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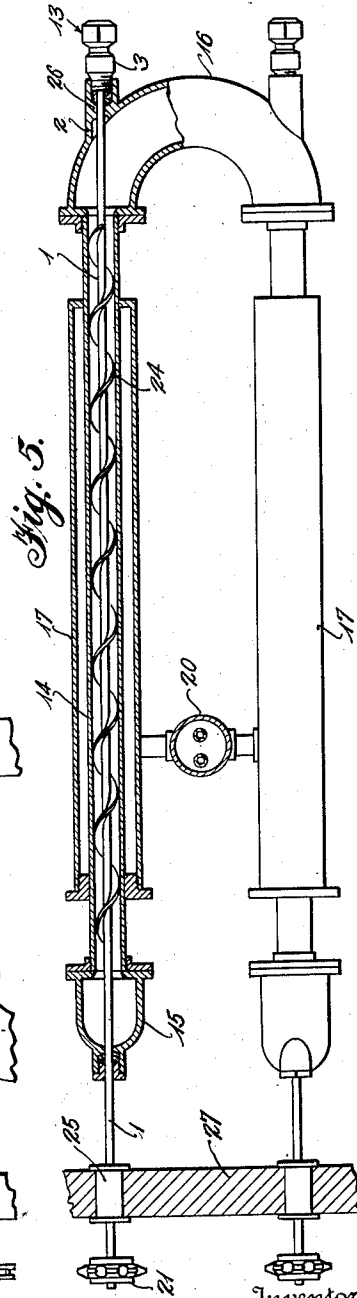
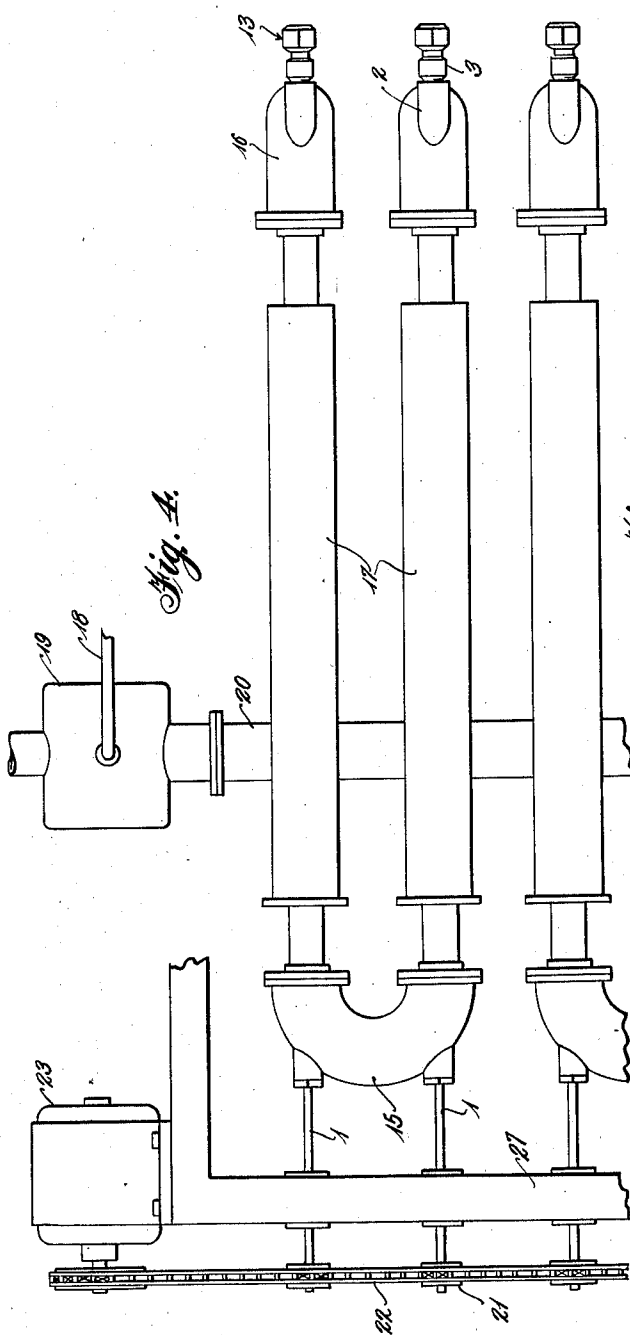
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ROTATION INDICATING DEVICE

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2 Sheets-Sheet 2



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ROTATION INDICATING DEVICE

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2 Claims. (Cl. 62—1)

This invention has to do with devices for indicating the rotation of shafts and the like, and has particularly to do with devices capable of showing the motion of relatively slow moving shafts under conditions of low visibility and high pressure.

