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ROTARY CUTTING, MIXING, AND ATTRITION MILL

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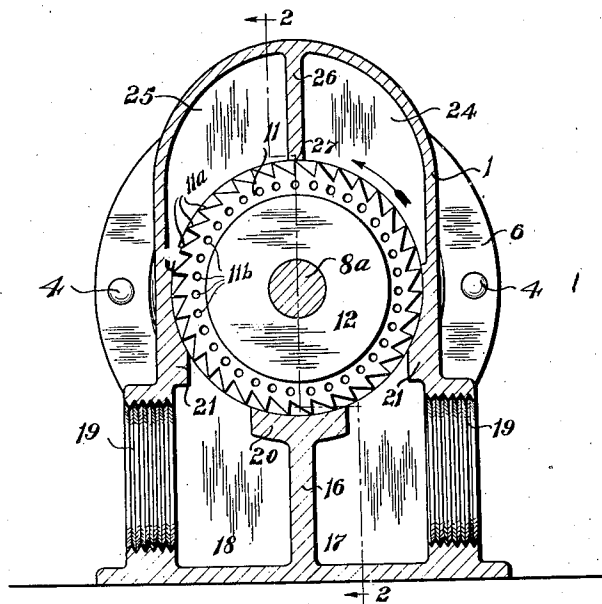


Fig. 1

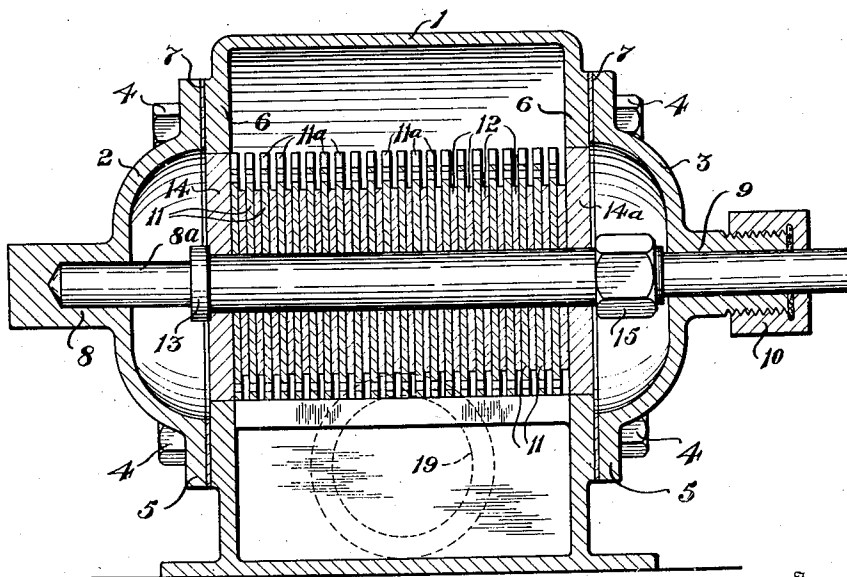


Fig. 2

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ROTARY CUTTING, MIXING, AND ATTRITION MILL

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The invention relates to mills for pulverizing, breaking up, mixing and screening the heavy particles of oils, paints, pigments and other mineral, vegetable and animal matter in fluid state or which will flow and capable of being ground and mixed with water, oils or other liquids.

The object of the improvement is to provide an apparatus which will cut, grind and mix the heavy particles of the oil or other substance to such an extent that it is thoroughly mixed of the same consistency and in condition to flow freely through pipe lines, valves and other parts such as included in the circulating system to an oil burner or the like.

Fuel oil, such as is used for oil burners and the like, comprises a considerable portion of sludge or heavy particles which will not freely flow through the circulating system and frequently clog the same, causing trouble and inconvenience.

The application of heat assists to some extent in dissolving these heavy portions of the oil and it is common practice to screen the oil, removing these heavy portions before the same passes to the burner.

The present invention contemplates the provision of mechanical means for entirely breaking up and pulverizing all of the heavy portions of the oil or other substance to such an extent that the oil may freely pass through the circulating system and be burned in the burners.

The objects of the invention may be attained by providing a housing within which is located a plurality of rotary saws or perforated disks spaced by means of disks of less diameter than the saws, the housing having ribs provided with cutting edges for cooperation with the saws.

The action of the improved mill is the cutting, grinding and mixing by friction caused by the rotating parts, which is increased by saw teeth, or perforations, formed on or within the disks, or both.

An embodiment of the invention is illustrated in the accompanying drawing, in which

Figure 1 is a transverse vertical sectional view of the improved oil mill; and

Fig. 2, a longitudinal sectional view taken upon the line 2—2, Fig. 1.

Similar numerals refer to similar parts throughout the drawing.

The mill includes a housing 1 preferably located in horizontal position and of greater height than its width, as best illustrated in Fig. 1.

Caps 2 and 3 are connected to the opposite ends of this housing as by the cap screws 4 located through the flanges 5 of the caps and into the flange portions 6 of the housing, gaskets 7 being preferably located in the joints to prevent leakage of the oil there-through.

A bearing 8 may be formed in the cap 2 within which may be journaled one end of the shaft 8^a and a bearing 9 is formed in the cap 3 through which is journaled the other end portion of the shaft, a stuffing box 10 being preferably associated with the bearing 9 for providing an oil-tight joint.

A plurality of disks 11 is mounted upon the shaft 8^a, the disks being spaced by means of disks 12 of substantially the same thickness as the disks 11 and preferably of a diameter less than the disks 11.

A collar 13 is fixed upon the shaft, near one end thereof and a heavy disk 14 abuts the collar, the alternate disks 11 and spacing disks 12 being held between said heavy disk 14 and a similar disk 14^a by means of the clamping nut 15 upon the shaft.

