Nov. 13, 1928. 1,691,308

C. R. SEABORNE

BEATER FOR PAPER STOCK

Filed Aug. 5, 1925 2 Sheets-Sheet 1

Fig. 1

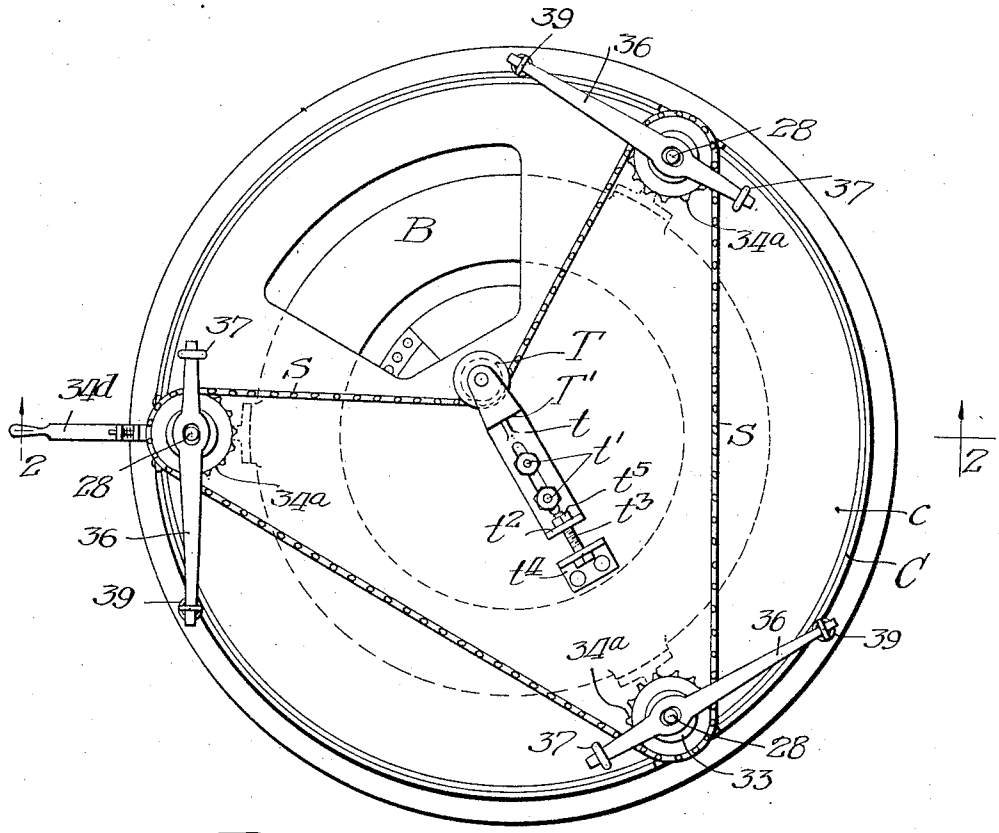


Fig. 5

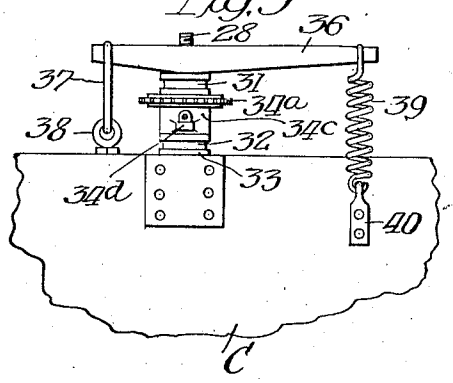
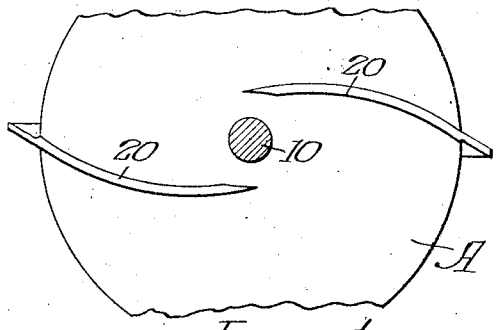


