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C. W. UNKLE ET AL

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RUBBISH SEPARATOR FOR STOCK FOR PAPER MILLS

Filed July 21, 1932

2 Sheets-Sheet 1

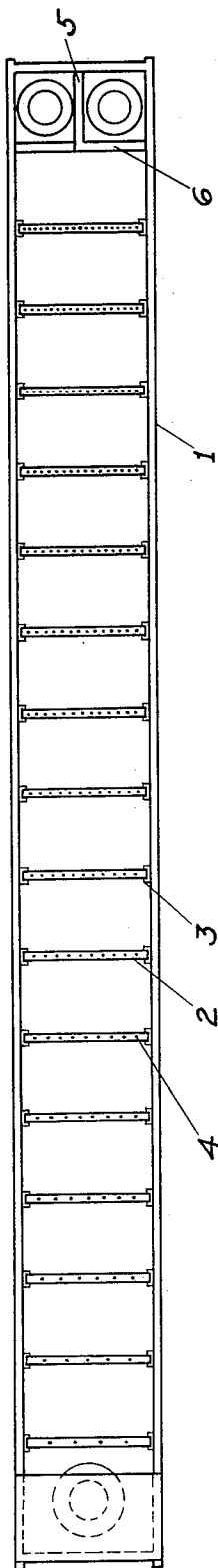


Fig. 2

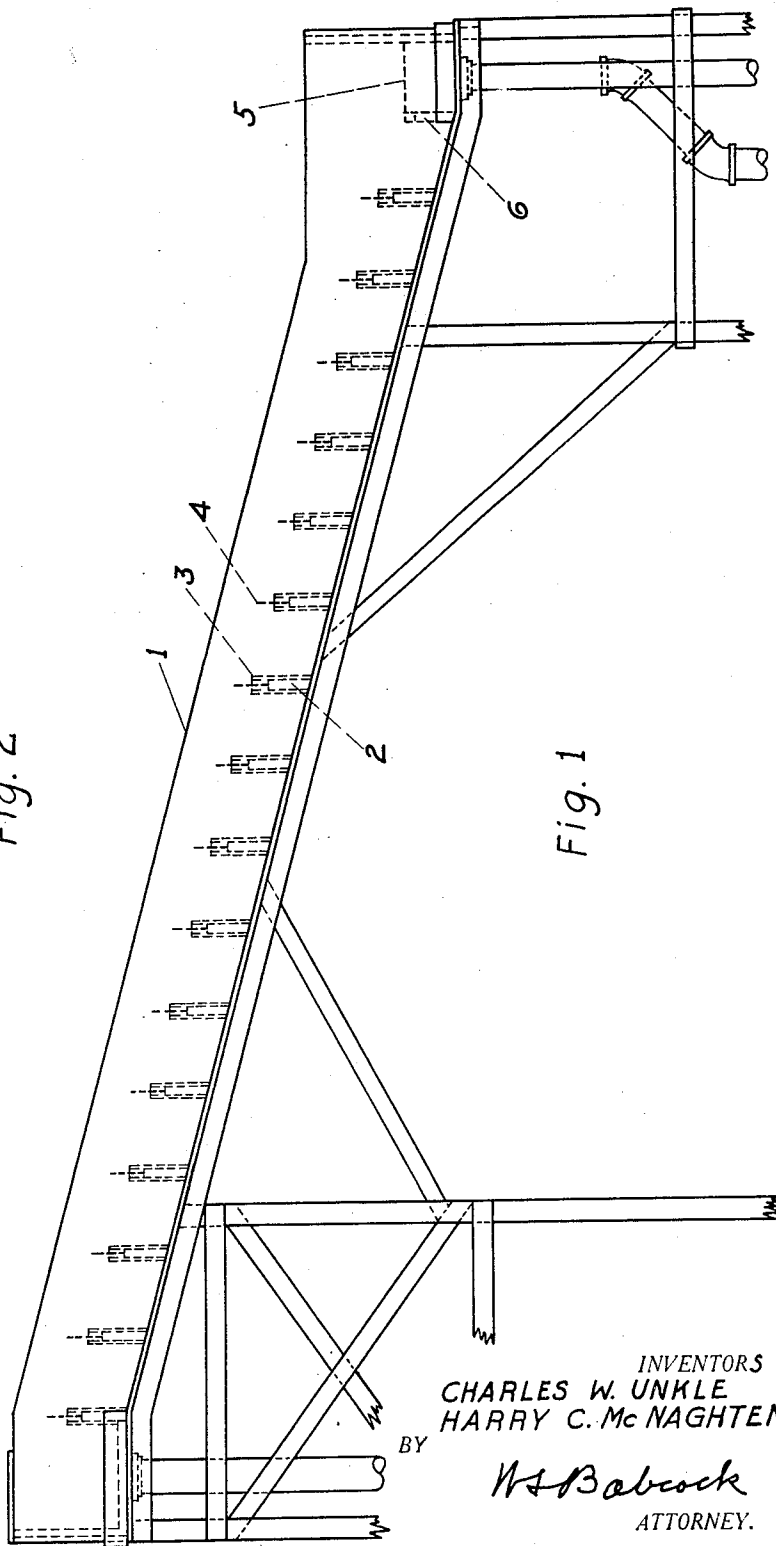


Fig. 1

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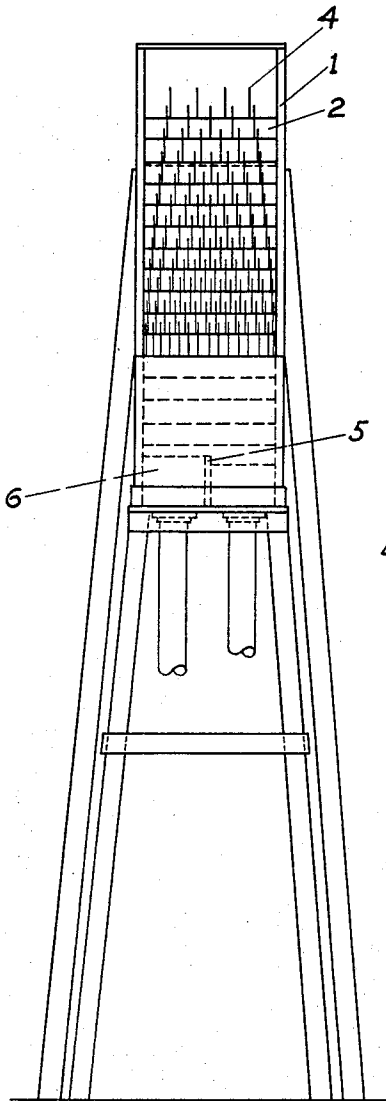


Fig. 3

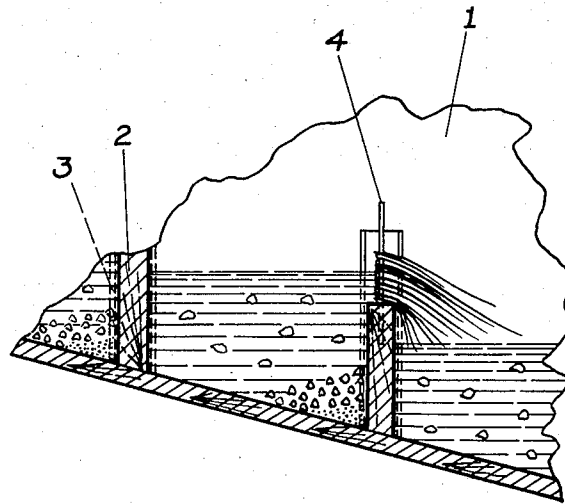


Fig. 4

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UNITED STATES PATENT OFFICE

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RUBBISH SEPARATOR FOR STOCK FOR
PAPER MILLSCharles Wilbert Unkle and Harry Claude
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Application July 21, 1932. Serial No. 623,844

13 Claims. (Cl. 92—28)

The invention to be hereinafter described relates to separators for use in paper mills and more particularly to a separator for removing from the stock foreign substances of various kinds.

