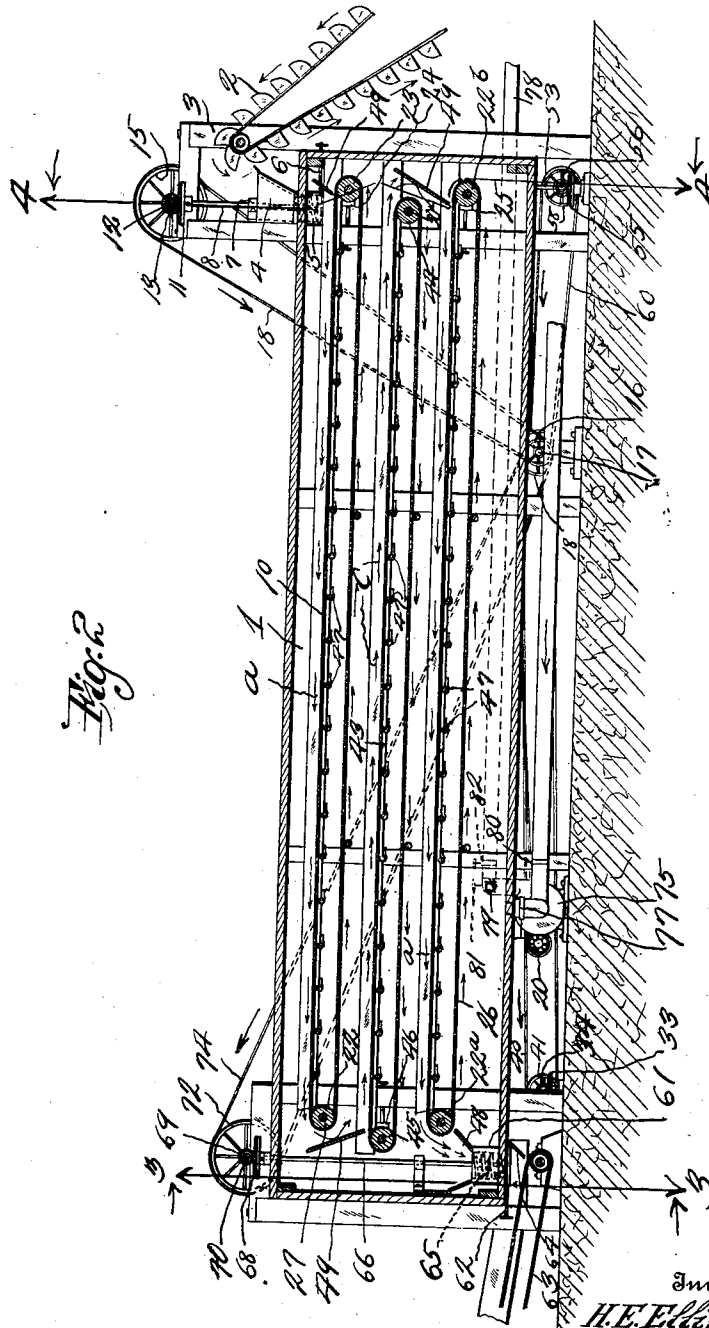


Fig. 2

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Fig. 7

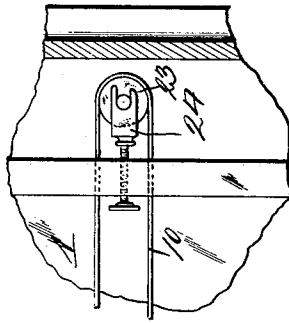


Fig. 8

