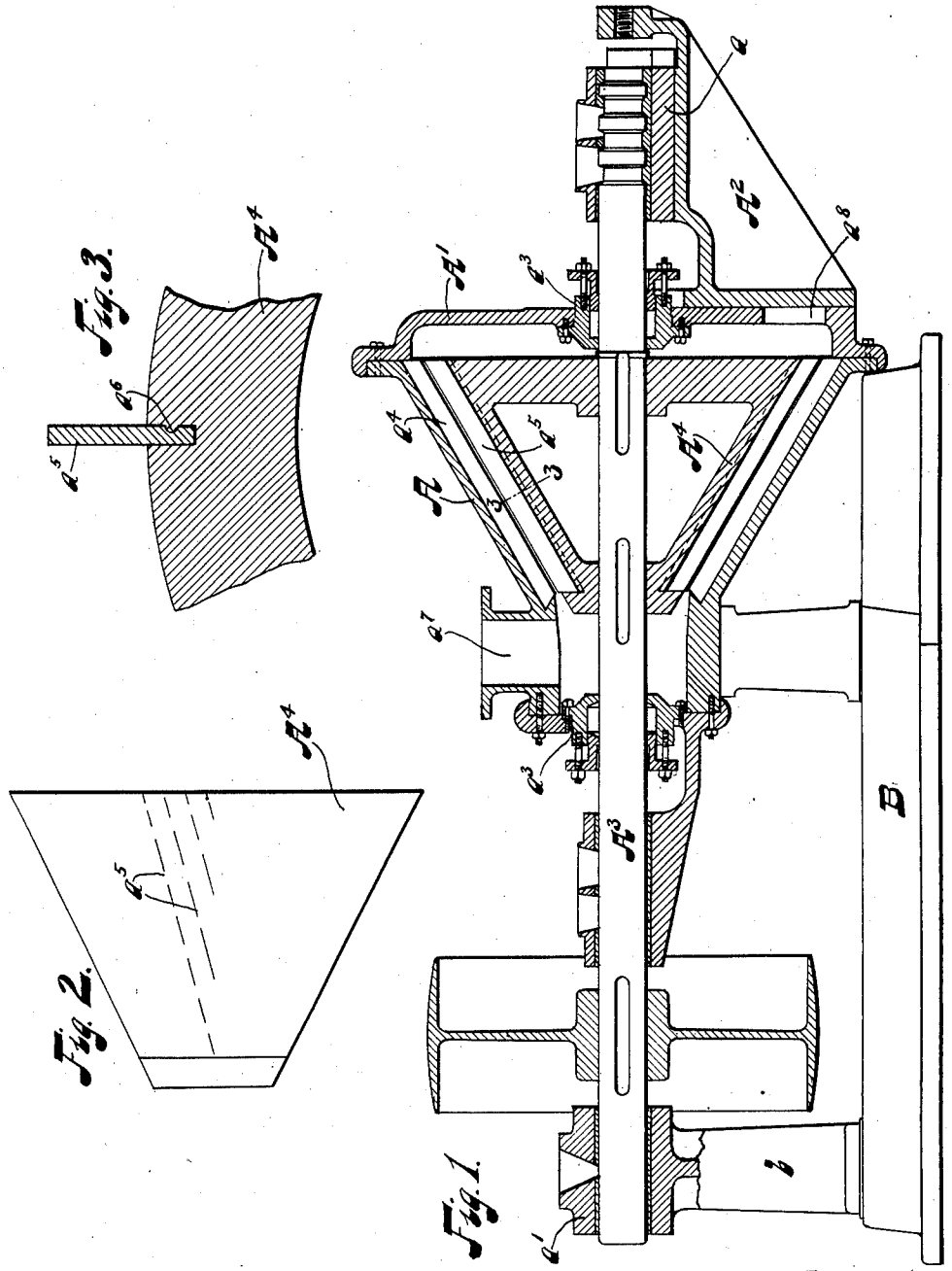
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G. D. CLAFLIN, Jr.

CONTINUOUS PULP BEATER.

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UNITED STATES PATENT OFFICE.

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CONTINUOUS PULP-BEATER.

No. 864,359. Specification of Letters Patent. Patented Aug. 27, 1907.

Application filed December 31, 1906. Serial No. 350,227.

To all whom it may concern:

Be it known that I, GEORGE D. CLAFLIN, Jr., a citizen of the United States, and a resident of Cleveland, county of Cuyahoga, and State of Ohio, have invented a new and useful Improvement in Continuous Pulp-Beaters, of which the following is a specification, the principle of the invention being herein explained and the best mode in which I have contemplated applying that principle, so as to distinguish it from other inventions.