5 A very large percentage of paper now made is produced from waste paper. This waste paper contains practically every imaginable foreign substance, in varying degrees. For instance, there are large quantities of floor sweepings, dust, dirt,
10 sand, rubber bands, pieces of stone, coal, iron fragments, small tools, broken glass, great quantities of paper clips, bottle caps, rags, and cord and string in great variety and quantity, etc. The regular entire contents of office and factory waste
15 paper baskets and bins is dumped into the baling presses. The bales, as delivered, contain, regularly, anywhere from 10% to 50% absolute foreign matter injurious to the stock and damaging to the machinery. Incidentally, aside from
20 the damage done, the power, repair, maintenance and many other costs of the mill are increased in proportion, relatively to what they would be were there no foreign matter in the bales.

A great difficulty has been to continue consistency of the stock at the desired point and, while in that consistency, to separate the foreign matter, without retarding the flow of the stock to the Jordans.

Clearly, presence of this foreign material is a continuous heavy expense. Its elimination is a problem which the mills have been continuously trying to solve. Various attempts have been made but, so far, with very little success. Settling tanks such as the well known Shartle settling tank
35 have been tried. No means prior to this invention, has given appreciable relief.

This separator which is the result of many years experience with these difficulties, permits free normal and unretarded flow of the stock at its regular operating consistency, and during such
40 flow automatically removes substantially all foreign matter. It is simple, compact, inexpensive and quickly and easily installed. Its connections with the cooperating machinery—pumps and Jordans may be adapted to suit greatest convenience. It does not require to be in the same building, even though that would usually be preferable. It may, easily, be mounted above the machinery such as pumps, Jordans, etc.

50 In order to more clearly disclose the construction, operation and use of the invention, reference is hereby made to the drawings forming part of this application. Throughout the several figures of the drawings like reference characters designate the same parts in the different views.

In the drawings:—

Fig. 1 is a side elevation, with the supporting frame partly broken away;

Fig. 2 is a top plan view of the inclined trough;

Fig. 3 is a right hand end view of Fig. 1, with pipe connections omitted; and

Fig. 4 is an enlarged fragmentary detail, showing one of the baffles with accumulated rubbish.

It should be remembered that the stock or "stuff" as it leaves the beaters, in "board" mills, is a thick mushy mass like a papier-mâché in slightly thinned condition. It is so thick that it carries with it, in suspension, bottle caps, cord, rubber bands, rags, leather scraps, and even small tools and fragments of iron. This mass, with its greater or less percentage of foreign matter goes to the chests. From there it is pumped to the Jordans. So whatever foreign matter passes through the large capacity pumps goes into the Jordans. In the mill in which this invention has been developed, the inventors have found it necessary, prior to this invention, to clean out the Jordans regularly every half-hour. Even then, the accumulation would sometimes cause real damage. In a short time, the collection may become such as to tightly clog the Jordan and completely strip the blades, involving a resulting heavy repair bill. Even when cleaning regularly every half-hour, the accumulation was frequently more than one bushel. With the present invention in that same circuit and using the same raw material, the stock passing from it to the Jordan, the Jordan is cleared regularly once in every eight hours, or, one-sixteenth as often, and the amount removed is less than one double-hand full. And that, too, is of the lighter and finer and less damaging foreign matter.