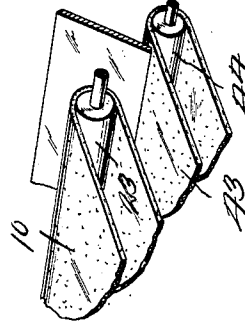
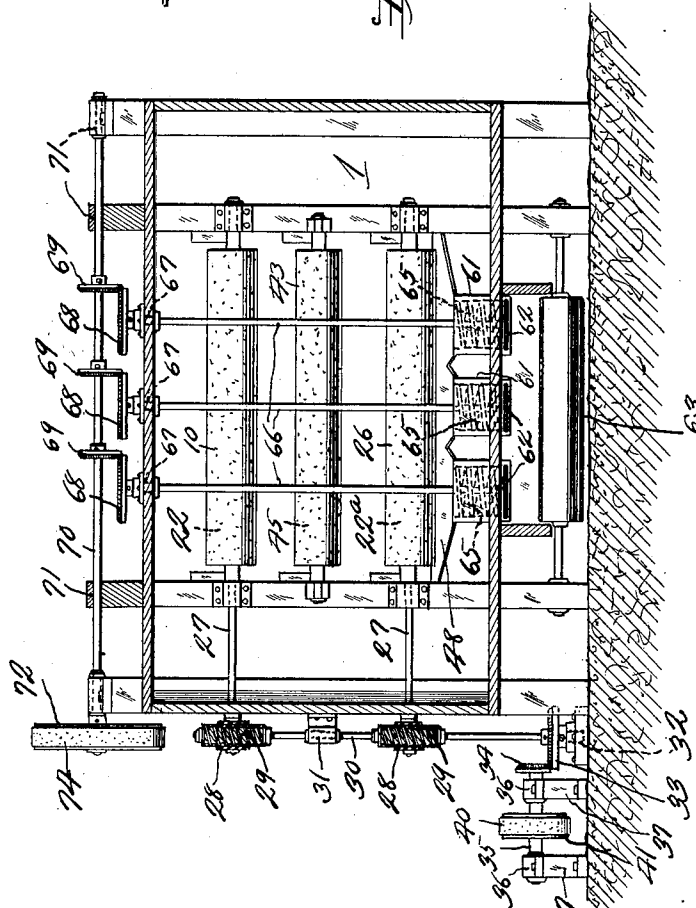


Fig. 3



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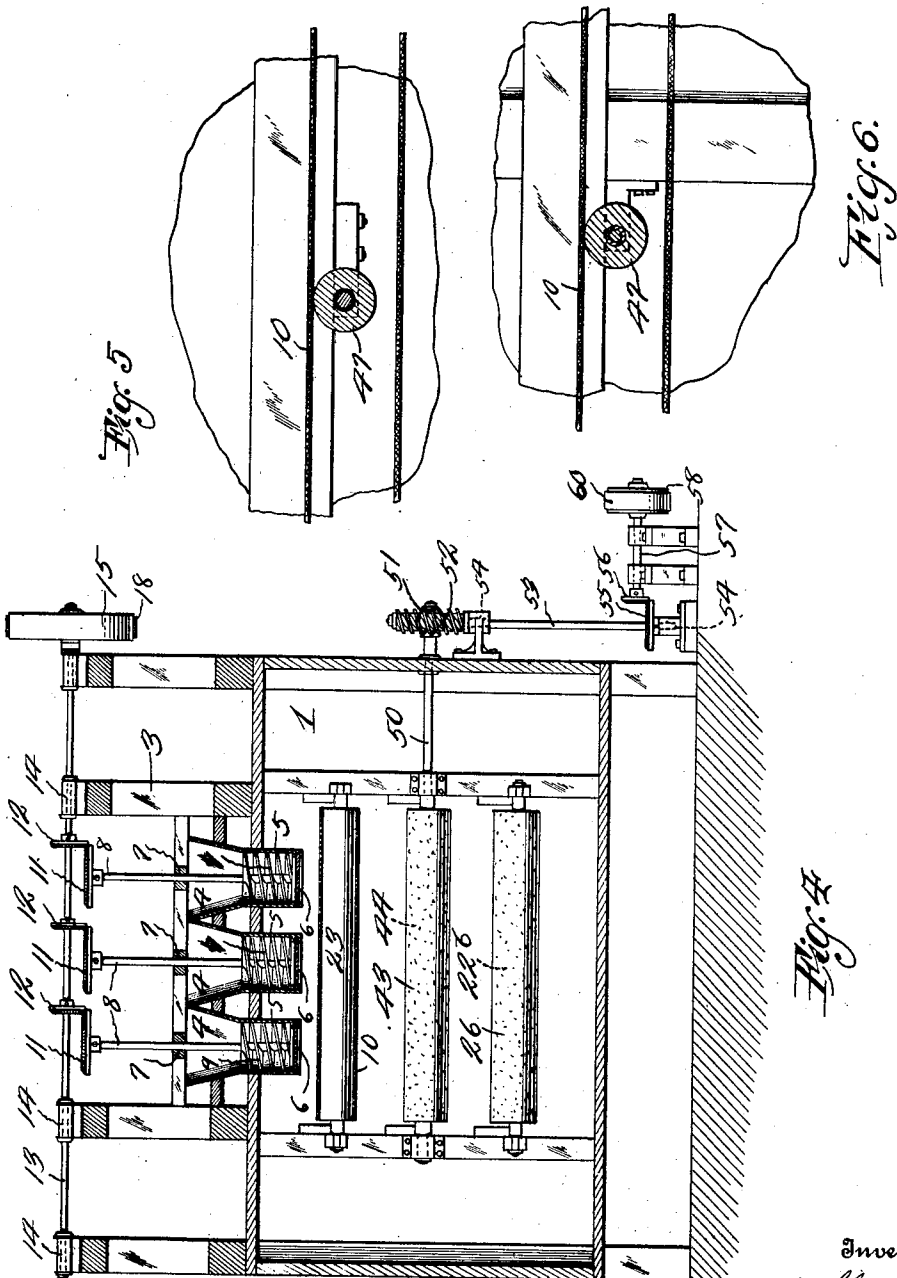


