Oct. 21, 1930. H. M. SPROSS 1,779,296

CENTRIFUGAL APPARATUS

Filed March 25, 1927 2 Sheets-Sheet 1

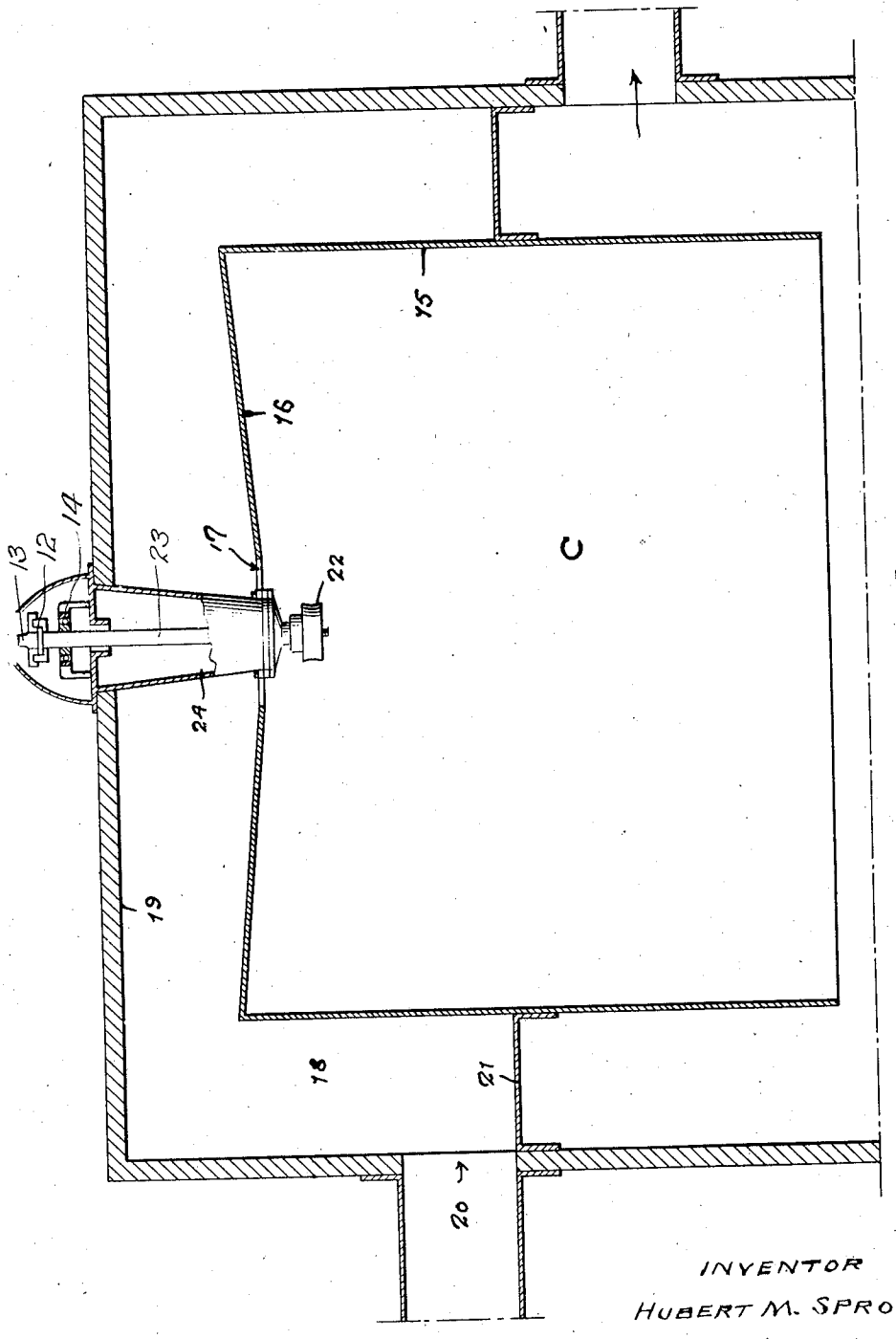


Fig. 1

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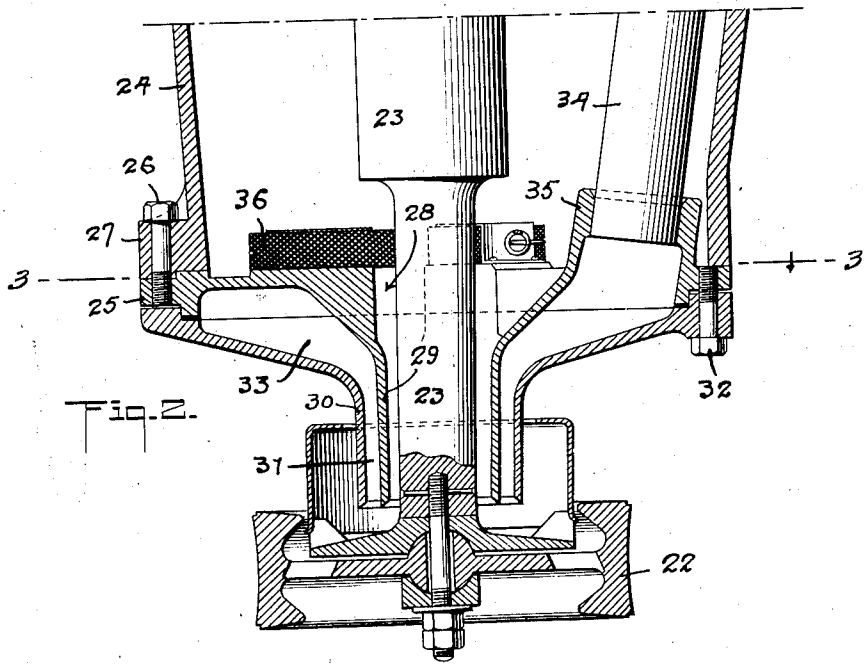


Fig. 2.

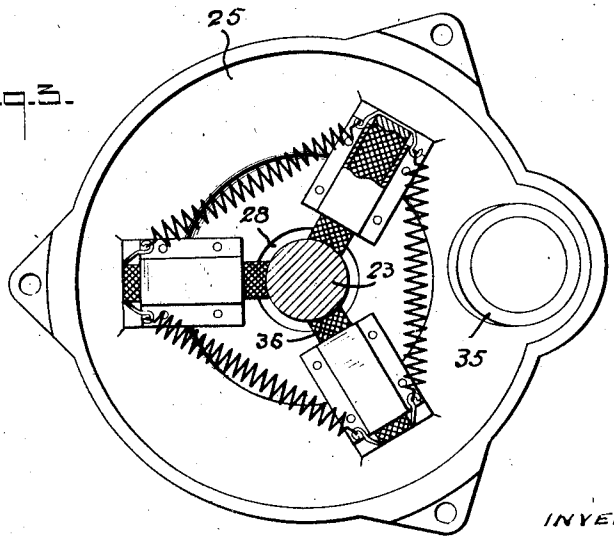


Fig. 3.

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UNITED STATES PATENT OFFICE

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CENTRIFUGAL APPARATUS

Application filed March 25, 1927. Serial No. 178,224.

My invention relates to centrifugal apparatus, and while applicable in certain of its aspects to centrifugals of various types, is particularly useful in connection with centrifugal nebulizers which discharge fluid in finely divided condition into a surrounding gaseous current. Among the various objects of my invention may be mentioned (1) an improved feed of the fluid to the nebulizer unit; (2) the protection of associated portions of the apparatus from the deposit of solids thereon; (3) the construction of the feeder to facilitate interior cleaning and the substitution of parts. Other features of advantage will also appear from the following description, or from an inspection of the accompanying drawings, in which—

Fig. 1 is a vertical section through apparatus in which my invention is embodied in one form;

Fig. 2 is an enlarged section through the feeder portion of the apparatus; and

Fig. 3 is a transverse section on the line 3—3, Fig. 2.