My invention relates to the art of paper making and has particular regard to the final treatment of the bleached pulp or so called "half-stuff" as it leaves the "potchers" or "steeping chests." Such further and final treatment, as is well known, is essentially a process of disintegration and comminution the main and immediate purpose of which is the complete separation of the individual fibers which in the "half-stuff" adhere to each other and are more or less agglomerated into masses. It is also necessary that the fibers should be more or less reduced in length, depending upon the character of the material.

The object of my invention is the provision of means whereby this operation of beating which has heretofore always occupied a considerable time and consumed a large amount of power may be much more economically and speedily carried out.

To the accomplishment of this object, said invention, then, consists of means hereinafter fully described and particularly pointed out in the claims.

The annexed drawing and the following descriptions set forth in detail certain means embodying the invention, such disclosed means constituting but one of various mechanical forms in which the principle of the invention may be used.

In said annexed drawing: Figure 1 represents a longitudinal central section of a device embodying the improvements contemplated by my invention; Fig. 2 is a diagrammatic plan view showing the arrangement of knives on the revoluble conical plug which forms a feature of said device; and Fig. 3 is a cross-section through a portion of such plug on the line 3—3, Fig. 1, indicating the manner in which the knives are mounted therein.

The operation of beating heretofore carried out in the general process of paper making has involved the conjoint use of two different machines. The half-stuff or bleached pulp is first fed to the "beater" or "beating engine," proper, where it is thoroughly mixed with water until a certain consistency is attained and then subjected to the action of revolving rollers or the like fitted with knives. The stuff is taken from such beater in a condition of partial preparation and is then further triturated by being passed through a refining or perfecting engine which may be shortly described as a sort of concentrated beater. This latter comprises two essential parts, a cast iron drum revolving within a fixed shell, said drum and shell being preferably both of a very slightly conical form. They are both furthermore fitted on their adjacent faces with steel knives, and the material which is fed into the shell at one end, from the tank or similar receptacle in which it is discharged after being sufficiently treated in the tub beater proper, is forced through between the aforesaid knives. The pulp as it leaves this refining or perfecting engine should be ready for the subsequent operation of forming into sheets.

My invention is based on a discovery that a large saving in time required to thus complete the whole operation of beating, and of the power necessary to effect such operation, may be made by inserting another step in the course of the operation as above described. This additional step involves the use of a third type of machine, that forming the subject matter of this invention. Such machine, Fig. 1, in general outline is similar to that of the refining or perfecting engine, just described, and consists, as shown, of an outer shell A, suitably supported on a base B with its axis horizontally disposed, within which shell is revolubly mounted a cast iron drum or plug A^4. The faces of said shell and plug are quite sharply inclined to their common axis so as to give a distinct conical cross section to the same as will be apparent from the figure above referred to. The angle thus made by the shell and plug faces with the axis should be between thirty and forty-five degrees, preferably about thirty-five, in order to effect the results hereinafter to be described. As a consequence of this degree of angularity it is not necessary to force the stock through the engine at all but simply to feed it thereto, for a strong suction is developed by the centrifugal force resulting upon the rapid rotation of the drum or plug. The larger end of shell A is closed by a cap A′ integrally formed with which is a bracket A^2 that bears a slidable end thrust bearing *a*. Mounted in slidable end thrust bearing *a*, and in a fixed bearing *a′* in a standard *b* mounted upon the other end of the base B is a horizontal shaft A^3. The points where such shaft passes through the respective ends of shell A are suitably inclosed about by stuffing boxes a^3 a^3, the details of whose construction need not be here set up, being well understood and furthermore apparent from inspection of said

Fig. 1. The plug A^4 of conical shape is fixedly mounted upon shaft A^3 within shell A. Such inner face of shell A is provided with a plurality of steel knives a^4 mounted longitudinally thereof such knives being held in position by hardwood wedges or fillets as has been the custom heretofore in machines of this class. Conical plug A^4 is provided on its outer surface with a corresponding set of steel knives a^5 adapted to coact with the knives a^4 mounted in shell A. An approved disposition of knives a^5 on the face of plug A^4 is indicated in Fig. 2, this disposition being designed for a left-handed plug, that is the one that rotates in a left-hand direction.

Knives a^5 on plug A^4 have in the type of refining engine heretofore utilized in the process of beating paper pulp been mounted in the same manner as I have described those a^4 of the shell being mounted, viz., by simply being wedged in place by wooden blocks. This has, even in the type of refining engine in use, been fraught with disastrous consequences inasmuch as, owing to the rapid rotation of the plug and the centrifugal force thus developed, the blocks or wedges in question frequently become loosened and the knives thereby allowed to rise from their setting and engage the knives in the shell. To obviate this difficulty I have devised the following method of mounting the knives a^5 in the plug. Instead of blocking or wedging them in place I embed them integrally in the face of the plug itself when the latter is cast. In order to make the union between such knives and the plug effective, the two being, respectively, of steel and cast iron as has been set forth, I coat the bases of the knives with tin preparatory to fixing them in the mold incidental to the casting operation. A firm and substantial union is thus formed when the cast iron is poured into the mold. To render such knives still more secure against dislodgment I make their bases of irregular form in cross-section, as by cutting a groove a^6 along one side thereof, as a result of which they are held not merely by the union between the two metals of which they are respectively composed but by a rabbet or lock, as it were. Their accidental displacement is hence impossible.