Fig. 6



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Fig. 2

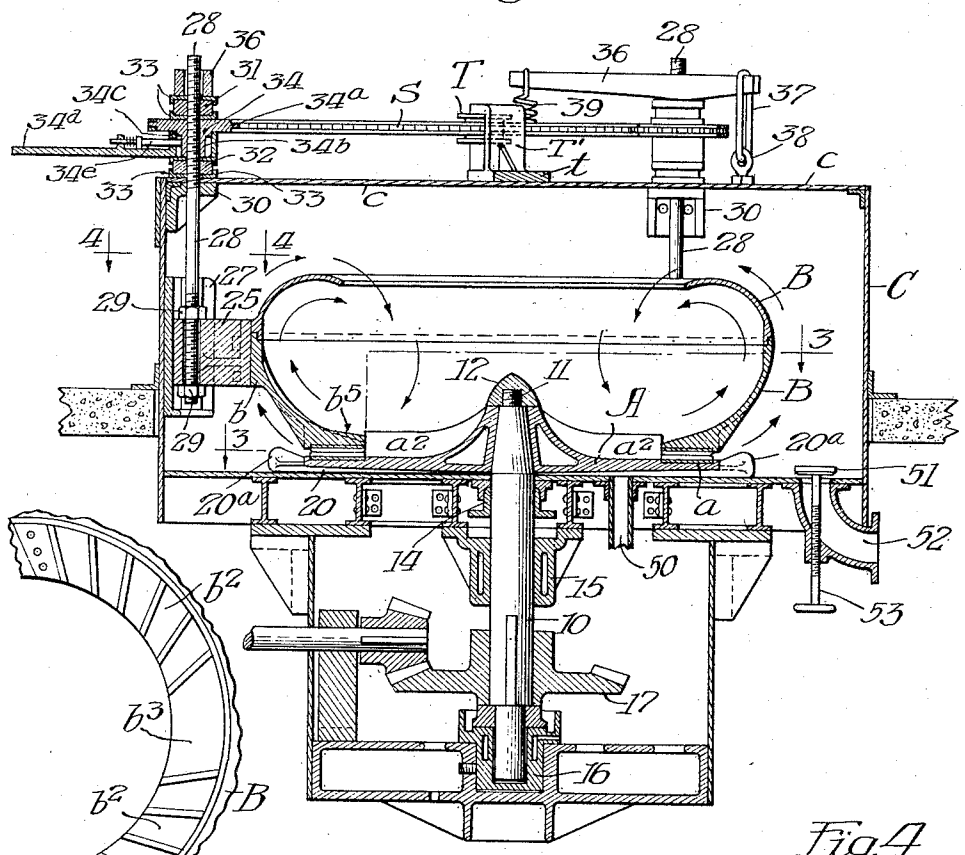


Fig. 3

Fig. 4

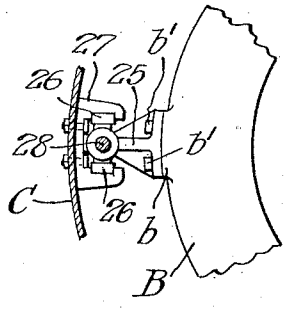
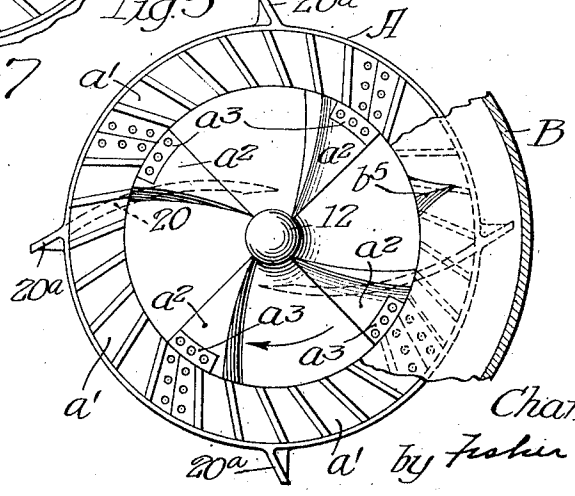


Fig. 7



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UNITED STATES PATENT OFFICE.