Fig. 4

Fig. 5

Fig. 6

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UNITED STATES PATENT OFFICE.

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PULP-BLEACHING APPARATUS.

1,375,285.

Specification of Letters Patent. Patented Apr. 19, 1921.

Application filed March 12, 1920. Serial No. 365,249.

To all whom it may concern:

Be it known that I, HARRY E. ELLIS, a citizen of the United States, residing at Leesburg, in the county of Lake, State of Florida, have invented a new and useful Pulp-Bleaching Apparatus; 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.

The invention relates to processes and apparatus for bleaching various kinds of pulp and has for its object to provide a process, wherein the bleaching is done by subjecting the pulp to the action of chlorin gas so that substantially all of the raw material will be bleached, thereby obviating the waste of fiber which results from the use of chlorid of lime which is at present commonly used for bleaching purposes. Also to provide an apparatus wherein chlorin gas may be utilized for bleaching pulp so that all kinds of pulp may be bleached which is not the case where chlorid of lime is used, for instance the bleaching of straw pulp which cannot be bleached by chlorid of lime.

A further object is to provide a bleaching apparatus wherein chlorin gas may be utilized for bleaching, said apparatus comprising a series of continuously moving conveyers superimposed in an air-tight chamber and so operated that the thin layer of pulp deposited on the upper conveyer will be conveyed and deposited on the adjacent under conveyer and eventually discharged from the chamber, wherein it has been subjected for bleaching action of chlorin gas.

A further object is to provide hoppers transversely disposed over one end of the upper conveyer and provided with feeding worms which regulate the feeding of the material onto said upper conveyer. Also to provide hoppers at the discharge end of the lower conveyer into which the bleached material is deposited and fed outwardly from the hoppers by rotating worms and deposited on a conveyer which may lead to a washer, said worms not only serving the function of uniformly feeding the material but also providing means whereby a certain amount of material will be held in the discharge ends of the feeding hoppers and in the discharge end of the discharge hoppers so as to form sealing means for preventing the escape of chlorin gas during the operation of the apparatus.

A further object is to provide means whereby chlorin gas may be forced into the air-tight chamber and removed therefrom as desired.

A further object is to provide means whereby the conveyers, the worm feeds, the washer delivery conveyer and the chlorin gas controlling fan may be operated from a single source of power.