While my invention presents features which are of value in centrifugal apparatus of various types, I have shown it, by way of illustration, embodied in an installation which comprises a chamber through which a current of gas is drafted, and into which a fluid, that is a freely flowing liquid, a slow flowing mud, or a substance of intermediate consistency, is centrifugally dispersed in finely divided condition.

I have indicated more or less diagrammatically an open bottom chamber C, formed by cylindrical side wall 15 and closed top 16, the latter apertured at 17 to admit a current of gas from the passage 18 formed between the side wall and top of the chamber and the surrounding casing structure 19. The current of gas, generally preheated, but cold if the character of the fluid renders this desirable, may be introduced through port 20 above an annular diaphragm 21 which compels the gases to pass upward around the side wall 15, across the top diaphragm 16, and downward through port 17 to the interior of the chamber.

The centrifugal nebulizer 22 arranged within chamber C below port 17 and centrally with respect to the latter, is mounted at the lower end of a vertical shaft 23, which is suspended from a combined radial and axial thrust bearing 14, to permit gyration. The bearing is supported in any suitable manner upon the casing 19. The gyratably mounted shaft 23 is connected at its upper end, by means of a coupling 12, with a driving spindle 13 which is mounted in bearings without freedom for gyration. The spindle 13 is driven at its upper end by any suitable means capable of imparting thereto very rapid rotation, say 10,000 R. P. M. The shaft passes downward freely through a conical housing 24, also supported from the casing 19 and extending downward through the gas-entry port 17 into the chamber C.

