

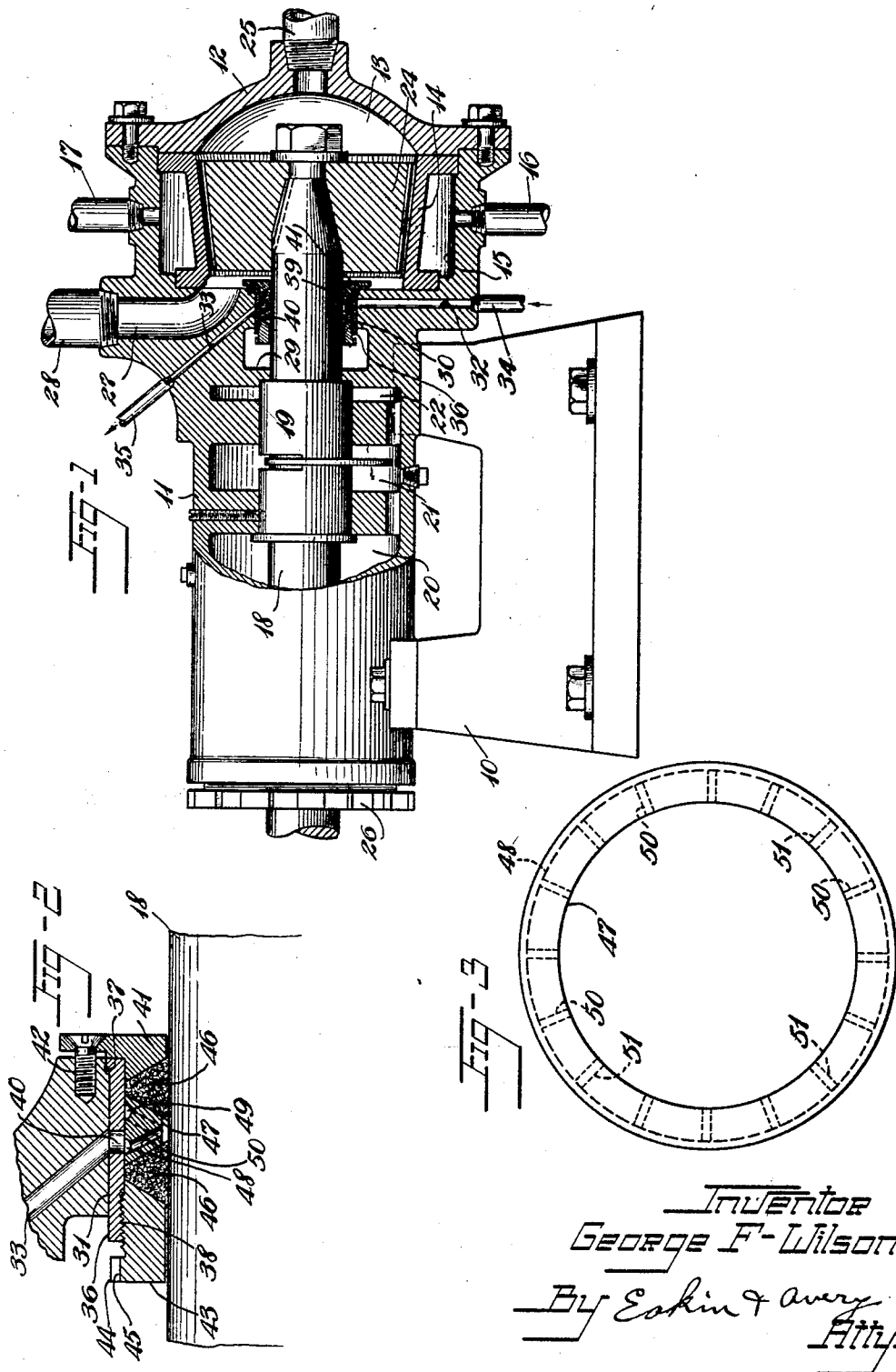
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STUFFING BOX

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## UNITED STATES PATENT OFFICE

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## STUFFING BOX

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This invention relates to stuffing boxes, and especially to stuffing boxes used on the shafts of machines for grinding abrasive material or the like in which situation it is important that none of the material being ground passes the stuffing box and gets into the bearings of the shaft.

The chief objects of the invention are to prevent solid material from passing between the stuffing box and the shaft; to prevent scoring of the shaft by said material; automatically to remove any solid material which may pass through the stuffing box; and to cool the shaft and stuffing box.

The forgoing objects are accomplished by means of a stuffing box employing fluid pressure of such magnitude as to create a differential of fluid pressure on opposite sides of the stuffing box, which pressure is greatest on the opposite side of the box from the material being ground. The result is that in case of wear in the packing of the stuffing box, fluid will flow from the latter instead of into it and the entrance of solid matter is prevented. The fluid in the stuffing box preferably is maintained in circulation so that it serves as a cooling medium, and it also serves to carry away any solid material which may work its way through the box against the fluid pressure during an interval of abnormal pressure in the grinding chamber.

Of the accompanying drawings:

Fig. 1 is a vertical longitudinal section through grinding apparatus embodying my invention in its preferred form, a part being in elevation.

Fig. 2 is a sectional detail, on a larger scale, of the stuffing box therein.

Fig. 3 is a detail side elevation of an element of the stuffing box.