Referring to the drawings in detail, 1 indicates a trough suitably mounted on any desired type of frame work or support. It is, in operative position, inclined. In the particular cases illustrated, for use in a "board" mill; an inclination of about 15 degrees downwardly from the horizontal has been found very satisfactory. It is not limited to that of course. With the stock used, the inclination given has permitted unretarded flow, so that the stock passes from the pump, through the separator and to the Jordan at the same speed as it comes from the pump. Of course, with stock of a different consistency, the inclination may vary accordingly. The capacity of the trough will, of course, be proportioned to the normal operating capacity of the pump supplying the stock. And the variable dimension will be the width. Thus, with a greater pump

delivery, a proportionately wider trough will be provided. This will keep the depth of flow of the stock over the baffles constant, so that the separator efficiency of the invention will be maintained. This particular trough has a horizontal length of approximately 23 feet, over-all, an inside width of approximately 24 inches, and an inside depth of about 20 inches. The measurements, of course, may be varied to suit circumstances and, particularly, to suit capacities. The trough has continuous, uninterrupted inside bottom and side walls. Its ends, of course, are closed. Also, the bottom for a short distance at each end is horizontal for the ready connection of pipes, as will be understood. In the arrangement illustrated, the usual stock pump draws stock from the chest to the upper end of the trough. At the lower end one pipe leads in usual and well known manner to a Jordan and another leads back to the chest. The one leading to the chest is provided as an overflow, of course. If the flow down the separator is faster than can be taken care of by the Jordan, the excess will overflow to the chest. When the pump has been properly regulated the excess or overflow will be slight and irregular, as will be readily understood. Overflow should, of course, be reduced to the least practicable, to avoid waste effort or unnecessary consumption of power. The supporting frame shown may be varied, of course, to suit circumstances and the arrangement of the other machinery. This particular frame will support the separator above other machinery such as pumps, Jordans, pipings, etc. Or it may be carried on brackets from a wall, or swung from hangers overhead. It may be mounted entirely outside the particular building, or in another building. Economy would usually dictate a location within the same building and close to the pump and Jordans, preferably between them. When arranged between the pump and Jordan, that is, with the pump close to the upper end and the Jordan close to the lower end, the connection is most economical and the circulation shortest. Obviously the above and various other methods of supporting the trough are matters of choice and detail and need no further disclosure.

Beginning at the upper end of the incline and ending with the lower end of it, a plurality of baffles 2 are provided at intervals throughout the length of the incline. In the particular arrangement shown, they are disposed at intervals of approximately fifteen inches from centre to centre, though that is not essential. The distance may be somewhat more or somewhat less. Also, though it is preferable to have the distance between them substantially the same or uniform, that, also, is not essential. It may be varied. These baffles are plane panels of suitable material, such as wood or rust resisting metal or the like. They extend completely across the interior of the trough from one side to the other and their ends slide freely in ways or guides formed by parallel strips 3 or the like on the trough walls. Of course, when the trough is of wood, its sides may be grooved to receive the baffle ends, though this is not a preferred arrangement. When the trough is of metal, parallel ribs may be pressed in the metal to form ways, if desired. Other suitable forms of guides may be used, also, of course. The baffles here shown are approximately eight inches in height, though that measurement is, of course, variable. By actual test, baffles of that height have been found very efficient in separating foreign matter from stock in

a "board" mill in which the raw material was average grade waste paper. Each baffle carries a plurality of rake teeth 4 projecting from its top. These teeth may be of wood or of metal. If of metal they should be to an appreciable degree rust proof to resist the chemicals of the stock. The same is true of the baffles and trough.

Notice particularly that the number of teeth per baffle increases progressively from top to bottom of the incline and that the spaces between teeth correspondingly decreases. Since the width of the trough is constant and also the length of baffle, this places the rake teeth out-of-line longitudinally of the incline. Each successive tooth is proportionally nearer the longitudinal trough centre, than the one immediately preceding it. This, of course, intensifies the raking action. It practically multiplies that action by the number of baffles used, whereas, if the teeth were all in line, there would be substantially, a single raking action. Of course, they could be similarly displaced from one side, only, toward the other, instead of from both sides toward the centre. Other staggering arrangements could also be used. The idea and arrangement should be such as to avoid as far as practicable any two or more rake teeth falling in the same line longitudinally of the trough. In the particular construction illustrated, the rake teeth project substantially six inches above the top edge of the respective baffle. That, of course, is variable. Preferably, the teeth are simple round rods set into or otherwise suitably secured to and carried by the respective baffle. They may be made removable if desired. A suitable partition 5 separates the upper or inlet ends of the pipes leading from the lower end of the incline. It extends from a low wall 6 between the last baffle and the pipe ends. This wall is really another baffle except that it is without rake teeth. Preferably, the partition 5 and that half of the wall 6 adjacent the overflow pipe are slightly higher than the other half of the wall 6, to allow the total normal flow to pass to the Jordan. Thus, only the excess will accumulate and flow over the partition 5 and wall 6 into the overflow. Briefly, the pipe ends are boxed around, the boxing for the overflow being slightly higher than that for the pipe to the Jordan.

