

June 29, 1943.

C. W. CHASE

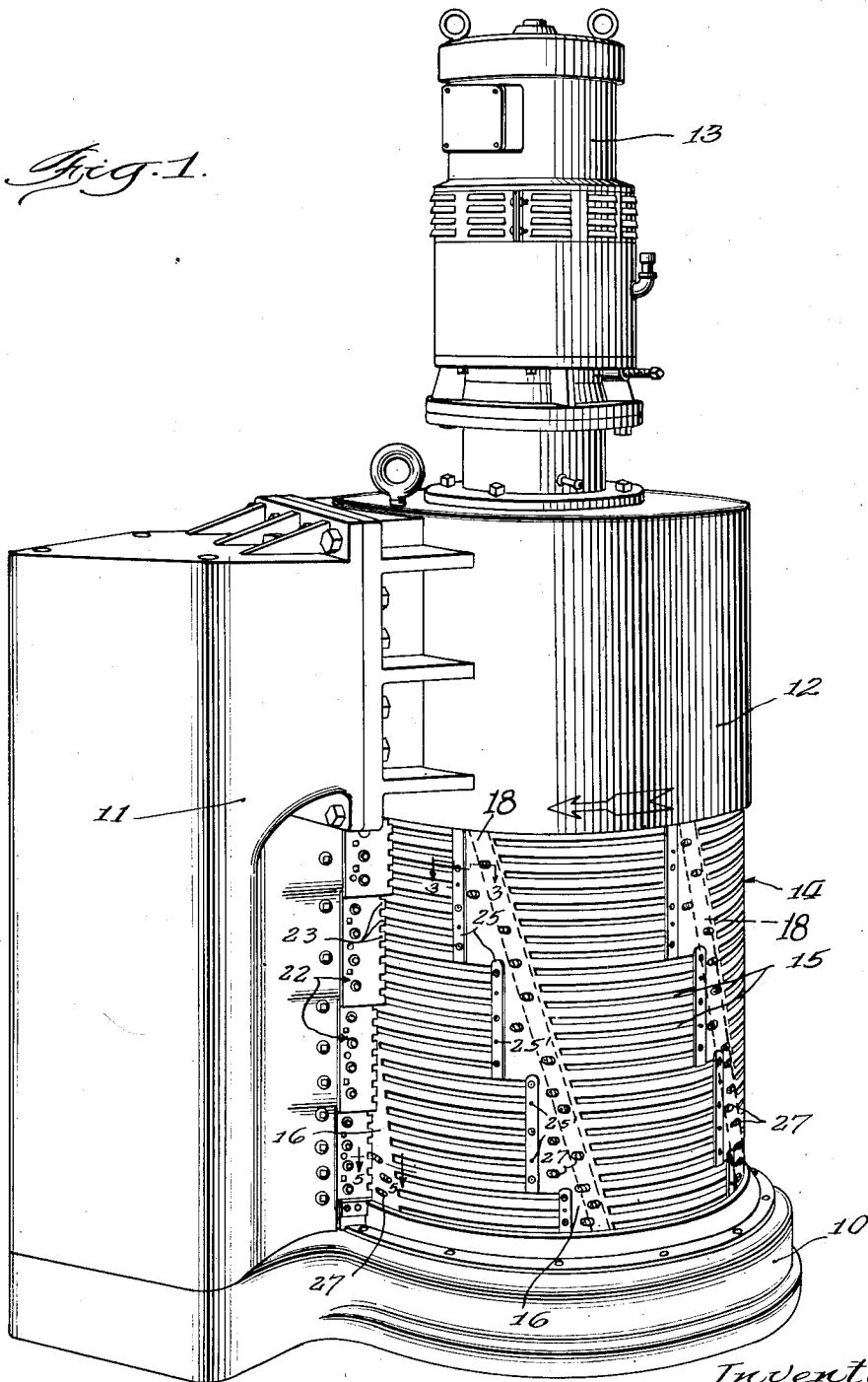
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COMMINUTOR

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3 Sheets-Sheet 1

Fig. 1.



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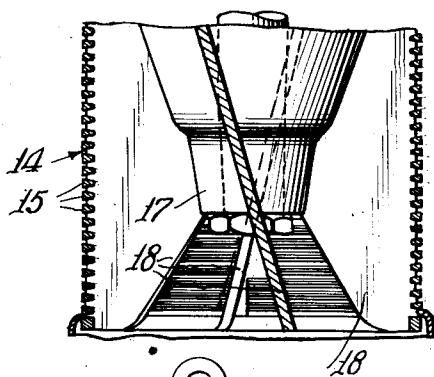


Fig. 6.