At the lower end of the housing 24 is arranged a feeder adapted to deliver to the centrifugal nebulizer 22 an annular stream of fluid. The feeder comprises a plate 25 removably secured, as by screws 26 and tapped bosses 27, at the lower end of the housing 24, which it closes except for the central aperture 28 through which the lower end of the shaft 23 passes with sufficient clearance to permit gyration. Extending downward from the inner periphery of the plate 25, and spaced from the shaft 23 for the same reason, is a cylindrical sleeve 29 which terminates in proximity to the nebulizer unit 22. A second sleeve 30 surrounds the sleeve 29 and is spaced therefrom to afford an annular feed channel 31 through which the fluid is led to the nebulizer 22. The sleeve 30 is upwardly extended to the plate 25, to which it is secured by screws 32, but its upper portion is so shaped with respect to the adjacent face of the plate 25 that it forms therewith a closed feed chamber 33. To the latter the fluid to be dispersed is led in any suitable fashion, for example by a supply pipe 34 passing down through the housing 24 and opening to the feed chamber 33 through a boss 35 formed on the plate 25.

A feeder of this construction has the marked advantage that it supplies fluid to the nebulizer 22 in an annular stream surrounding its normal axis of rotation and substan-

tially concentric therewith. The nebulizer 22 is thus uniformly and simultaneously weighted at all points around its axis by the incoming fluid under treatment. Not only is an unbalanced condition of the nebulizer thus prevented (a condition which unavoidably results when the feed is in a stream which discharges to one side only of the unit), but the dispersal of the fluid therefrom is uniform at all points around its periphery.

As an important incident to the feed of the liquid in an annular stream to the nebulizer unit, it will be noted that a fluid curtain is formed between the lower end of the annular feed channel 31 and the surface of the nebulizer unit against which it impinges. Consequently solid fines, floating in the gaseous current which surrounds the unit, cannot possibly enter the interior of the housing 24, and not only is the spindle 23 preserved from the deposit thereon of solids, which may tend to unbalance it, but such apparatus as may be arranged within the housing 24 and above the latter is maintained absolutely clean.

This preservation of the interior of the housing 24 against entrance of solid fines, is important in connection with the operation of the gyration brake blocks 36. It will be noted that these lubricated blocks which form the gyration brake are mounted above the plate 25 upon which they rest. They are thus located within the housing and their operation is never impeded by reason of fouling from deposit of fines thereon. A much freer and more certain operation of the blocks is thus assured. Moreover the location of the gyration brake within the housing and above the feed funnel 33 protects the blocks from exposure to high temperature, if the gases which enter the chamber 16 through the port 17 are heated, and the lubricant carried by the blocks therefor remains in good condition, unaffected by the heat of the gas (if a heated gas is used). It may also be pointed out that the material entering through the feed chamber 33 must always be in fluid form, that is to say below its vaporization temperature. The brake blocks which are directly in contact with the wall 25 of the feed chamber are not ordinarily heated to a temperature above that of the fluid, whereas the gases, when heated, are generally at much higher temperature.

Again, the drafting of the gas through the diaphragm 16 and the current of liquid discharged from the annular feed channel 31 create a suction effort downward through the housing 24, and a current of cool air flows constantly past the brake blocks and into the area between the sleeve 29 and the spindle 23, thus affording further means for preserving a relatively low temperature within the housing.

The division of the liquid feed chamber into upper and lower sections 25 and 30, permits the ready removal of the lower plate 30 for cleaning. Moreover, if a feed chamber of different shape is desired, for a fluid of different character, it is a simple matter to replace the plate 30 by another, which in cooperation with the plate 25 suitably shapes the feed chamber to the fluid under treatment, as well as the diameter of the annular feed channel 31, through which discharge to the nebulizer unit 22 occurs.

I also draw attention to the detail that the lower margins of the spaced tubular necks of the upper and lower plates of the feed chamber are outwardly beveled at 37, the purpose of which is to prevent the drag of the fluid by capillary action toward the vertical shaft, with resultant fouling and possible unbalance of the latter. For this purpose the outwardly beveled lower margin of the inner tubular member is of more importance than that of the outer tube, but I prefer to bevel both margins so as to insure a clean discharge from the lower end of the feed passage.