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BEATER FOR PAPER STOCK.

Application filed August 5, 1925. Serial No. 48,217.

The present invention has for its object to provide an improved beater whereby the reduction and refining of paper stock can be more effectively accomplished, and the invention consists in the features of novelty hereinafter described, illustrated in the accompanying drawings and particularly pointed out in the claims at the end of this specification.

Figure 1 is a plan view of a beater embodying my invention; Figure 2 is a view in vertical section on line 2—2 of Fig. 1; Figure 3 is a view in section on line 3—3 of Fig. 2, parts being shown in elevation; Figure 4 is a detail view in horizontal section on line 4—4 of Fig. 2; Figure 5 is a detail view in elevation of the bowl-adjusting means; Figure 6 is an inverted plan view of the revoluble plate; and Figure 7 is an inverted detail plan view showing groups of knives on the bottom of the bowl.

My improved beater comprises a rotary plate or element A, and a stationary bowl or element B, that are mounted within the inclosing tank C, preferably of circular construction. The plate A, which is shown of disk form, is preferably a casting raised at the center and tapering downwardly and outwardly towards its periphery. The plate A is fixed upon the upper end of a drive shaft 10 having a reduced threaded portion 11 to receive a correspondingly threaded cap 12, the outer surface of which is inclined to correspond with the curvature of the upper face of the plate A. The shaft 10 passes through a stuffing box 14 and through a bearing 15, these parts being suitably sustained beneath the tank C, and the lower end of the shaft is mounted in a step-bearing 16 of suitable construction. On the lower portion of the shaft 10 is mounted a suitable drive gear or pulley 17 whereby rotation of the shaft may be effected. To the under side of the plate A are fixed suitable metal strips 20 that are preferably curved as indicated in Fig. 6 of the drawings, these strips serving, when the plate is driven, to throw outwardly any material that might tend to lodge between the under face of the plate and the bottom of the tank C. Near its periphery, the upper face of the plate is provided with an annular set of knives a' that are preferably set within an annular seat or recess a in the upper face of the plate. As shown, these knives a' are arranged at an angle to the radius of the plate and are adapted to cooperate with the knives on the bowl, to be presently described. The portion of the upper face of the plate A within the set of knives is formed or provided with a plurality of arms or blades a^2 that may be formed integral with the plate. The peripheral portions of these arms or blades a^2, where subjected to the greatest wear, are shown as provided with detachable wearing plates a^3 connected, as by screws, to the arms or blades a^2. The preferred form of the arms or blades a^2 is as indicated in the drawing (see Fig. 3); that is to say, each arm or blade has its forward surface somewhat more gradually inclined than its rear surface, the blades increasing in elevation from the center towards the periphery of the plate.