A further object is to provide a bleaching apparatus wherein the material is deposited and conveyed over a series of conveyers, said material being in a thin sheet so that the chlorin gases contained in an air-tight chamber in which conveyers are located may thoroughly penetrate the material to be bleached and to provide means whereby said conveyers may be stopped so as to subject the fibrous material thereon to a longer treatment, thereby allowing a continuous treatment of the material or a noncontinuous treatment as desired.

A further object is to provide the feeding hoppers and the discharge hoppers with valves whereby the feeding of material onto the conveyers and the discharge of the material from the discharge hoppers may be controlled and regulated.

A further object is to provide means for controlling the supply of chlorin gas to the bleaching chamber, and also means of controlling the discharge of said gas from said chamber.

With the above and other objects in view the invention resides in the combination and arrangement of parts as hereinafter set forth, shown in the drawings, described and claimed, it being understood that changes in the precise embodiment of the invention may be made within the scope of what is claimed without departing from the spirit of the invention.

In the drawings:—

Figure 1 is a top plan view of the bleaching apparatus, parts being broken away to show the interior thereof.

Fig. 2 is a longitudinal vertical sectional view through the apparatus.

Fig. 3 is a vertical sectional view taken on line 3—3 of Fig. 2.

Fig. 4 is a transverse sectional view taken on line 4—4 of Fig. 2.

Fig. 5 is an enlarged detail sectional view of a portion of one of the conveyers showing the supporting rollers for the load side of the conveyer belt.

Fig. 6 is a detail view similar to Fig. 5 but showing a supporting bracket for the roller of a different form from that shown in Fig. 5.

Fig. 7 is a detail view of one of the belt tightening devices.

Fig. 8 is a detail perspective view of the adjacent ends of two of the conveyers, showing one of the guide plates for directing the material from one conveyer to the other.

Referring to the drawings, the numeral 1 designates a rectangular shaped gas chamber, into which chamber chlorine gas is forced for bleaching the pulp. The material to be bleached is conveyed upwardly by means of a conveyer 2, the upper end of which is disposed between the frames 3 in such a position that the material will be deposited in the transversely disposed feed hoppers. The feed hopper 4 is provided with downwardly extending cylindrical portions 5, the lower ends of which are provided with cutoff valves 6, so that the feeding of the material may be stopped and the escape of chlorine gas from the chamber 1 prevented when the chamber is being filled with gas. Rotatably mounted in bearings 7 of the frame 3 are shafts, the lower ends of said shafts being provided with feed worms 9, which are disposed in the cylindrical portions 5 of the hopper. Feed worms 9 when rotated, and when the cutoff valves are open feed the material onto the upper conveyer 10 so that the material will spread on the conveyer 10 uniformly thereby allowing a uniform bleaching of the material in its travel through the bleaching apparatus. The worms 9 also form means for maintaining and holding a portion of the material in the cylindrical portion 5 so that when the machine is started and the cutoff valves 6 opened the material held in the cylindrical portions 5 will form a seal for preventing the escape of chlorine gas from the chamber 1. Shafts 8 at their upper ends are provided with bevel gears 11, which bevel gears have meshing therewith bevel gears 12 carried by a transversely disposed shaft 13 which is rotatably mounted in bearings 14 of the frame. One end of the shaft 13 is provided with a pulley 15 and around the pulley 15 and a pulley 16 carried by an idle shaft 17, a belt 18 extends. The idle shaft 17 is provided with a drive pulley 18 which drive pulley 18 is driven by a belt 19 which extends around the drive pulley 18 and a pulley 20 of an engine 21, which engine drives the idle shaft 17, from which shaft the various driving mechanisms hereinafter described are also driven.