It is particularly applicable to a certain type of machine, viz., a double pipe heat exchanger, known as a "Carbondale chiller", used in the oil industry for the chilling of solutions of oils containing petroleum wax in order to crystallize the wax and render it separable from the oil by filtration. These Carbondale chillers consist essentially of a number of horizontal runs of a double pipe heat exchanger stacked one above the other, each horizontal run consisting of an internal pipe, usually six inches in diameter, through which the oil passes, surrounded with an outer pipe, usually eight inches in diameter, a refrigerating medium such as brine, cold oil, or ammonia being circulated in the annular space between the two pipes. Appropriate connections, as by means of return bends, are made at either end of each horizontal run, so that oil and brine may flow in their proper paths in series through a number of such pipes. Inside each six-inch pipe there is installed a shaft extending throughout the length of the six-inch pipe and extending from it at either end. Upon the portion of this shaft which is within the six-inch pipe, there is placed a "scroll" or helix, or any other convenient form of helical or straight metal scraper. The purpose of this scraper is to continuously remove deposited crystallized wax from the inner surface of the heat exchange surface, to keep such crystallized wax at all times in proper admixture with the flowing mother liquor, and to assist in the movement of the slurry of wax and oil through the machine. To drive this scroll one external end of the shaft is fitted with a sprocket which is chain driven. Since it is highly important that these scrolls continue to turn to prevent blocking and shutdown of the apparatus, and since the nature of their work is such that they may encounter unusual loads, it is customary to extend the opposite end of the shaft outside of the pipes in which they are mounted, and the extending ends of such shafts are observed periodically to see that all is in order within the machine. In customary past practice, it has been sufficient to pass the extended "back" end of the shaft through an ordinary gland or stuffing box of simple design, and where the mixture within the chiller was the usual wax-oil-

naphtha-mixture no great leakage was experienced.

Recent changes in the wax handling art have brought about the use of mixtures within the chiller which have a very much lower viscosity at the temperatures encountered than the wax-oil-naphtha-mixture mentioned above. Additionally, since these less viscous mixtures are attained by the use, instead of naphtha, of substances such as benzol and acetone, or methyl-ethyl-ketone, there is added to the problem of leakage the complication raised by the escape of toxic materials into the atmosphere of the plant wherein the equipment is housed.

It is an object of this invention to provide a rotation indicating device capable of effectively sealing the area within which the indicator operates against access to the atmosphere and at the same time to provide a device which is able to give positive evidence of indication at low speeds and under highly adverse conditions of visibility.

In order to more readily understand this invention, reference is now made to the drawings attached to this specification, in which Figure 1 is a longitudinal view partially in section of the device, Figure 2 is another longitudinal view partially in section taken at an angle of 90° to Figure 1, Figure 3 is an end view partially in section, Figure 4 is a side elevation of a portion of a chilling apparatus showing the position of the indicating device thereon and, Figure 5 is a top plan view of a portion of a chilling apparatus partly cut away to show a helix therein. Referring now to Figure 1, we find shaft 1 protruding through sleeve 2, which forms or is formed upon some portion of the apparatus within which shaft 1 is mounted. Housing piece 3 is observed to extend around and enclose the end of shaft 1, this housing piece 3 being detachable, and is affixed to sleeve 2 by some fastening capable of withstanding pressure, as for example by threaded joint 4. As shown in the drawings, a reduction of the diameter of shaft 1 takes place at point 5 enabling the junction of housing piece 3 and the shaft at this point to form a thrust bearing for the purpose of centering the rotation of shaft 1 within the housing piece 3. This construction is optional, as no reduction need be made. Upon the outer end of the housing piece 3 there is mounted a sleeve nut or collar 6, which is externally shaped to receive a wrench end, and internally shaped to support a heavy glass disk 7 between washers 8 upon the outer end of housing piece 3. This disk 7 is conveniently made of glass, although where conditions of tem-

perature and pressure dictate the choice of other materials, any suitably transparent material may be used. Within the housing piece 3, we find that the reduced external end of shaft 1 is formed with a slot 9 of appreciable width, within which is mounted a flat vane 10, and that this vane 10 is continuously urged into contact with the glass disk 7 by a spring 11, which spring is compressed between the inward end of vane 10 and the bottom wall of the inner cavity in housing piece 3, or against any other suitable anchorage. It is noted that the slot 9 is of sufficient depth so that the vane 10 may be depressed thereinto a somewhat greater distance than is necessary to break contact with glass disk 7.

Referring now to Figure 2, which is the same as Figure 1, except that the section is taken at a point 90° removed from the plane of the section in Figure 1, we have a side view of the device with the outer portions in section, showing the internal relationship between shaft 1, vane 10, glass disk 7, and spring 11. A preferred variation of structure is shown here in that washer 12 is provided as a seat for spring 11.