Each disk 11 may be provided with cut-out portions such as the saw teeth 11^a around its periphery, or the perforations 11^b near its periphery, or with both as illustrated in the accompanying drawing; or if desired the saw teeth may be upon the spacing disks 12 and the disks 11 may be perforate or imperforate.

A pulley or the like may be fixed upon the protruding outer end of the shaft 8^a for operatively connecting the same to a motor or other suitable source of power whereby the shaft may be rotated in the direction of the arrow in Fig. 1 at a high rate of speed.

The lower portion of the housing is di-

vided, by means of a central partition wall 16 into the inlet and outlet chambers 17 and 18 respectively. Threaded bores 19 are provided in opposite sides of this lower portion of the housing for the connection of pipes whereby oil may be supplied to and discharged from the housing.

The upper end of the partition wall 16 is provided with the arcuate T-head 20, for contact with the circular saw blades 11, and two ribs 21, one at the inlet side of the mill and the other at the outlet side, are formed upon the inside of the housing. These ribs are machined to a close fit with the teeth of the saw blades.

The upper portion of the housing is divided into two attrition chambers 24 and 25, by means of the depending partition wall 26 having the lower cutting edge 27 for peripheral engagement with the disks 11.

In the operation of the mill, oil or other substance is fed to the inlet chamber 17 and passes upward between the adjacent rib 21 and the disks, the heavy particles thereof being broken up, pulverized, mixed and screened.

It will be seen that room is provided at the top of the casing, to allow the flow of oil or the like to slow down to a speed at which it is ground or milled by attrition within the chamber 24, after which it passes beneath the cutting edge 27 to the chamber 25.

The material then passes down between the other rib 21 and the disks, into the outlet chamber 18 from which it is discharged through the pipe connected thereto.

By revolving the disks at high speed, in the direction indicated in the drawing, the action of the mill assists the usual pump in the circulating line, by supplying a momentum by the cutting action and attrition of the disks.

By separating the disks 11, by means of the disks 12, it will be seen that oil can be pumped through the mill while running or while at rest.

This mill may be located on either the suction or pressure side of a circulating pump and it should be understood that it does not replace the pump but aids the work of pumping by the cutting, grinding and milling effect, reducing the heavy particles of oil and the like to the consistency of free flowing liquid.

From the above it will be seen that since all of the oil passing through the circulating system must pass between the disks and each of the ribs 21, all heavy particles in the oil will be broken up, thus providing a free flow of the oil through the circulating system and permitting all of the oil to be burned as fuel.

It will be obvious that there will be a dissolving action of the heavy particles of oil or other substance due to the generation of heat

resulting from the breaking and cutting up of the oil particles.

It will also be seen that since all of the working parts of the mill are entirely surrounded by the oil being milled, there will be an automatic lubrication of all such parts.

I claim:

1. A rotary mill including a housing, a plurality of revolving disks within the housing, cutting edges upon the interior of the housing in close contact with the peripheral portions of the disks, and means for passing oil and the like through the housing between the disks and said cutting edges.

2. A rotary mill including a housing, a plurality of revolving disks within the housing, cutting edges upon the interior of the housing in close contact with the disks, and means for passing oil and the like through the housing between the disks and said cutting edges, the housing being enlarged between said cutting edges whereby the oil flow is slowed up, producing an attrition and mixing of the oil.

3. A rotary mill including a housing, a revolving shaft within the housing, a plurality of disks upon said shaft, spacing disks located between said first named disks, and cutting edges upon the interior of the housing in close contact with the peripheral portions of said disks.

4. A rotary mill including a housing, a revolving shaft within the housing, a plurality of disks upon said shaft, spacing disks of less diameter than the first named disks, located between said disks, and cutting edges upon the interior of the housing in close contact with the peripheral portions of said first named disks.

5. A rotary mill including a housing, a plurality of revolving disks within the housing, cutting edges upon opposite sides of the interior of the housing in close contact with the disks, a partition dividing the portion of the casing beneath the disks into two compartments and means for admitting oil and the like to one of said compartments and discharging the oil from the other compartment after it has passed between the disks and said cutting edges.

6. A rotary mill including a housing, a plurality of revolving disks within the housing, cut-out portions in the disks, cutting edges upon the interior of the housing in close contact with the peripheral portions of the disks, and means for passing oil and the like between the disks and said cutting edges.

7. A rotary mill including a housing, a plurality of revolving disks within the housing, saw teeth on the disks, cutting edges upon the interior of the housing in close contact with the peripheral portions of the disks, and means for passing oil and the like between the disks and said cutting edges.

8. A rotary mill including a housing, a

plurality of revolving disks within the housing, perforations in the disks, cutting edges upon the interior of the housing in close contact with the peripheral portions of the disks, and means for passing oil and the like between the disks and said cutting edges.

9. A rotary mill including a housing, a plurality of revolving disks within the housing, a plurality of cutting edges upon the interior of the housing in close contact with the peripheral portions of the disks, corresponding attrition chambers within the housing, and means for passing oil and the like between the disks and cutting edges and through said chambers.

10. A rotary mill including a housing, partition walls dividing the housing into a plurality of chambers and provided with cutting edges, a rotary cutter within the housing in close running contact with the cutting edges, and means for passing oil and the like through the rotary cutter and over the cutting edges, progressively through said chambers, the rotation and attrition of the cutters imparting a whirling motion to the oil in the chambers causing the heavy particles of the oil to flow toward the rotary cutter by the centrifugal force set up in the chambers.

In testimony that I claim the above, I have hereunto subscribed my name.

ROBERT C. HOPKINS.

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