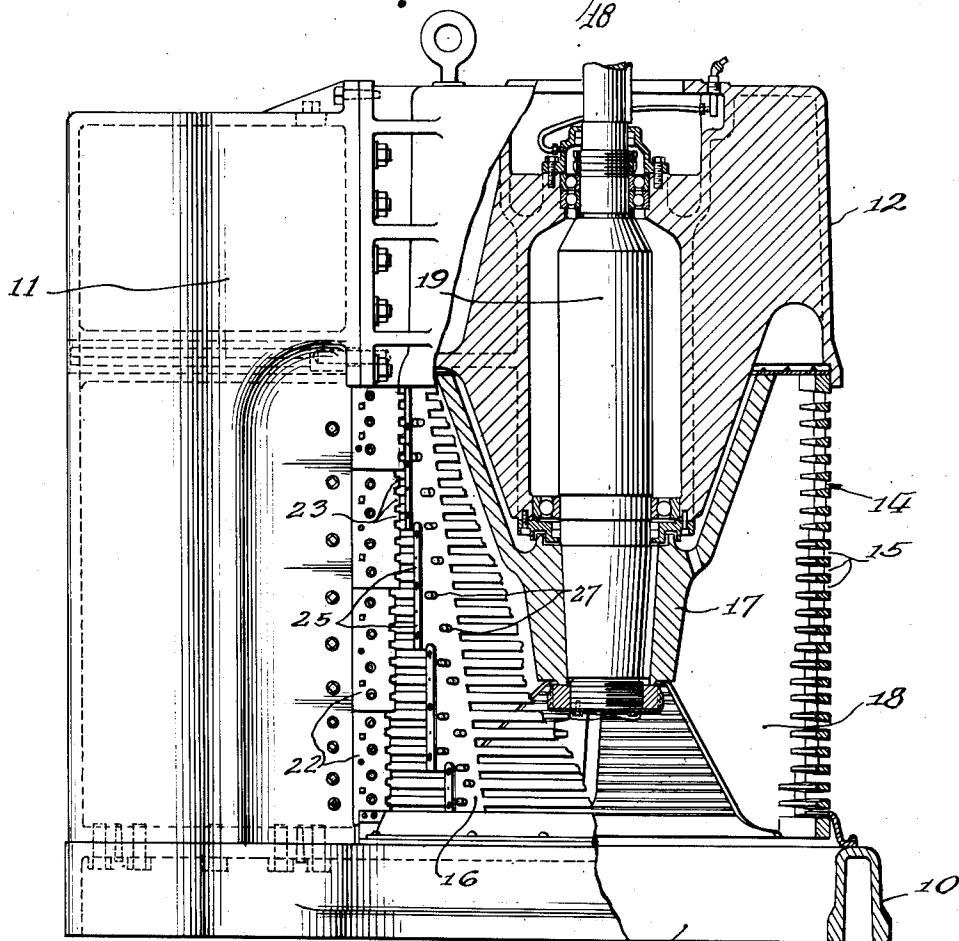


Fig. 2.