The conveyer 10 is an endless belt which is preferably formed from canvas and extends around rollers 22 and 23, roller 23 being rotatably mounted in an adjustable bearing 24 so that the belt may be tightened

as desired. Also rotatably mounted in bearings of the sides of the chamber 1 and in an adjustable bearing 25 are rollers 22^a and 22^b. Around the rollers 22^a and 22^b an endless belt 26, which belt is similar to the belt 10 extends, and is driven in the same direction as the belt 10, that is in the direction of the arrows *a*. Rollers 22 and 22^a have one end of their shafts 27 provided with gears 28, which gears are rotated by means of worm gears 29 carried by a vertical shaft 30. The vertical shaft 30 is rotatably mounted in bearings 31 and 32. Rotary movement is imparted to the shaft 30 through a bevel gear 33, which is secured to the lower end thereof and with which bevel gear a bevel gear 34 meshes. The bevel gear 34 in turn being rotated by a shaft 35 which is mounted in bearings 36 carried by brackets 37 secured to the floor adjacent the apparatus. Rotary movement is imparted to the shaft 35 by means of a belt 40 which extends around a pulley 41 carried by the shaft 35 and a pulley 42 carried by the idle shaft 17. Thus it will be seen that as the shaft 17 rotates so as to drive the belt 40 in the direction of the arrow *b* Fig. 1 that the conveyers operated by the rollers 22 and 22^a will be rotated in the direction of the arrows *a* as shown in Fig. 2. Interposed between the conveyer belts 10 and 26 is a conveyer belt, which belt extends around rollers 44 and 45, roller 45 being carried by adjustable bearings 46 so that the slack in the belt may be taken up as desired. The conveyer belt 43 operates in the directions of the arrows *c* Fig. 2, through mechanism hereinafter described. All of the conveyer belts are supported by rollers 47 so that they will be held in substantial horizontal plane as they move in conveying the material during the bleaching operation longitudinally in a zig zag course from one end of the chamber 1 to the other so that it will be subjected to the action of the chlorine gas and be bleached and finally dumped into a series of transversely disposed hoppers 48 adjacent the discharge end of the lower conveyer 26. Plates 49 which are inclined are provided adjacent the discharge ends of the conveyers so that the material will be guided from one conveyer to the other as it passes over the zig zag course through the bleaching chamber. Plates 49 also form means for preventing the material as it is deposited on the adjacent lower conveyer belt from being projected beyond the receiving end of the adjacent lower conveyer. The conveyer belt 43 is driven by means of the shaft 50 carried by the conveyer roller 44, the end of the shaft 50 being provided with a gear 51, with which gear 51 a worm 52 engages. Worm 52 is carried by a vertically disposed shaft 53, which shaft is rotatably mounted in bearings 54. Secured to the lower end of

the shaft 53 is a bevel gear 55, with which bevel gear a bevel gear 56 carried by a shaft 57 meshes. Shaft 57 is rotatably mounted in bearings and is provided with a pulley 58, around which pulley 58 and around a pulley 59 a belt 60 passes so that as the shaft 17 is rotated by the engine 21, the belt 60 will operate the shaft 57 and cause the intermediate conveyer belt 43 to move in the direction of the arrows *c*, Fig. 2.

The material after it leaves the conveyer 26 is deposited in the transversely disposed discharge hoppers 48, which hoppers are provided with downwardly extending cylindrical portions 61, the discharge ends of which are controlled by cutoff valves 62. The cylindrical portions 61 are disposed above a conveyer 63 which conveyer delivers the bleached material to a washer or to any place of deposit. Conveyer 63 is operated by any suitable mechanism. An inclined plate 64 is provided under the discharge ends of the cylindrical portions 61 so that the bleached material will be guided onto a conveyer 63 as it leaves the discharge hoppers 48. Rotatably mounted in the cylindrical portion 61 of the discharge hoppers are worms 65, which worms are feed worms and feed the material from the discharge hoppers onto the conveyer 63, they also form means for maintaining a seal in the cylindrical end 61 so that the chlorin gas will be prevented from escapement. Worms 65 are carried by vertically disposed shafts 66, which shafts are mounted in bearings 67 and have their upper ends provided with bevel gears 68. The bevel gears 68 mesh with bevel gears 69 which are carried by a shaft 70, which shaft 70 is rotatably mounted in bearings 71 of the frame and is rotated by means of a pulley 72, around which pulley and a pulley 73 carried by the idle shaft 17, a belt 74 extends. Thus it will be seen that power from the engine 21 is utilized for driving the discharge feed worms 65.