A suitable walk, not shown, is carried by the frame alongside the trough so that an operative may walk alongside of the trough and remove the accumulating rubbish at frequent intervals from the rake teeth, as will be readily understood. A ladder or stair, not shown, is, of course, provided, where, as is frequently the case, the lower end of the trough is raised appreciably above the ground floor.

Wherever metal is used in places that it will come in contact with the stock, it will be suitably protected against the chemicals of the stock, as by chrome plating or the like, as will be readily understood.

Essentially, the invention is a cascade, each drop of which is provided with rake teeth to separate suspended rubbish, the heavier rubbish gravitating out above the drop or baffle.

The operation of the invention is as follows:—Stock which has been delivered to a chest from the usual beater will be pumped from the chest into the upper end of the trough. Pumping is regulated to give a flow approximately four inches deep over the top of the first baffle and across its full length. The stock, as delivered by the pump, is a thick mushy mass carrying a large quantity

of rubbish in suspension, the same foreign material hereinbefore referred to. The rake teeth have been stated as in the illustrated example, approximately six inches high. They will, therefore, project about two inches above the moving mass. The first baffle, of course, checks the flow and some of the heavier foreign matter settles out against the upper side of that baffle. As the four inch layer or current overflows the top of the baffle, the teeth 4 rake through and catch such rubbish as strings, rubber bands, rags, etc., etc., as well as some heavier rubbish entangled with these lighter floating materials. The current drops abruptly over the opposite side of the baffle to the incline of the trough and brings up short in the pocket above the next baffle, depositing in that eddy more of its suspended heavy rubbish. As the current piles up to overflow above the second baffle, it gets another thorough raking through lines parallel to the first raking lines, but inwardly thereof. The flow proceeds to cascade or hurdle over each succeeding baffle, each time being thoroughly churned or turned over by each succeeding baffle and eddy, and each time being thoroughly raked through, along different parallel paths. As it reaches the lower end of the trough, every part of it will have been very thoroughly raked and it will have been repeatedly mixed, churned, eddied, and settled. Practically all foreign matter will have been either settled out in the pockets above the baffles or raked out by the teeth 4. What little is left is both small and light, as that is the only rubbish which could pass through. Thus, stock passing from the separator to the Jordan and overflow will be practically pure and as nearly as practicable absolutely free from any foreign matter.

Of course, the upper pockets will be first to fill and the upper sets of rake teeth will be the first to become clogged. Should a set of rake teeth become clogged, as, of course, should not be permitted, the current will simply flow above and over the clogged teeth and into the next pocket above the next baffle.

Preferably, the teeth are kept clear by one of the operatives. He simply walks along the trough at intervals and, with his hand, lifts off the material accumulated on the teeth, and throws it in the waste cans kept near by. If advisable, one or more baffles may be completely removed, at a time, and returned, without interruption. Thus, the baffles may be repaired or renewed at will, without any interruption to the working of the separator. The operation is continuous and uninterrupted, and the separation is complete. Stock containing various percentages of rubbish is pumped from the chest to the separator as rapidly as it is used, and it flows through the separator at the same rate. On the way through, it is thoroughly cleaned and all foreign matter removed.

The separator is purely gravity operated and absolutely automatic from start to finish. It requires absolutely no power.