As shown, the bowl B is of general concavo-convex, annular shape, its bottom being formed and closed by the plate A and its top being left open to receive the stock and permit the circulation of the pulp over the inwardly turned edge of the top, as will hereinafter more fully appear. For convenience of construction, the bowl is formed of upper and lower sections having flanged meeting edges adapted to interlock. The upper face of the lower portion of the bowl is formed or provided with a plurality of humps or offsets b^5 (see Figs. 2 and 3) adapted to cooperate with the blades or arms a^2 of the plate, as will hereinafter more fully appear, these offsets having preferably inclined sides, as shown. The upper and lower portions of the bowl are provided preferably at three points with lugs or offsets b, to which are bolted, as at b', the slide blocks 25, these slide blocks having vertical ribs 26 adapted to move in ways or channels formed in the side walls of castings 27 that are bolted to the wall of the tank C. Through a vertical hole formed in each of the slide blocks 25 is passed a rod 28 to which the corresponding slide block is connected by nuts 29 engaging threaded portions of the rod 28. The upper end of each rod 28 passes through a bracket 30 bolted to the tank C near its top, the rods 28 passing also through holes in the top plate c of the tank. The upper portion of each rod 28 is encircled by one or more springs or cushions whereby the bowl may be yieldingly supported. As shown, each rod 28 passes through two rubber cushions 31 and 32, these cushions being inclosed within perforated disk-shaped plates 33. Between the cushions 31 and 32 is placed a threaded adjusting nut 34, the construction of which will here-

inafter more fully appear. Above the upper cushion 31 extends a lever 36 through which the upper end of the rod 28 freely passes (see Fig. 5). As shown, the inner end of the lever 36 is connected by a loop or ring 37 to an eye-bolt 38 secured to the top c of the tank and the outer end of the lever 36 is engaged by the upper end of a spring 39 the lower end of which is attached to a hook 40 secured to the side wall of the tank. The hook 40 may be adjustably secured to the wall of the tank so that the strain of the spring 39 upon the lever 36 may be varied as desired. The springs 39 and the levers 36 serve to exert a downward pressure upon the rods 28 that sustain the bowl, thus insuring a firm pressure of the knives b^2 of the bowl against the knives of the plate.

While provision may be made for adjusting the nuts 34 individually, I prefer to provide means whereby these nuts may be adjusted in unison and at a single operation. To this end, each nut is shown as provided at its top with sprocket teeth 34^a and the body of one of the nuts is formed with ratchet teeth 34^b that extend vertically around its periphery. This nut is formed with an annular shoulder over which sets the annular hub 34^c of an adjusting hand lever 34^d. This hand lever 34^d carries a spring actuated pawl 34^e that engages the ratchet teeth 34^b. Around the sprocket teeth 34^a of the several nuts extends a sprocket chain S that extends also around a tightening pulley T. As shown, the pulley T is mounted in a yoke T′ adjustably mounted on the top c of the tank. The shank t of the yoke T′ is shown as provided with slots through which pass the bolts t' and through the upturned end t^2 of the yoke shank t passes a tightening screw t^3 the opposite end of which passes through a bracket t^4 attached to the top of the tank. The opposite end of the screw t^3 is provided with a corresponding threaded nut t^5.

By the means last described, it will be seen that by operating the hand lever 34^d, an adjustment of all the rods 28 may be simultaneously effected, to insure a uniform vertical movement of the bowl B.

The knives b^2 of the bowl (see Fig. 7) are arranged in a series of groups around the bottom of the bowl and these knives extend, with respect to the radius of the bowl and the plate, at an angle opposite the angle at which the knives of the plate are arranged, thus giving a better shearing action to the knives. Between the series of groups of knives at the bottom of the bowl are formed the channels or open spaces b^3 (see Fig. 7) through which pulp may pass outwardly between the bowl and the plate. By thus forming the bowl with a series of groups of knives, instead of a continuous annular set of knives as on the plate, the freer and more effective circulation of the pulp between the knives is insured. The groups of knives at the bottom of the bowl should be formed of a hard material, such for example, as hardened steel, and should be detachably connected to the body of the bowl, and similarly, the annular series of knives on the plate may be formed of segmental hard metal plates detachably connected to the peripheral portion of the plate. In the top c of the tank is formed an opening (closed by a lid when required) through which the stock or pulp to be beaten may be delivered into the bowl B.

To the bottom of the tank C, and preferably beneath the plate A, is connected an inlet pipe 50 by which water will be admitted to the tank, and adjacent the outer wall of the tank is formed a discharge opening adapted to be closed by a suitable valve, such for example, as a poppet valve 51, to which opening will be connected a pipe 52 for the discharge of the pulp from the tank. The valve 51 may be conveniently operated by a stem 53 passing through the discharge pipe 52.