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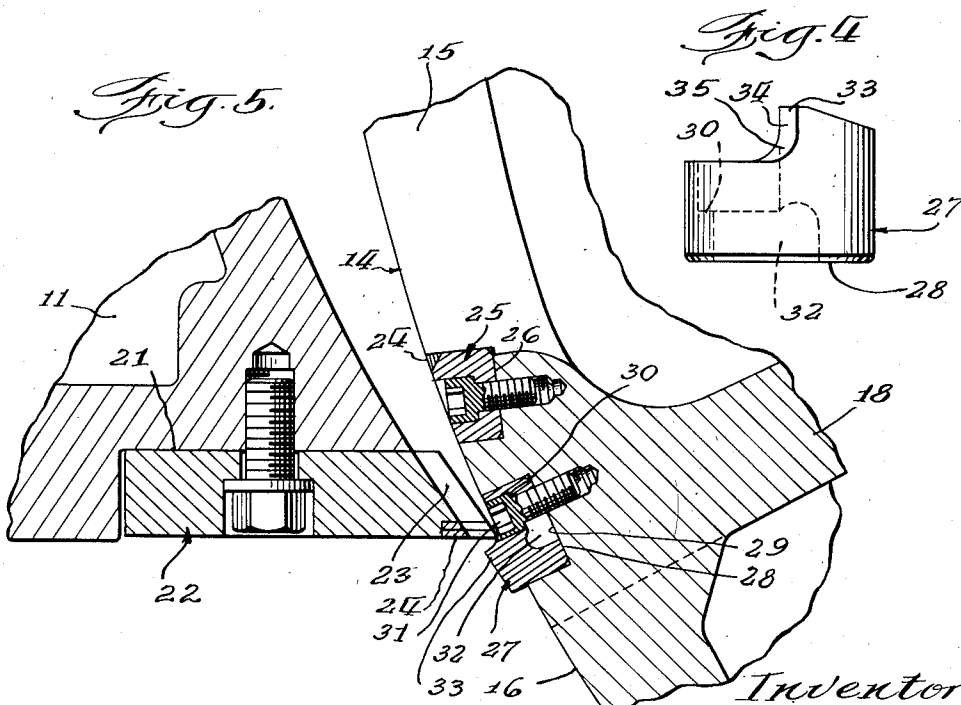
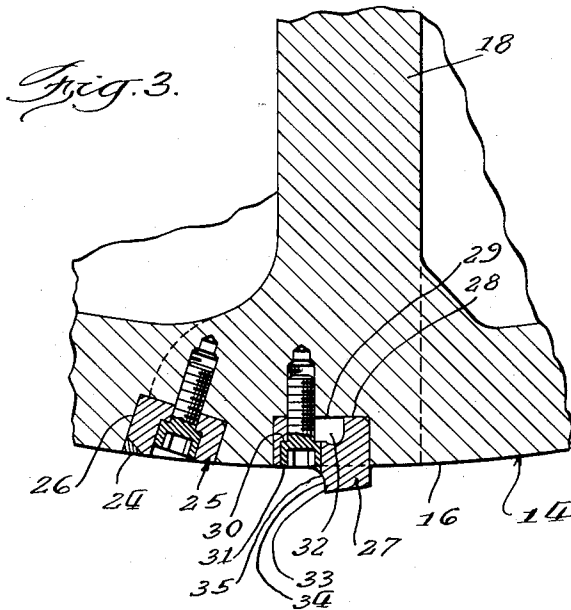
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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

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COMMUNUTOR

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Application February 26, 1940, Serial No. 320,865

14-Claims. (Cl. 210—152)

This invention relates to comminutors and particularly to comminutors of the rotary screen type which are employed for comminuting solids carried by sewage. The improved comminutor may be of the general type described and claimed in the copending application of Augustus C. Durdin, III, Serial No. 155,710, filed July 26, 1937.

The principal object of the invention is to provide an improved comminutor of this general type.

A further object of the invention is to provide a comminutor of this type in which the cutting load is substantially uniform.

A further object of the invention is to provide improved stationary cutter means whereby replacements and repairs may be made more economically.

A further object of the invention is to provide improved cutting means whereby the screen may be cleaned automatically in the normal operation of the comminutor.

A further object of the invention is to provide in a comminutor of this type cutting means adapted to expel metal objects such as spikes and nails, without expelling softer materials such as wood and non-metallic debris generally.

Other objects, advantages and capabilities of the invention will appear from the following description of a preferred embodiment thereof, taken in conjunction with the accompanying drawings, in which:

Figure 1 is a perspective view of the improved comminutor;

Fig. 2 is an elevational view partly in section, showing the manner in which the screen is mounted;

Fig. 3 is a sectional detail view, taken on the line 3—3 of Fig. 1, showing a cutting bar and cutting tooth in cross-section;

Fig. 4 is a side elevation of a tooth;

Fig. 5 is a sectional plan detail, taken on the line 5—5 of Fig. 1, showing the manner in which the cutting face of the tooth cooperates with a cutting comb, and

Fig. 6 is a vertical sectional view of the comminutor screen showing the oblique relation of its supporting spokes.

Referring to the drawings and particularly to Fig. 1, my improved comminutor comprises a base 10, a standard 11 mounted thereon, a head 12 mounted on the standard, a motor 13 mounted on the head 12 and a screen 14 which is of substantially cylindrical form rotatably suspended from the head 12 and adapted to be driven by the motor 13. The screen 14 extends between the head 12 and the base 10, the portion of the base 10 inside the screen providing a downward exit opening for the liquid and comminuted solids. In operation the improved com-

minutor is located in a suitable chamber into which the sewage is delivered.