At intervals, of course, the trough should be cleaned, and all accumulated foreign matter should be removed. For this the pump is stopped. Then, beginning at the top, the baffles are successively removed and the accumulated rubbish passes down from each to the next below, until the mass piles up to near the top of the particular baffle. At that point, it is shovelled out or otherwise removed. After the trough has been thus cleaned, the baffles are replaced and the operations are resumed.

It is thought that the construction, operation and use of the invention will be clear from the preceding detailed description.

It will be obvious that either wood or metal or partly both may be used, as desired. It is a matter of personal choice, according to circumstances.

Many changes may be made in the construction, arrangement and disposition of the various parts of the invention within the scope of the appended claims, without departing from the field and intent of the invention and it is meant to include all such within this application wherein only one preferred form has been illustrated, purely by way of example and with no thought or intention of limiting the claims thereby.

Having thus described our invention, what we claim and desire to protect by Letters Patent is:—

1. A rubbish separator for stock for paper making machines comprising, an inclined trough, a cascade removably mounted in said trough and rake teeth extending upwardly from the upper edges thereof.

2. A rubbish separator for stock for paper making machines comprising, an inclined trough and a plurality of baffles removably mounted in said trough at intervals in its length to form catch pockets at their upper sides and to compel a current flowing down the trough to take a vertically sinuous path and rake teeth extending upwardly from the upper edges of said baffles.

3. A rubbish separator for stock for paper making machines comprising, an inclined trough, a cascade therein, and a plurality of rake teeth mounted in said cascade at intervals lengthwise of said trough.

4. A rubbish separator for stock for paper making machines comprising, an inclined trough, a cascade therein, and a plurality of rake teeth mounted in said cascade and arranged in rows across said cascade.

5. A rubbish separator for stock for paper making machines comprising an inclined trough, a cascade therein, and a plurality of rake teeth mounted in said cascade and arranged in rows longitudinally of said cascade.

6. A rubbish separator for stock for paper making machines comprising, an inclined trough, a cascade therein, and a plurality of rake teeth mounted in said cascade and arranged in rows both longitudinally and cross wise of said cascade.

7. A rubbish separator for stock for paper making machines comprising, an inclined trough, a plurality of removable baffles extending completely across said trough, and a row of rake teeth carried by each baffle.

8. A rubbish separator for stock for paper making machines comprising, an inclined trough, a plurality of baffles in said trough, and a row of rake teeth carried by each baffle, the teeth of each baffle being differently spaced than those of the next adjacent baffle.

9. A rubbish separator for stock for paper making machines comprising, an inclined trough, a plurality of baffles in said trough, and a row of rake teeth carried by each baffle, the teeth of each baffle being in a different plane longitudinally of said trough than those of the next adjacent baffle.

10. A rubbish separator for stock for paper making machines comprising, an inclined trough, a plurality of baffles in said trough, and a row of rake teeth carried by each baffle, the teeth of each succeeding baffle being spaced more closely than those of the next preceding baffle, and

the corresponding teeth of each baffle, successively, being nearer the longitudinal centre of said trough than the corresponding tooth of the last preceding baffle.

- 5 11. A rubbish separator for stock for paper making machines comprising an inclined trough having a continuous and uninterrupted inner bottom, a plurality of removable baffles spaced at intervals along said trough, extending completely across the interior thereof and also extending upwardly from the bottom, and rake teeth extending upwardly from the upper edges of said baffles.

- 10 12. A rubbish separator for stock for paper making machines comprising an inclined trough having a continuous and uninterrupted inner bottom, a plurality of removable baffles spaced

at intervals along said trough, extending completely across the interior thereof and also extending upwardly from the bottom, and rake teeth extending upwardly from the upper edges of said baffles, the number of teeth in succeeding baffles increasing with corresponding decrease in space between the teeth of the respective baffles.

13. A rubbish separator for stock for paper making machines comprising a steeply inclined trough, a plurality of removable longitudinally spaced baffles extending completely across said trough and extending upwardly from the bottom, and rake teeth extending upwardly from the upper edge of each baffle.

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