C. W. SHARTLE.

PROCESS FOR REDUCING PULP.

APPLICATION FILED OCT. 16, 1915.

1,173,750.

Patented Feb. 29, 1916.

2 SHEETS-SHEET 1.

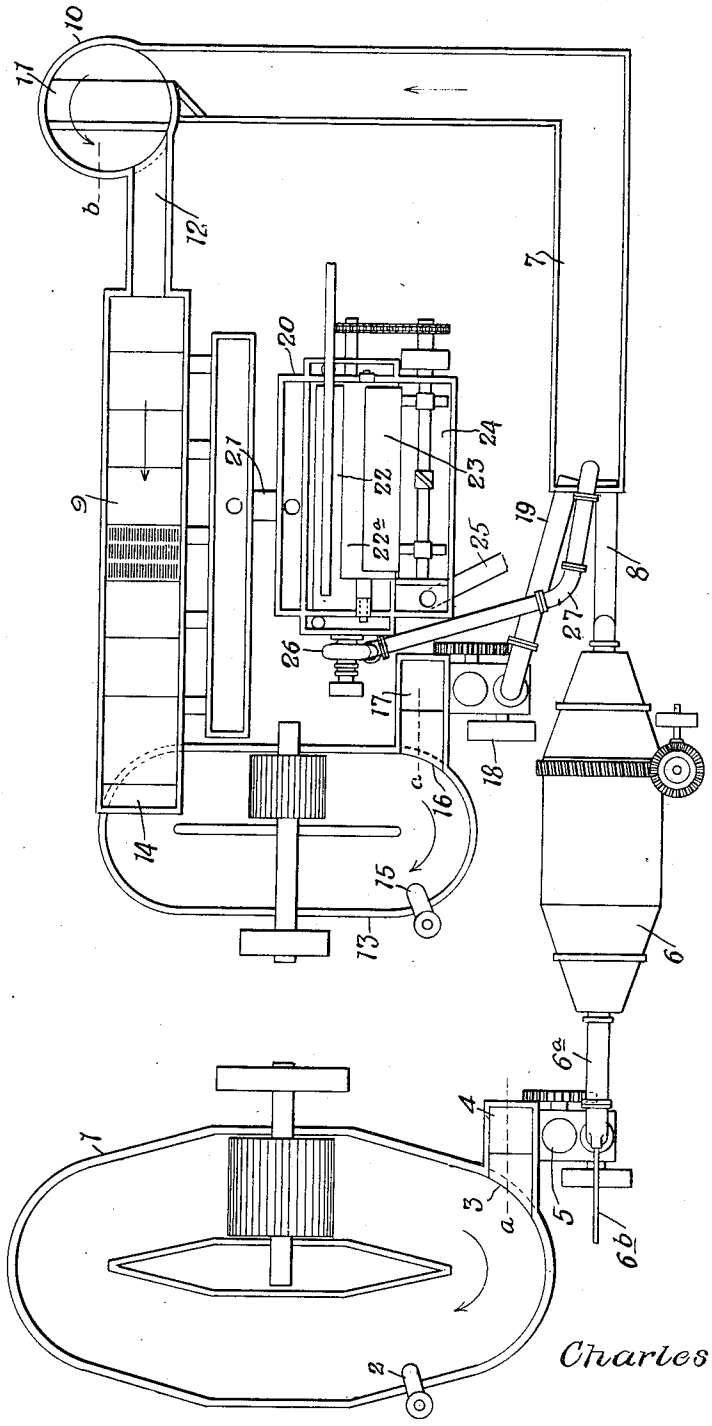


FIG. 1.