The screen 14 may suitably be in the form of a casting having an outer cylindrical wall which is provided with a plurality of series of horizontal slots 15 through which the liquid may pass into the interior of the screen. Each series of slots 15 is located on the cylindrical screen in oblique relation, the series being separated by solid wall portions 16 which also extend obliquely along the length of the cylindrical wall.

The cylindrical wall of the screen is connected to a hub 17 by means of enlarged spoke members 18 which extend obliquely relative to the axis of rotation of the screen. The outer ends of the spokes 18 extend substantially along the cylindrical wall and conform to the oblique relation of the solid portions 16 of the screen with which they are integral. The cylindrical screen is secured to a shaft 19 which is driven by the motor 13 in the direction indicated by the arrow on Fig. 1, the hub 17 being secured to the shaft 19. It may be noted that the sloping spokes 18 serve as vanes, forcing the liquid within the screen downwardly through the discharge opening 20 and thus minimizing the resistance to flow presented by the screen 14.

The forward ends of the slots 15 of each series are preferably located on a straight line. The rear ends of the slots of each series terminate on a plurality of vertical lines, the forward edge of the solid portions 16 of the cylindrical wall being in stepped formation as best seen in Fig. 1.

The standard portion 11 is provided with a plurality of seats 21 upon which are mounted a corresponding number of stationary cutting combs 22. The seats 21 are arranged in step formation so that the lower end of the second comb from the bottom overlaps the upper end of the lowermost comb and the lower end of the third comb from the bottom overlaps the upper end of the second comb from the bottom, and so forth. The combs 22 are secured upon the seats 21 by means of suitable bolts.

Each comb 22 is provided with a plurality of teeth 23 which project almost into contact with the cylindrical surface of the screen 14. These teeth and the recesses between them are cut back from the front face of the comb at suitable angles to provide cutting clearance. The forward cutting portions of these teeth and the adjacent portions of the comb 22 may suitably be formed from a strip 24 of hard cutting material, for example, stellite, which may be secured in suitable manner to the main portion of the comb 22.

The forward faces of the teeth 23 are adapted to cooperate with cutting bars 25. These cutting bars are mounted by means of suitable bolts upon the cylinder 14. They are located in slots 26 which are formed in the screen 14 along the

forward faces of the step formations of the solid cylindrical portions 16. As best seen in Fig. 1, the cutting bars 25 are arranged in overlapping relation and they are also arranged so that each cutting bar cooperates with two of the combs 22. Since the bars 25 are vertical and the cutting combs 22 are displaced relatively with respect to the vertical direction, each cutting bar cooperates with the forward edges of the teeth of one comb and shortly thereafter the bar cooperates with the forward edges of cutting teeth of the next comb. Owing to the relative displacement of the combs 22 and the relative displacement of the bars 25, the cutting load of these bars is distributed over a wide angle of rotation of the screen 14. The cutting bars 25 are mounted on the screen 14 so that their forward edges are substantially flush with the cylindrical surface of the screen 14. They may, however, be arranged to project slightly beyond this surface in order to cooperate more effectively with the outer ends of the teeth 23.

The forward edge of the cutting bar 25 may suitably consist of a strip of hard cutting material, for example, stellite, which is rigidly mounted on the main portion of the bar. It will readily be understood that any fibrous material which may be come caught upon the bar portions of the screen between the slots 15 are engaged by the cutting edges of the teeth 23 of the combs 22, these teeth being in alignment with and in overlapping relation to the slots 15. Such fibrous materials are consequently carried by the teeth 23 and are severed by the cutting bars 25 so that the severed portions may flow through the screen and pass into the discharge opening 20. The bars 25 are provided with tapped openings 25' for the reception of jack screws for forcibly removing the bars from their seats 26 when desired.

Upon the cylindrical wall of the screen 14, and preferably upon the solid portions 16 thereof, I mount a plurality of cutting teeth 27. Each cutting tooth 27 may suitably comprise an elongated base portion 28 which is formed to seat snugly within a recess 29 formed in the outer cylindrical surface of the screen 14. This base portion is provided with a seat 30 for the head 31 of a bolt which passes through an opening 32 in the base into a threaded opening in the cylindrical wall of the screen 14.