From the foregoing description, the operation of my improved beater will be seen to be as follows: Water will be admitted through the inlet pipe 50 to the tank C until the water reaches a level somewhat above the top of the bowl B. Before the water is thus admitted, however, the bowl should be raised somewhat by means of the adjusting nuts 34 so that as the water passes into the tank it will flow between and around the knives of the bowl and of the plate and thus free them from any pulp that may have lodged thereon. While the water is thus delivered to the tank C, rotation may be imparted to the plate A and the operator may begin to deliver the paper stock to the interior of the bowl through the opening in the top of the tank. The bowl will then be adjusted downwardly by means of the nuts 34 until the knives of the bowl bear firmly against the knives of the plate. As the plate is revolved, its arms or blades a^2 will impart a double circulation to the material within the tank. That is to say, these arms will cause the material within the bowl to circulate outwardly, upwardly and downwardly, as indicated by the arrows in Fig. 2, and will cause a portion of the pulp to pass between the knives of the plate and bowl and thence upwardly and over the inwardly curved top of the bowl in downward direction. The arms or blades a^2 will cause any masses or accumulations of pulp within the bowl to be circulated and repeatedly moved within the bowl until such masses are broken up and reduced to such condition as to pass freely between the beater knives. This breaking up of any accumulations of pulp within the bowl is aided by the humps or offset portions b^5 of the bowl, the inner ends of which extend in close proximity to the ends of the blades or arms a^2, and cooperate with these blades or arms in cutting or shearing and elevating any stock that may have a tendency to lodge adjacent

the narrow opening between the knives. The metal strips or ribs 20 beneath the plate A will prevent the lodgment of material between the plate A and the bottom of the tank, but being preferably provided on their outer ends with expanded inclined portions 20ª, aid in the upward circulation of the material in the tank.

My present invention will be found adapted for the beating of paper pulp stocks of widely varying character and to possess many advantages over the beaters now in general use. In the forms of beaters most commonly employed in paper mills, a very large percentage of the power used in driving beaters is required for the elevation and circulation of the stock, whereas in my improved beater the power required for the circulation of the stock is reduced to a minimum. Again, the construction and arrangement of the plate and bowl with their horizontally disposed knives, enable a most accurate adjustment of the knives to be secured and maintained. So, also, the time required for the beating operation in my present machine is far less than that required in any other beaters with which I am familiar, while the disintegration and hydration of the pulp is far more effectively accomplished. Again, the double circulation of the pulp, insuring as it does a thorough breaking up of any masses or accumulations of stock before passing to the knives, avoids clogging the entrance to the knives and is attended with most important results. It will be noticed also that the shape of the bowl B, with its upper part extended inwardly to a considerable distance from its periphery, will aid in insuring a most effective circulation of the material within the bowl.

I wish it understood that the details of construction above set forth may be varied without departing from the spirit of the invention and that features of the invention may be employed without its adoption as an entirety.

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

1. A machine of the character described comprising a tank, a bowl within said tank and spaced from the wall thereof, said bowl having a bottom with an opening therein and provided around said opening with a plurality of spaced and downwardly projecting beater knives, a plate located beneath and closing the bottom opening of said bowl and provided with beater knives arranged opposite the knives of said bowl to cooperate therewith and provide an entrance therebetween for stock to be beaten, means for imparting rotation to the part carrying one set of said knives, and means for effecting an upward circulation to stock between the tank and bowl, and both an upward and downward circulation to stock within the bowl to prevent the stock within the bowl from settling over and plugging the entrance to the knives.