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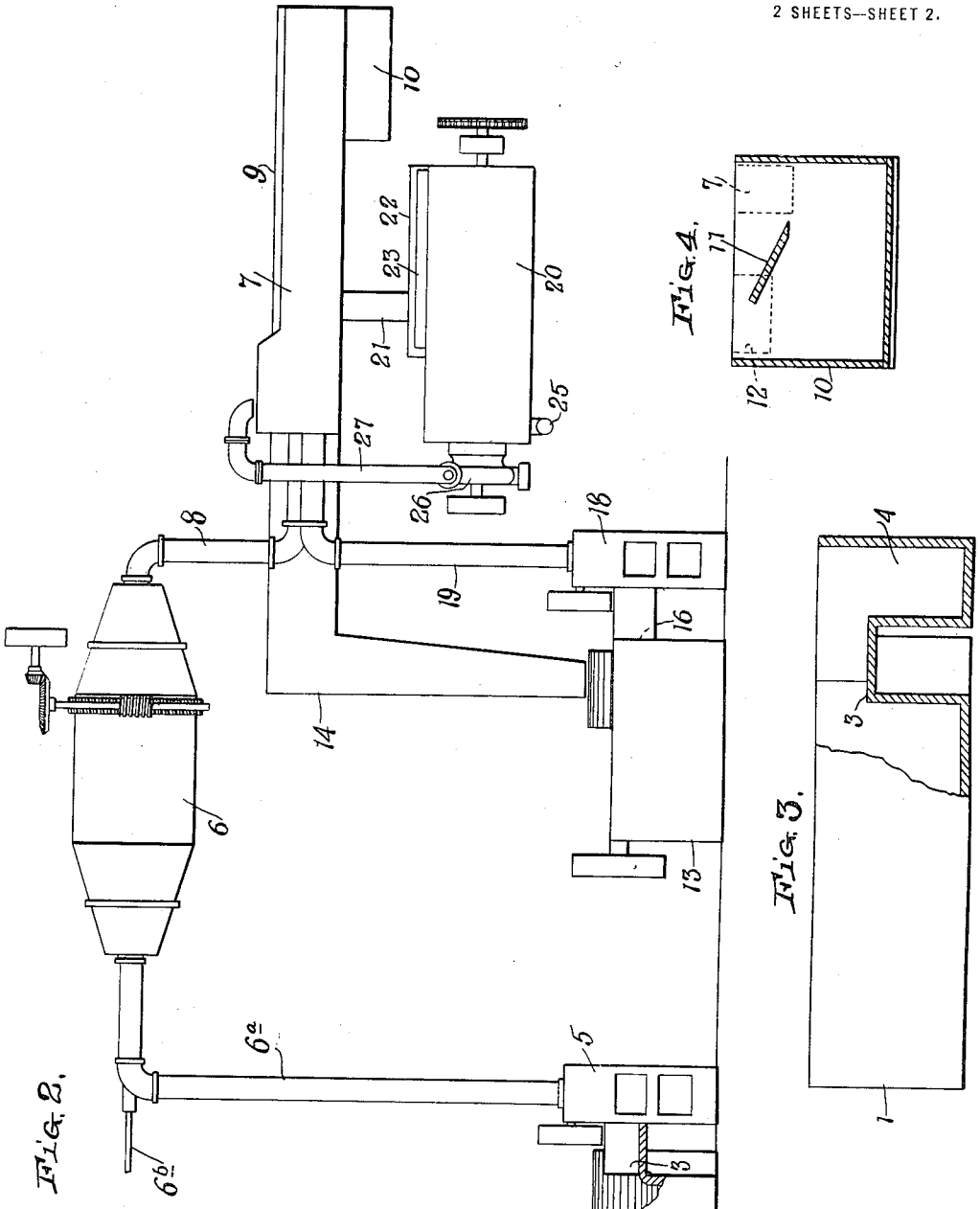
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UNITED STATES PATENT OFFICE.

CHARLES W. SHARTLE, OF MIDDLETOWN, OHIO.

PROCESS FOR REDUCING PULP.

1,173,750. Specification of Letters Patent. Patented Feb. 29, 1916.

Original application filed November 25, 1912, Serial No. 733,267. Divided and this application filed October 16, 1915. Serial No. 56,193.

To all whom it may concern:

Be it known that I, CHARLES W. SHARTLE, a citizen of the United States, residing at Middletown, in the county of Butler and State of Ohio, have invented certain new and useful Improvements in Processes for Reducing Pulp, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention relates to a process for reducing pulp, such as is commonly employed in the manufacture of paper, and is a division of the application for patent filed by me Nov. 25th, 1912, Ser. No. 733,267.

In the ordinary pulp-reducing operation the tub of the reducing engine is first charged with as much stock and water as it will contain and this stock is treated until it is fine enough for removal therefrom. This system has two disadvantages. First, the stock, which is already fine enough, is treated over and over again until that which is coarser and more difficult of reduction has been reduced to the proper degree of fineness. As a result the fibers are broken and the stock is damaged. In the second place there is a great deal of time lost. First by the use of the entire system for the reduction of a comparatively small amount of coarse stock or stock that is difficult of reduction after the great bulk of stock has been reduced to the necessary degree of fineness; and second, the time necessary to discharge the material from the tub and to recharge the same.

The object of the present invention is to provide a process for continuously treating the stock to reduce the same to the required degree of fineness, the fine stock, or pulp, being automatically separated from the coarse stock without interrupting the continuous treatment of the coarser stock.