The opening 32 is provided with a lateral extension to facilitate the removal of the tooth from its seat 29. The head 31 of the bolt is normally below the surface of the cylindrical wall of the screen and when this bolt is removed a tool can be inserted into the lateral extension of the opening 32 so that the cutting tool 27 may be forcibly withdrawn from its seat. The cutting tooth comprises a cutting projection 33 which is provided with a cutting face 34 which is located at an intermediate position in the length of the base 28.

The cutting face 34 is normally located obliquely with respect to the vertical direction, as shown in Fig. 1, so that the cutting load of each tooth is distributed through a slight angle of rotation of the screen 14. The cutting projection 33 of each tooth is adapted to pass in cutting relation with the three sides of a corresponding recess between a pair of adjacent teeth 23 on one of the combs 22. The combs are so formed that a single recess on each comb 22 corresponds to one of the teeth 27. The forward face 34 of the cutting projection 33 of each cutting tooth 27 has its

outer portion in the form of a plane. This plane is connected by a curved face 35 which connects the plane face into the outer surface of the base 28.

It is to be noted that the combs 22 are not located in radial relation to the screen 14. They lie in planes which pass in front of the axis of the screen 14. Consequently, the base of the cutting projection 33, that is, the curved portion 35 of the front face of the projection 33, passes between two teeth 23, and the plane portion 34 of the cutting face of the projection 33 being substantially radial with respect to the axis of the drum 14, moves gradually in between the adjacent teeth 23, as best seen in Fig. 5. In other words, at the time of cutting, any radial line on the face 34 is located at a slight angle to the outer face of the comb 22 with which it is cooperating. In the event that relatively soft material such as wood is being cut, this angle is insufficient to expel the material engaged between the teeth and the comb. In the event, however, that a piece of metal such as a nail or spike is located between the tooth and the comb, this open angle is sufficient to cause its expulsion, thus saving the tooth from fracture. The curved faces 35 aid materially in the expulsion of nails, spikes and the like out of the space between the tooth and the comb so that the teeth are not injured by the work otherwise necessary to sever these hard objects.

As best seen in Fig. 1, the teeth 27 are arranged in staggered relation so that, for the most part, only one tooth or, in some cases, two teeth are operative at any time. Thus, in the left-hand assembly of teeth 27 shown in Fig. 1, the uppermost step has three teeth 27 operative at different times. The second step has four teeth operative at different times. Two of these teeth are in vertical alignment, but they cooperate with the second and third combs 22 which are out of vertical alignment. The third step comprises three teeth 27 in vertical alignment, but the uppermost tooth cuts before the other two.

In operation, solid material carried by the incoming flow is carried up against the screen 14. This solid material is engaged by the teeth 27 and is carried around to the combs 22. Normal solids, including pieces of wood, are comminuted, each tooth breaking a small portion out of the solid. These small portions are carried by the stream through the screen 14. In the case of a large piece of wood, for example, the teeth 27 continuously take bites out of it until the wood is completely disintegrated into small pieces which pass through the screen.

As previously described, nails, spikes and other metal objects which may be carried by pieces of wood, for example, are expelled from the cutting members and softer materials associated with these metal objects are disintegrated until the expelled metal objects sink to the bottom of the chamber, from which they may be removed at suitable intervals.

The mounting of the combs 22 out of alignment and the generally oblique relation of each group of cutting teeth 27 and their staggered relation with their groups, distributes the cutting load substantially around the complete cylindrical surface of the screen 14.

Although the invention has been disclosed in connection with the specific details of a preferred embodiment thereof, it must be understood that such details are not intended to be limitative of the invention except in so far as set forth in the accompanying claims.

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

1. A comminutor comprising a rotatable screen, cutting teeth on said screen, and stationary cutting comb means adapted to cooperate with said teeth, said teeth being arranged in a plurality of separate series located in a generally oblique direction relative to the axis of rotation at a plurality of positions on said screen.

2. A comminutor comprising a rotatable screen, cutting teeth on said screen, and stationary cutting comb means adapted to cooperate with said teeth, said teeth being arranged in a plurality of separate series located in a generally oblique direction relative to the axis of rotation at a plurality of positions on said screen, and said cutter bar means being arranged in an oppositely oblique relation.