2. A machine of the character described comprising a bowl having a bottom opening and provided with outwardly projecting beater knives; a part located beneath the bottom of said bowl and provided with beater knives arranged opposite the knives of said bowl; a receptacle for pulp surrounding said knives and communicating with the top of said bowl; means for imparting rotation to one set of said knives and the part carrying the same; and means located inside the series of beater knives for preliminarily breaking up accumulations of the paper stock and causing it to circulate within the bowl.

3. A machine of the character described comprising a tank; a bowl within said tank and spaced at a distance from the wall thereof and open at its top and bottom and having its bottom provided with knives; and a rotary plate extending beneath and closing the bottom of the bowl, said plate having knives for cooperating with the knives of the bowl and having arms or blades on its top surface adapted to impart circulation to material within the bowl.

4. A machine of the character described comprising a tank; a bowl within said tank spaced at a distance from the wall thereof and open at its top and bottom and having its bottom provided with knives; and a rotary plate extending beneath the bottom of the bowl, said plate having knives to cooperate with the knives of the bowl and having upon its upper surface inclined arms or blades to impart circulation to material within the bowl.

5. A machine of the character described comprising a tank; a bowl within said tank spaced at a distance from the wall thereof and open at its top and bottom and having its bottom provided with knives, the inner surface of the bottom portion of the bowl being provided with humps or offsets; and a rotary plate extending beneath the bottom of the bowl and having upon its upper surface arms or blades adapted to cooperate with the humps or offsets of the bowl.

6. A machine of the character described comprising a bowl having a bottom opening and provided with outwardly projecting beater knives; a plate located beneath and closing the bottom of said bowl and provided with beater knives arranged opposite the knives of said bowl; a receptacle for pulp surrounding said knives and communicating with the top of said bowl; means for imparting rotation to one set of said knives and the part carrying the same; and means located inside the series of beater knives for preliminarily breaking up accumulations of the paper stock.

7. A machine of the character described

comprising a bowl having top and bottom openings and provided around its bottom opening with a plurality of spaced and downwardly projecting beater knives, a plate located beneath and closing the bottom opening of said bowl and provided with beater knives arranged opposite the knives of said bowl to cooperate therewith and provide an entrance therebetween for stock to be beaten, and a receptacle for pulp surrounding said knives and communicating with the top opening of said bowl, the part carrying one set of said knives being rotatable and having means for imparting an upward circulation to the stock from said receptacle to said bowl and both an upward and downward circulation to stock within the bowl to prevent the stock from settling over and plugging the entrance to the knives.

8. A machine of the character described comprising a tank; a stationary bowl within said tank and spaced at a distance from the wall thereof, said bowl having its outer wall extending outwardly and upwardly and then inwardly to a considerable distance from the periphery of the bowl and provided at its bottom with knives; and a rotary plate extending beneath the bowl and closing its bottom, said plate having knives adjacent its periphery to cooperate with the knives of the bowl, said rotary plate also cooperating with the inwardly extending portions of said bowl for effecting circulation within the bowl of stock therein.

9. A machine of the character described comprising a tank; a bowl located within said tank and spaced from the wall thereof, said bowl having outwardly projecting beater knives about a bottom opening therein and a top portion extending inwardly to a considerable distance from its periphery; a plate located beneath and closing the bottom opening of said bowl and provided with beater knives arranged opposite the knives of said bowl; means for imparting rotation to one set of said knives and the part carrying the same; and means located inside the series of beater knives for imparting a centrifugal movement to the pulp to force it between the knives and also to force the stock to circulate in vertical direction within the bowl.

10. A machine of the character described comprising a tank, a broad and relatively shallow bowl within said tank and spaced at a distance from the wall thereof, said bowl having its wall inclined outwardly and upwardly and then inwardly and provided at its bottom with a central aperture and beater knives arranged about said opening and projecting downwardly from the bottom, a rotary plate extending beneath the bowl and having its central portion projecting upwardly through said aperture a considerable distance above the bottom of the bowl and having its upper surface downwardly and outwardly inclined from the center towards the edge of the bottom around said aperture so as to constitute, in effect, a centrally upwardly projecting bottom for the bowl adapted to facilitate circulation within the bowl of stock therein, said rotary plate also being provided with beater knives arranged opposite the knives of the bowl and adapted to cooperate with said knives of the bowl.