Turning now to Figure 3, which is an end view, partially in section, we may see both the position of vane 10 shaft 1, and spring 11 within the housing and the external appearance of the device wherein the end of vane 10 may be seen pressing against the inside of glass disk 7. Vane 10 is preferably made of a soft metal or other materials impervious to the liquid in which it is placed, and having a color contrast with that liquid. It should not be a material abrasive to disk 7.

In the preferred form of construction shown in Figure 2, the vane 10 is held against the glass disk 7 by spring 11, which in turn rests upon washer 12. Thus assembled, the pressure of the vane against the disk can be accurately preadjusted, and thereafter will not be subject to variations caused by axial movement of shaft 1.

In operation this device has proven itself invaluable for the indication of motion of shafts revolving in opaque materials, slurries, or other media wherein it is difficult to see an object immersed even a relatively short distance within the liquid. In operation the spring 11 urges the vane 10 against the disk 7. As the shaft 1 turns, vane 10 cleans from the inner surface of disk 7 any material which may be deposited thereon and thus makes a sufficiently clear contact with disk 7, so that its position may be observed even in relatively poor light, thus giving all of the positive indication available in any rotation indicating device depending upon a shaft extending from within the device into the atmosphere, and at the same time preventing escape of the material surrounding the shaft whose rotation is observed into the surrounding atmosphere. With reference to Figures 4 and 5, the indicator shown in detail in Figures 1 to 3 inclusive is generally designated at 13, being threadedly connected to the sleeve 2 in the manner shown more in detail in the former figures. The chilling apparatus comprises a plurality of pipes 14 arranged in vertically spaced tiers through which the liquid to be chilled circulates. The pipes in each tier are connected by suitable elbows 15 while the pipes in one tier are connected to the pipes in the tier next therebelow by suitable elbows 16 so as to provide a continuous path for the circulation of the liquid to be cooled. Sur-

rounding the pipes 14 are refrigerant jackets, constituting the space defined by the pipes 14 and the pipes 17 and containing a suitable liquid refrigerant supplied from a source not shown through pipe 18 to accumulator 19 and from there down through distributor 20. Within the pipe 14 there is mounted a shaft 1 to which is keyed sprocket 21 driven through the medium of chain 22 actuated by motor 23. Along that portion of the shaft 1 operating within pipe 14 there is a helix 24 attached thereto for the purpose of assisting the circulation of the liquid to be chilled. It should be noted that this helix contacts the inner walls of pipe 14 and will act as a scraper therein. The shaft 1 is suitably journaled at 25 and 26. Journal 25 is made fast in insulating jacket 27. In operation, material to be chilled is pumped into the pipe 14 from a source not shown and is subjected to chilling as it passes through the superimposed tiers of the apparatus. Any material solidifying as a result of the chilling operation is scraped from the walls of pipe 14 by the helix 24 and is thus caused to be propelled along the pipe with the liquid material therein. It is to be noted that each of the shafts 1 will have surrounding one end thereof the indicator 13. Thus if any of the shafts 1 break, the breakage may be localized irrespective of the movement of its sprocket 21 by the use of the indicator 13.

I claim:

1. In an apparatus for the treatment of substances under pressure in which the substance treated undergoes a change which increases the likelihood of breakage of a moving part operating therein, and in which at least some of the materials in the apparatus would be dangerous if permitted to escape and would be deleteriously affected by the admission of air thereto, tubular passages through which the material is propelled, propulsion means in each of the passages, and means for driving each propulsion means, said propulsion means having a movable portion extending beyond its respective tubular passage and positioned within a chamber sealed against leakage to the exterior of the apparatus of said dangerous materials which may progress along the movable portion, said chamber having a wall which renders the movement of said portion discernible from the exterior of the chamber during the entire operation, whereby upon interruption in the operation of any of the propulsion means as a result of breakage the stoppage of the movable portion will be visibly indicated without the subjection of the atmosphere surrounding the apparatus to infiltration of said dangerous materials.

2. A mechanism for determining breakage of enclosed driven shafts of the type used in wax-chillers and the like, where driven shafts operate in series, comprising a plurality of driven shafts the rotation of which is to be observed, a sealed housing surrounding one end of each of said shafts, a transparent sight window in each of said housings, a vane interiorly adjacent each of said sight windows and keyed to its respective shaft, and means to maintain said vanes in wiping contact each with its respective window at a constant predetermined pressure irrespective of normal variation in axial position of respective shafts responsive to thrust, whereby when a shaft is broken the failure may be readily localized with respect to the system.

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