Apparatus of the character illustrated may be utilized for the nebulization of fluids which are injurious to iron and steel. To take care of this situation I prefer to make the feeder of bronze, or other chemically inert material which is not subject to attack by acids. It may even be made of glass or porcelain.

In operation the fluid passing into the feed chamber from pipe 34 completely fills the chamber so that annular discharge through the feed passage is always assured. Under certain conditions it may even be desirable to place the material in the feed chamber under pressure applied at a point above the feed pipe 34. This is particularly true when handling muds, or other fluids which do not freely flow. In any event, the liquid in the feed chamber and annular delivery passage leading to the nebulizer, as well as during its flow in the form of an annular curtain from the feeder to the nebulizer, is subjected directly or indirectly to the heat of the incoming gases. The temperature of the liquid is thus raised before the liquid is actually dispersed by the nebulizer, and it is thus brought into condition for more complete absorption of moisture therefrom by the gaseous current. Thus the liquid serves not only to protect the apparatus from the heat of the gas while it is itself being heated, but also to form a protective curtain which excludes fines from the shaft and equipment arranged within the housing.

It will be understood that in the following claims I use the expression "fluid" in a sense broad enough to include a freely flowing liquid, or a slow flowing mud or paste, in fact any material which may pass through the feeder by gravity, or under pressure.

The construction shown is but an illustra-

tion of the thoughts which underlie my invention, and which may be embodied in various structures without departing from what I claim as my invention.

I claim—

1. The method of feeding fluid to a gyratable centrifuge, which comprises supplying the fluid to the centrifuge in the form of an annular stream substantially coaxial with the normal axis of rotation of the centrifuge but radially spaced therefrom.

2. Centrifugal apparatus comprising a rotor for centrifugally dispersing a material in finely divided condition, a gyratably mounted driving spindle therefor and a feeder delivering thereto comprising a fixed annular feed channel around the said spindle and adapted to deliver to the latter an annular stream substantially coaxial with its center of gyration.

3. Centrifugal apparatus comprising a centrifuge, a vertical shaft supporting the same and mounted for gyratory movement, a housing for the shaft, a closure member for the lower end of the shaft, said closure member being ported to permit passage of the shaft therethrough with freedom for gyration, together with a gyration brake mounted on the inner face of said closure member and engaging the shaft to restrict its gyratory movement, and means below said closure member for feeding to said unit an annular stream surrounding the shaft to form a liquid curtain seal against the entry of fines to the interior of the housing.

4. The combination with a centrifuge of a vertical, gyratably mounted, shaft by which it is suspended, and a feeder surrounding the shaft but radially spaced therefrom to permit shaft gyration, said feeder being shaped to deliver an annular stream of fluid to the centrifuge and to entrain a current of another fluid between the shaft and the feeder, and a gyration brake located in the path of the entrained fluid.

5. Apparatus comprising a centrifuge, a gyrating shaft carrying the same, a gyration brake associated with the shaft, and means utilizing the entraining force of the liquid to be centrifuged for cooling said gyration brake.

6. Apparatus comprising a centrifugal unit, a suspended gyrating shaft at the lower end of which said unit is mounted, a gyration brake for the shaft, a support for the brake, and means for leading in contact with said support the liquid to be centrifuged.

7. The method of protecting from excessive heat certain of the moving parts of a centrifugal atomizer located within a casing in a heated atmosphere and of simultaneously pre-heating the liquid to be atomized, which consists in causing the liquid that is to be atomized to flow along the inner surface of the outer wall of said casing and simultaneously directing the flow of the heated gases along the other side of said wall whereby there is heat interchange through said wall.

8. In combination, a vertical gyratably mounted spindle, an annular rotor driven thereby, a fluid supply conduit surrounding said spindle for at least a portion of its length and spaced therefrom to permit gyratory movement thereof, and a gyration brake mounted on the inward exterior side of said conduit, whereby heat generated in said brake may be transferred to the liquid.

9. An apparatus comprising an atomizing rotor, a shaft therefor, an annular conduit for the fluid to be atomized, said conduit surrounding the shaft, and means for guiding the gas, in which the fluid is to be atomized, adjacent the outer wall of said conduit whereby heat interchange may occur through said outer wall between the fluid and the gas.

10. An appartus comprising a rotor, a driving spindle therefor, annular walls forming a supply conduit to the rotor, said walls being spaced from the spindle and from each other, the margin of the inner wall adjacent the rotor being outwardly beveled.

11. An apparatus comprising a rotor, a driving spindle therefor, annular walls forming a supply conduit to the rotor, said walls being spaced from the spindle and from each other, the margins of said walls adjacent the rotor being outwardly beveled.

In testimony whereof I have signed my name to this specification.

HUBERT M. SPROSS.