11. In a machine of the class described, a tank, a bowl within said tank and spaced from the wall thereof, said bowl being open at both its top and bottom, a rotary plate disposed at the bottom of said bowl and forming a closure for the bottom opening, a plurality of paddle members extending from the edge of said plate and adapted to effect circulation of the stock in said tank.

12. A machine of the character described comprising a tank; a bowl within said tank and spaced at a distance from the wall thereof and open at the top and bottom and having its bottom provided with outwardly projecting knives; a rotary plate extending beneath the bottom of the bowl and having knives adjacent its periphery to cooperate with the knives of the bowl; and adjusting means connected with the bowl at at least three points around its periphery, whereby said bowl may be uniformly raised and lowered by a single operation, and each of the connections being capable of being independently adjusted.

13. A machine of the character described comprising a tank; a bowl within said tank and spaced at a distance from the wall thereof and open at the top and bottom and having its bottom provided with outwardly projecting knives; a rotary plate extending beneath the bottom of the bowl and having knives adjacent its periphery to cooperate with the knives of the bowl; and adjusting means connected with the periphery of said bowl, said adjusting means comprising vertically adjustable rods and elastic cushions for the bowl.

14. A machine of the character described comprising a tank; a bowl within said tank and spaced at a distance from the side wall thereof and having an open bottom provided with knives extending in outward direction; a revoluble plate extending beneath the bottom of the bowl and having knives adjacent its periphery to cooperate with the knives of the bowl; adjusting means connected with the bowl at at least three points each of which connections is capable of being independently adjusted; and connecting means uniting the several adjusting means of the bowl for conjoint operation.

15. A machine of the character described comprising a tank; a stationary bowl within said tank and spaced from the wall thereof, said bowl having a bottom opening provided with outwardly projecting beater knives; a plate located beneath and closing the bottom

of said bowl and provided with beater knives arranged opposite the knives of said bowl; ribs upon the under side of said plate for forcing outwardly the material between the bottom of the plate and the tank; and means for imparting rotation to said plate.

16. A machine of the character described comprising a tank, a bowl within said tank and spaced from the wall thereof, and open at the top and bottom and having its bottom provided with outwardly projecting knives, a rotary plate extending beneath the bottom of the bowl and having knives adjacent its periphery to cooperate with the knives of the bowl, and adjusting means connected with said bowl comprising vertically adjustable rods and elastic cushions for supporting the bowl.

17. A machine of the character described comprising a tank, a bowl within said tank and spaced from the wall thereof, a rotary member disposed at the bottom of said bowl, beater members on said bowl and said rotary member adapted to cooperate with each other when said rotary member is rotated to beat material fed into the bowl, cushion means for supporting said bowl within said tank and means for adjusting the beater members on the bowl with respect to the beater members on the rotary member.

18. A beater for paper stock comprising a receptacle, a bowl within and spaced from the wall of said receptacle and having top and bottom openings and an inner surface sloping upwardly and outwardly from the edge of said bottom opening, a rotatable beater disk beneath said bowl, said bowl and disk having cooperating sets of knives, and means for forcing the stock outwardly through said sets of knives and also outwardly and upwardly over the inner surface of the bowl.

19. A beater for paper stock comprising a receptacle, a bowl within and spaced from the wall of said receptacle and having top and bottom openings and a wall sloping outwardly from the edges of said top and bottom openings, toward the mid-portion thereof, and a rotatable beater disk beneath said bowl, said disk and bowl having cooperating sets of knives and said disk having blades projecting upwardly into the bottom opening of the bowl for forcing the stock outwardly between said sets of knives and also outwardly and upwardly over the inner surface of the bowl.

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