The pulp as it is received, as heretofore specified, is fed into the machine through a suitable feed opening a^7 at the small end of the shell. As a result of the angularity existing between the surface of such shell and plug revolving therein with respect to their common axis such a degree of centrifugal force is developed as will effect the suction of this pulp through between knives a^4 a^5 from whence it is fed into the chamber beneath cap A′ at the large end of the shell and thence discharged through an opening a^8 in the lower part of such cap. The stock as it thus passes through between knives a^4 a^5 may be comminuted to any degree of fineness desired by a proper adjustment of the slidable end thrust bearing a, as has already been indicated.

The manner in which I utilize my machine in the general process previously described is to effect a partial disintegration of the pulp pending its passage from the old style tub beaters to the refining engine. In other words, the pulp instead of being made to pass directly to the refining engine from such beater proper is first made to pass through my improved continuous beater. In the use of these three machines together then, the pulp is fed from the tub beater into my continuous beater in coarser form than it is possible to feed it into the old style refining engine and the stock is then taken from such continuous beater, which has a relatively high capacity for handling the same, before it has been completely prepared for the subsequent operations in paper making. The final "breaking" and "cutting" I find is much more quickly and thoroughly carried on in the refining engine machine. As illustrative of the saving which I effect, I may state that whereas heretofore in connection with a refining engine of the prevailing type, a battery of at least six tub beaters, each requiring from fifty to seventy-five horse power in their operation has been necessary to supply such refining engine with material in a sufficiently comminuted form to permit of its final disintegration therein, with my improved continuous beater employing only forty horse power it has been possible to do away with two out of the six beaters and still handle the pulp more rapidly than was possible under the former arrangement. This saving is achieved in part by a curtailing of the time required for the treatment of the stock in the tub beater, my continuous beater being utilized for the completion of the preliminary operation ordinarily performed by such tub beater; and in part by anticipating with said continuous beater the work of the refining engine, the completion, merely, of the final operation being performed by such last-named machine. The adaptability of my machine to the work described appears attributable to the increased degree of angularity given the knife-bearing surface of the conical shell and revoluble plug with respect to their common axis, whereby my continuous beater is enabled to receive and treat much coarser material than can be handled with the ordinary refining engine. The limit of angularity within which the desired result is attained is fairly circumscribed, in other words, lies between thirty and forty-five degrees as has been stated. At the same time by my improved method of embedding the knives a^5 integrally in the cast iron plug when the latter is made, I am enabled to attain the requisite degree of speed without danger of having such knives dislodged and the machines seriously damaged. This feature of mounting the knives obviously is capable of employment with equally satisfactory results in the present type of refining engine.

Having thus described my invention in detail, that which I particularly point out and distinctly claim, is:—

1. In a pulp refining engine, the combination of a fixed cone-shaped shell disposed with its axis substantially horizontal; a cap secured to the outer end of said shell; said cap having a central aperture and a discharge outlet; an outwardly projecting bracket integral with said cap; a slidable end thrust bearing resting upon the upper face of said bracket; steel knives mounted on the inner surface of said shell; a cast iron plug, of a shape similar to that of said shell revolubly mounted therein; and steel knives borne by said plug adapted to co-act with the knives in said shell, the bases of the knives on said plug being tinned and formed irregular in cross-section and thereupon solidly embedded in said plug in the process of casting.

2. In a pulp refining engine, the combination of a fixed cone-shaped shell disposed with its axis substantially horizontal; a cap secured to the outer end of said shell, said

cap having a central aperture and a discharge outlet; an outwardly projecting bracket integral with said cap; a slidable end thrust bearing resting upon the upper face of said bracket; steel knives mounted upon the inner surface of said shell; a cast iron plug of a shape similar to that of said shell revolubly mounted therein, the conical faces of said shell and plug being inclined at an angle of between thirty and forty-five degrees to their common axis; and steel knives borne by said plug adapted to co-act with the knives in such shell, the bases of the knives of said plug being tinned and formed of enlarged cross section and thereupon solidly embedded in said plug in the process of casting.

Signed by me, this 26th day of December, 1906.

GEORGE D. CLAFLIN, JR.

Attested by—
D. T. DAVIES,
JNO. F. OBERLIN.