Located to one side of the gas chamber 1 is a centrifugal fan blower 75 a suction pipe 76 of which is connected with a gasometer (not shown), which gasometer is filled with chlorin gas. The suction pipe 76 has a branch 77 connected to the bottom of the chamber 1. The discharge pipe 78 is also connected with the gasometer and has a branch pipe 79 connected through the side of a chamber *a*. The suction pipe 76 and the branch pipe 79 are provided with gate valves 80 and 81. The discharge pipe 78 and the branch pipe 77 are provided with gate valves 82 and 83. Blower fan 75 is driven by means of a belt 84, which belt extends around a pulley 85 carried by the blower 75 and a pulley 86 carried by the idle shaft 17 so that power from the engine 21 may also be utilized for operating the blower fan. Doors 87 are provided so that access may

be had to the interior of the apparatus for repair and clean out purposes, the number of doors being increased or diminished according to the size of the apparatus. It may also be understood that the doors may be located in any place desired.

The operation of the bleaching mechanism is as follows. The doors 87 are closed so that the chamber 1 will be airtight. The cutoff valves 62 and 6 are then closed. Then the valve 80 upon the suction pipe 76 is opened, also the valve 81 upon the branch pipe 79 is opened. The valve 83 upon the branch pipe 87 is closed also the valve 82 carried by the pipe 78. The engine being started the elevator 2 will begin to discharge the material to be bleached into the hoppers 4. The valves 6 are then opened, care being taken that the worms 9 are kept covered with raw material so as to close the cylindrical ends 5 of the hoppers 4 and prevent the escape of gas from the chamber 1. The fan 75 draws the gas from the gasometer through the suction pipe 76 and discharges it into the chamber 1 through the branch pipe 77 and the fan must be continued in operation until the presence of chlorin gas appears at the discharge hoppers 48, at which time the fan is stopped and valves 80 and 81 are closed. The material discharged from the hoppers 4 by means of the worms 9, falls upon the conveyer 10, which conveyer is made of cloth, which moves slowly forwardly in the direction of the arrows *a*, thus spreading the material over the cloth uniformly. The forward travel of the belt 10 finally causes the material to drop over the roller 22 and be deflected by the inclined plate 49 onto the next conveyer below, which conveyer 43 moves in the direction of the arrows *c* and in an opposite direction to the movement of the conveyer 10. The material passes over the roller 44 and is deflected onto the conveyer 26 by means of the inclined plate 49, which carries the same in the direction of the arrows *a*. As many conveyers may be used as desired, however, three have been found to give good results and it has been found that a uniform speed is sufficient for bleaching material. However, it is to be understood that the conveyers may be so geared that they will move at different speeds. It will be seen that the whole of the conveyers become covered with the material, which material is fully exposed to the action of the chlorin gas, with which the chamber 1 is filled.

When the material reaches the discharge end of the lower level, if the bleaching has not then been carried far enough the machinery may be stopped, the cutoff valves 6 closed and the bleaching continued until sufficiently advanced to admit of discharge through the hoppers 48. For this purpose

the machinery is started as soon as the hoppers 48 are full and the cutoff valves 62 are opened. The worms 65 will discharge the material onto the conveyers 63 for delivery to a washer. The operation of the worms 9 and 65 if kept covered with material will admit of loss of very little gas. When the material is all discharged from the chamber 1, the valves 83 and 82 should be opened, valves 80 and 81 closed, the fan started so that any gas remaining in chamber 1 will be withdrawn and returned to the gasometer. The materials to be bleached should be in a loose fibrous condition, moist free from acids or alkalis. From the above it will be seen that a machine will be provided wherein material may be bleached, or, more perfect bleaching of raw material attained. It will also be seen that there will be a saving from waste of fiber which results from the use of chlorid of lime, and the ability to bleach some materials which cannot be bleached by chlorid of lime, such for instance as straw pulp. It will also be seen that an apparatus is provided wherein the bleaching process may be a continuous one or an intermittent one if so desired.

The apparatus as far as possible may be made of concrete or wood. Where made of wood, the wood is preferably protected by a coating of paraffin. All of the parts of the apparatus which are made of metal are preferably treated by what is known as the "Parker process," which will render them non-corrosive by chlorin gas.