In carrying out my process I place the stock which is to be reduced in a suitable receptacle or tub, together with large quantities of water and treat the same to reduce it to a pulp of the desired degree of fineness. As will be readily understood parts of the material will soften and be reduced to the desired fineness more quickly than will other parts of the material, this being particularly true where the stock being worked is old paper stock which often contains books, compact bundles of papers, and the like. The finer portions of the stock will float higher in the water than will the coarser portions thereof and as the treatment continues and portions of the stock reach the desired degree of fineness I cause the water to overflow from the tub and to carry with it such portions of the stock in suspension therein as may be sufficiently fine. This stock which overflows from the tub is received in a conduit or other device by means of which it is conducted to a suitable point for further treatment. In the present process it is screened or treated to further separate the fine pulp from the coarse pulp and the coarser portions of this pulp, or the tailings, are again treated to further reduce the same. It is preferable that the stock should first be treated to break up the very coarse stock and to separate therefrom any hard substances which may have been mixed with the same. After this first treatment the fine pulp which has overflowed from the tub is screened and the tailings are then treated in a second reducing engine which serves to more finely separate the fibers. As the stock is reduced the finer stock or pulp is overflowed from the second reducing engine in the manner above described and conveyed again to the screen where the pulp of the proper degree of fineness is separated and the tailings again delivered to the second reducing engine. This process is carried on continuously and without interruption, additional stock and water being added to the first reducing engine to replace those portions thereof which overflow from the tub.

In the accompanying drawings, Figure 1 is a plan of a pulp-reducing apparatus suitable for carrying out my invention; Fig. 2 is a side elevation of the same, both of these figures being somewhat diagrammatic in character: Fig. 3 is a vertical section taken through the outlet of a beater tub in the plane of the line *a* in Fig. 1; and Fig. 4 is a vertical section of the whirl pool in the plane of line *b* of Fig. 1.

In these drawings I have illustrated one form of apparatus for carrying out this process and this apparatus is also capable of carrying out an amplified process embodying the same steps above described and other steps which include the subjecting of the stock which has overflowed from the reducing engine to the action of a digester, then delivering the stock from the digester

to a settling box, whence it is delivered to the screen, the fine pulp going from the screen to the wet machine and the coarser stock or tailings going to the beating engine. It will be understood, however, that this particular apparatus is shown for the purpose of illustration only and that the process can be carried out by various apparatus. This apparatus, which is particularly designed for reducing old paper stock and the like, comprises a breaking engine 1 which is of a construction similar to a beating engine except that its cylinder is not set close to the bed plate, the function of the breaking engine being to break up the masses of stock and reduce the stock to such a condition that it may be readily handled through pipes or other conveyers. The water is supplied to the tub of this breaking engine through a pipe 2 and the stock is delivered thereto by dumping it over the side of the tub. The tub is provided with an outlet arranged slightly lower than the upper edge of the tub so that the water and the fine pulp which is suspended in the water will overflow through this outlet. In the present instance the overflow outlet comprises merely a low point in the rim of the tub. The water and stock overflowing through this outlet are received by a conduit or receiver and conducted to a suitable point for further treatment. In the present arrangement of the apparatus parts of the mechanism are on a higher level than the breaking engine and I utilize a pump 5 to elevate the stock which has overflowed from the breaking engine to these other parts of the apparatus and, therefore, the conduit or receiver is arranged to deliver the stock to this pump. The delivery pipe 6^a of the pump leads to a digester 6 in which the stock is subjected to the action of steam which is delivered thereto by a pipe 6^b. This digester is shown of a rotary type but it will be obvious that it may be of any suitable character. After leaving the digester 6 the stock is conveyed to a screen 9, of a well known construction and preferably provided with means for dragging the stock tailward over the screen plates. In order that the foreign matter contained in the stock may be separated therefrom before it reaches the screens the delivery pipe 8 of the digester is arranged to deliver to a settling box 7. In passing through the settling box the heavy impurities will settle to the bottom of the box and thus be separated from the stock which, together with the lighter impurities will be delivered to a whirl-pool 10. The stock is delivered tangentially from the settling box or trough 7 to the whirl-pool, which latter consists of a circular vessel having a fender 11 disposed across the upper portion thereof and presenting an upper face sloping downwardly toward that side of the pool into which the trough or settling box delivers. The stock and water entering the whirl-pool rotates therein in finding its way to the outlet thereof. Any heavy matter which may have succeeded in reaching the whirl-pool will settle therein while the extra light impurities will be skimmed from the stuff in the whirl-pool and arrested by the fender 11, the result being that the stock going from the whirl-pool to the screen is practically free from both heavy and light impurities. The impurities may be removed from the whirl-pool and from the settling box from time to time as may be necessary. The stock is conveyed from the whirl-pool to the screen by means of a trough 12 and such matter as is not fine enough to pass through the screen plates is carried from the tail of the screen to a beating engine 13 through an outlet or conduit 14.