3. A comminutor comprising a rotatable screen, cutting teeth on said screen at various locations therealong, and a series of stationary cutting combs each adapted to cooperate with a plurality of teeth, each said cutting comb having a plurality of recesses through which the teeth pass in cutting relation, the adjacent ends of said cutting combs being arranged in overlapping relation and each tooth being provided with a complete corresponding recess in one of said combs.

4. A comminutor comprising a rotatable screen, cutting teeth on said screen, stationary cutting comb means provided with recesses through which said cutting teeth pass in cutting relation and teeth which project towards said screen, and cutting bars mounted on said screen adapted to cooperate with the outermost ends of said cutting comb teeth.

5. A comminutor comprising a rotatable screen having arcuate slots for the passage of liquid, cutting teeth mounted on said screen, stationary cutting comb means provided with recesses through which said teeth pass in cutting relation and teeth which project towards said screen, and cutter bars mounted on said screen at the rear end of said slots adapted to cooperate with the ends of said cutting comb teeth, the last said teeth being in alignment with at least part of the surfaces of the screen between said slots whereby material caught on said surfaces and extending into said slots is severed between the last said teeth and the cutter bars of the screen.

6. In a comminutor, in combination, a rotary screen having a cylindrical wall provided with water passing slots, a hub and spoke members connecting said wall to said hub, means providing an outlet from the lower end of the interior of the screen, and a shaft carrying said hub, said spoke members being relatively long and being arranged obliquely to the axial direction of the screen whereby they serve as pumping vanes to force liquid downwardly through said outlet.

7. In a comminutor, in combination, a screen, a cutting bar having a seat in said screen, means securing said bar in its seat, and threaded openings in said bar adapted to receive threaded members to serve as jacks for forcible removal of the bars from their seats.

8. A comminutor comprising a screen, a cutting comb, means for effecting relative movement therebetween, and cutting teeth on said screen and said cutting comb adapted to move past each other, said teeth being adapted to cut at an open angle whereby hard metal objects are expelled from between the teeth and softer materials are retained and comminuted.

9. A comminutor comprising a screen, a cutting comb, means for effecting relative movement therebetween, and cutting teeth on said screen and said cutting comb adapted to move past each other, said teeth being adapted to cut at an open angle and certain of said teeth having an arcuate formation whereby hard metal objects are expelled from between the teeth and softer materials are retained and comminuted.

10. A tooth for a comminutor comprising an elongated base portion and a cutting portion projecting from and coextensive with one end of the base portion, said cutting portion continuing outwardly in alignment with said end of the base portion, said cutting portion having a cutting face comprising a plane surface substantially transverse to the longitudinal direction of the base portion, and an arcuate surface in continuation of said plane surface merging forwardly into the base portion.

11. A tooth for a comminutor comprising an elongated base portion and a cutting portion projecting from and coextensive with one end of the base portion, said cutting portion continuing outwardly in alignment with said end of the base portion, said cutting portion having a cutting face comprising a plane surface extending across the width of the base portion and oblique to the transverse direction of said base portion, and an arcuate surface in continuation of said plane surface merging forwardly into the base portion.

12. A comminutor comprising two relatively movable members, cooperating cutting teeth on said members, one of said members being provided with a surface having recessed seats therein, each tooth on last said member comprising an elongated base portion adapted to be received within one of said seats, and a cutting portion projecting from and coextensive with the rear end of the base portion, said cutting portion continuing outwardly in alignment with said end of the base portion, said cutting portion having a cutting face comprising a plane surface substantially transverse to the longitudinal direction of the base portion, and an arcuate surface in continuation of said plane surface merging forwardly into the base portion.

13. A comminutor comprising two relatively movable members, cooperating cutting teeth on said members, one of said members being provided with a surface having recessed seats therein, each tooth on last said member comprising an elongated base portion adapted to be received within one of said seats, and a cutting portion projecting from and coextensive with the rear end of the base portion, said cutting portion continuing outwardly in alignment with said end of the base portion, said cutting portion having a cutting face comprising a plane surface substantially transverse to the longitudinal direction of the base portion, and an arcuate surface in continuation of said plane surface merging forwardly into the base portion, the teeth on said members being arranged to move past each other with an open angle between them.

14. A comminutor comprising a rotatable screen, cutting teeth on said screen at various locations therealong, and a series of cutter combs each adapted to cooperate with a plurality of teeth, each said cutter comb having a plurality of recesses through which the teeth pass in cutting relation, said cutter combs being arranged in an oblique series relative to the axis of rotation of the screen.

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