The Parker process is a process covered by Letters Patent No. 1,215,463, dated February 13, 1917, and issued to William H. Allen and assigned to the Parker Rustproof Company of America doing business at Detroit, Mich.

The invention having been set forth what is claimed as new and useful is:—

1. A pulp bleaching apparatus comprising a chamber, conveyers located in said chamber, said conveyers moving in opposite directions, means for filling said chamber with a bleaching gas and means for feeding pulp onto said conveyers and removing said pulp from the bleaching chamber in such a manner that the pulp forms a seal for preventing escape of the bleaching gas.

2. A pulp bleaching apparatus comprising a chamber, means for filling said chamber with gas as desired, superimposed conveyers working in opposite directions to each other and disposed in the chamber, feed hoppers for feeding the material onto the upper conveyer, means whereby the material will be fed from one conveyer to the other, the lower conveyer discharging the material into a hopper, and means whereby the material as it enters and leaves the chamber will

form a seal for preventing escape of the bleaching gas.

3. A pulp bleaching apparatus comprising a chamber, means for filling said chamber with gas and removing the gas from the chamber as desired, superimposed conveyers disposed in the chamber and working in opposite directions, hoppers disposed over the end of the upper conveyer, feeding worms disposed in said hoppers, hoppers disposed adjacent the discharge end of the lower conveyer, feeding worms disposed in said discharge hoppers for controlling the discharge of the material, and means for operating the above mentioned mechanisms.

4. A pulp bleaching apparatus comprising a chamber, means for filling said chamber with gas and removing the gas from the chamber as desired, superimposed conveyers disposed in the chambers and working in opposite directions to each other, hoppers disposed over the end of the upper conveyer, feeding worms disposed in said hoppers, hoppers disposed adjacent the discharge end of the lower conveyer, feeding worms in said hoppers for controlling the discharge of the material from the chamber, said feed worms also forming a sealing means for preventing the escape of gas from the chamber at the intake or discharge ends, and means for operating the above mentioned mechanisms.

5. A pulp bleaching apparatus comprising a chamber for the reception of gas, means for filling said chamber with and removing the same therefrom as desired, superimposed conveyers disposed in the chamber and working in opposite directions to each other, hoppers disposed over the upper conveyer, feed worms disposed in said hoppers for feeding the material onto the upper conveyer, discharge hoppers disposed below the discharge end of the lower conveyer, feed worms in said discharge hoppers, said feed worms also forming means whereby the intake and discharge ends will be sealed so as to prevent the escape of gas from the chamber, and means for operating the above mentioned mechanisms from a single source of power.

6. A pulp bleaching apparatus for bleaching material as it passes over movable conveyers in an air tight gas chamber, hoppers in communication with the gas chamber for feeding the material onto the conveyers, and discharging the same from the chamber after the same has been bleached, said hoppers being provided with means whereby the escape of gas from the chamber will be prevented during the feeding and discharging operation.

7. A pulp bleaching apparatus for bleaching pulp comprising an airtight chamber having therein chlorin gas, conveyers disposed in said gas chamber for receiving and

exposing the pulp to the action of the gas, a feed hopper for feeding the material onto said conveyers, a discharge hopper into which the material after it has been
5 subject to the action of the gas is discharged, feeding mechanisms in the hoppers for feeding the material and also forming means for sealing the gas chamber during the intaking and discharging of the pulp.
10 8. A pulp bleaching apparatus for bleaching pulp comprising an air tight chamber having therein chlorine gas, means for pumping the gas into and out of the chamber as desired, conveyers disposed in said chamber
15 for receiving and exposing the pulp to the action of the gas during a bleaching opera-

tion, hoppers for feeding the material onto the conveyers and discharging the material from the gas compartment, means in said hoppers for feeding the material through 20 the same, said means also forming means for preventing the escape of the gas from the gas chamber and means for operating the aforesaid mechanism from a single source of power. 25

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

HARRY ELWOOD ELLIS.

Witnesses:

JOHN D. SHAW,
WILLIAM DON.