The beating engine 13 is of a known construction and has its beating elements arranged to reduce the stock to a fine pulp. Water is supplied to this engine through a supply pipe 15 and the water and fine stock or pulp is overflowed from the tub through an overflow outlet, which, as in the case of the breaking engine, is in the form of a depression in the rim of the tub. A conduit or receiver 17 carries the overflow water and pulp to a pump 18 which delivers them through a pipe 19 to the settling box 7. The coarser stock in the beating engine continues to circulate therein until the action of the beating element has reduced the same to the proper degree of fineness. The pulp entering the settling box passes from the settling box and the whirl-pool to the screen where those portions thereof which are of sufficient fineness pass through the screen plates and such parts thereof as are still too coarse are returned to the beating engine, this cycle of operations continuing so long as there is any pulp which has not been reduced to a suitable degree of fineness. The fine pulp which passes through the screen plates is delivered by a conduit 21 to the vat of a wet machine 20 which is of a known construction, comprising a vat with a foraminous cylinder 22 rotating therein. This cylinder picks up the pulp and subjects it to the action of a couch-roll 22^a, the water and some entrained pulp passing into the cylinder, while the drier finished pulp is scraped off the couch-roll by a doctor 23 and delivered to the finished pulp vat 24 of the wet machine, which contains an agitator to keep the pulp in fair condition for out-flow. The pulp flows from the vat 24 through a pipe 25 to such point as may be desired, such as the point where it is to be used or to apparatus for further treatment. The water and entrained pulp which pass into the cylinder of the wet machine are taken up by a pump 26 and delivered into

the general circuit so that the entrained pulp may be recovered. In the present instance a pipe 27 leads from the pump to the settling box 7, but where the water and entrained pulp handled by the pump 26 are so dirty that it is undesirable to let them go into the finished pulp the pipe 27 may deliver the same at a waste point or to some point of utilization of the material where the dirtiness thereof would be unobjectionable.

The character of my process and the manner in which it is carried out will be readily understood from the foregoing description and it will be apparent that I have provided a process whereby the stock may be continuously treated to reduce it to the desired degree of fineness and the fine stock or pulp automatically separated from the coarser stock and subjected to further treatment without interfering with or interrupting the treatment of the coarser stock. It will further be apparent that an essential feature of the process is the overflowing of the fine pulp from the reducing engine, this overflowing resulting in the automatic separation of the coarse and fine stock and enabling the coarse stock to be further treated and the fine stock to be removed before it has been treated to such an extent as to injure the same.

Having thus fully described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. A pulp-reducing process which consists in floating the stock in water within a container having an overflow outlet, treating the stock to reduce its coarseness and causing the water and fine stock to overflow from the container through the outlet by raising the general level of the water and stock above the outlet.

2. A pulp-reducing process which consists in floating the stock in water within a container having an overflow outlet, treating the stock to reduce its coarseness, causing the water and fine stock to overflow from the container through the outlet by raising the general level of the water and stock above the outlet and conducting the stock which has overflown from said container to a point for further treatment.

3. A pulp reducing process which consists in floating the stock in water within a container, treating the stock to reduce its coarseness, causing the water and fine stock to overflow from the container, and treating the stock which has overflowed from said container to further separate the fine stock from the coarser stock.

4. A pulp reducing process which consists in floating the stock in water within a container, treating the stock to reduce its coarseness, causing the water and fine stock to overflow from the container, treating the stock which has overflowed to separate impurities therefrom, further treating said stock to separate therefrom any stock which is not of sufficient fineness and again treating this last-mentioned stock to further reduce the same.

5. A pulp reducing process which consists in floating the stock in water within a container, treating the same to reduce its coarseness, causing water and fine stock to overflow, treating the stock which has overflowed to separate the fine stock from the coarser stock, again floating this coarser stock in water within a container and causing water and the finer stock to overflow from said container and again treat the stock which has overflowed to separate the finer stock from the coarser stock.

6. A process for reducing pulp stock consisting in placing the stock in a receptacle with large quantities of water, treating the same to reduce it from a coarser to a finer condition, causing the fine pulp to overflow from said receptacle, screening the pulp which thus overflows from said receptacle, and returning the tailings to said receptacle.

7. A process of reducing pulp stock consisting in placing the stock in a tub with large quantities of water, causing said stock and water to circulate in said tub, treating the stock in said tub to reduce it from a coarser to a finer condition, causing the water to overflow said tub and carry with it the finer stock, supplying additional stock and water to said tub to replace the stock and water which have overflowed from said tub and conveying the stock which has overflowed from said tub to a place for further treatment.

In testimony whereof, I affix my signature.

CHARLES W. SHARTLE.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."