Referring to the drawings, 10 is a base casting, 11 the housing, and 12 the cover of a grinding or comminuting machine of known construction adapted especially for wet grinding the housing being formed, behind the cover 12, with a grinding chamber 13 in which is mounted the stator member 14 of the grinding mechanism. The stator 14 comprises an annular, rearwardly-tapered struc-

ture having its inner periphery roughened or corrugated, and is spaced from the surrounding housing structure to provide a water jacket 15 of which 16 is the inlet pipe and 17 the outlet pipe thereof. A driven horizontal shaft 18 is journaled in the housing 11 in a sleeve bearing 19 and in other bearings (not shown), and the housing is formed with chambers 20, 21, and 22 for containing the lubricating oil for said bearings. Mounted upon the end of the shaft 18 in the grinding chamber 13 and concentric with the stator 14 is a frusto-conical grinding rotor 24 which has a roughened or corrugated periphery adapted to cooperate with the corrugated surface of the stator to grind material fed into the grinding chamber 13 through an inlet pipe 25. The shaft 18 is adjustable axially by means of the threaded member 26 to vary the clearance between the rotor 24 and the stator 14, and an outlet passage 27 formed in the housing 11 and communicating with the rear of the chamber 13 and with a pipe 28 is provided for carrying off the comminuted material. A through passage 29 extending transversely of the housing 11 is formed therein between the chambers 13 and 22, and my improved stuffing box, designated 30, is mounted in an aperture 31 in the housing wall between the chamber 13 and passage 29, surrounding the shaft 18. Passages 32, 33 extending through the wall of the housing 11 intersect the aperture 31 at top and bottom near the middle thereof but in different vertical planes, the outer ends of said passages communicating respectively with a fluid supply pipe 34 and a drain pipe 35. As shown in Fig. 1, the passage 32 and pipe 34 are of greater capacity than the passage 33 and pipe 35.

The stuffing box 30 comprises an annular bushing 36 mounted in the aperture 31 and having one of its ends formed exteriorly with a circumferential flange 37 seated in a complementary counterbore in the aperture 31 and having its opposite end extending into the passage 29 and formed interiorly with a screw thread 38. The bushing 36 is formed with centrally-positioned apertures 39, 40 registered with the passages 32, 33.

The flanged end of the bushing 36 is closed by an annular cap 41 which telescopes with the end portion of the bushing and is secured in place by screws such as the screw 42, or by any other suitable means. The end face of the cap 41 which lies within the bushing 36 is sloped outwardly in the direction toward its inner periphery.

The other end of the bushing 36 is closed by a gland 43 which is threaded into the screw thread 38. The outer end of the gland 43 is formed exteriorly with a circumferential flange 44 of somewhat smaller diameter than the aperture 31, and said flange is formed with a plurality of spaced-apart notches, such as the notch 45, by which the gland may be engaged by a spanner wrench, inserted in the passage 29, for tightening or loosening it. The end face of the gland 43 which lies within the bushing 36 is sloped outwardly in the direction toward its inner periphery.

Mounted in bushing 36 between the cap 41 and gland 43 are a pair of annular, spaced-apart packing members 46, 46, which in cross-section are V-shaped, being tapered toward their outer peripheries. Positioned between the packing members is an annular, complementally-shaped, metal spacer-ring 47 the outer periphery of which snugly fits within the bushing 36, its inner periphery being spaced from the shaft 18 to provide a passageway for fluid therebetween. The arrangement is such that when the gland 43 is set up against the adjacent packing member 46, both packing members will be compressed and urged radially inward against the shaft 18.

The spacer-ring 47 is formed in its outer periphery with a pair of parallel circumferential grooves 48, 49 which intersect the respective apertures 39, 40 of the bushing 36 when the spacer ring is mounted therein. A plurality of radial-passages 50, 50 are formed in the ring 47 extending from the circumferential groove 48 to the inner periphery of the ring, parallel to the adjacent side of the latter, and a similar series of passages 51, 51 extend from the groove 49 to the inner periphery of the ring, the passages 50 and 51 being positioned in alternation circumferentially of the ring.

The stuffing box functions in the following manner. With the various parts assembled as shown and described, and the shaft 18 being driven to drive the rotor 24 and thereupon to comminute the solid matter in a wet mix fed into the grinding chamber 13 through the inlet pipe 25, water under pressure is admitted through the pipe 34 and passes through the passage 32, aperture 39, groove 49 and passages 51 into the space between the shaft 18 and spacer-ring 47. The water flows out from said space through the passages 50, groove 48, aperture 40, passage 33 and drain pipe 35. The alternate positioning of the

passages 50, 51 induces a circulation of the water in the space between the spacer-ring 47 and shaft 18 circumferentially of the latter.

The passage 33 being smaller than the passage 32, the flow of water is retarded thereat and excess pressure is built up in the stuffing box. Said pressure is maintained somewhat higher than the normal pressure of the wet mix in the grinding chamber 13 with the result that when the packing 46 becomes so worn as normally to permit leakage of the mix along the shaft into the stuffing box, such tendency is overcome by the greater pressure of the water in the latter.

The arrangement prevents solid matter in the mix from passing the stuffing box and getting into the shaft bearings which would result in scoring of the shaft. The water circulating in the bearing keeps the bearing cool, and carries away any matter which may be forced past the packing 46 during an interval of abnormally high pressure of the mix in the grinding chamber 13.

The invention may be variously modified within the scope of the appended claims.

I claim:

1. In a stuffing box assembly the combination of a shaft, a stuffing box therefor, a pair of packing members in the stuffing box for confining fluid on one side thereof, a spacer-ring positioned between said packing members and standing clear of the shaft so as to define a passage for fluid thereabout, and means for conducting fluid to and from the spacer-ring, said spacer-ring being provided with means adapted to prevent the flow of fluid from the inlet to the outlet except by way of the passage, to effect circulation of the fluid within the passage and being formed on its outer periphery with a pair of circumferential grooves in communication with the fluid inlet and outlet respectively, and having a plurality of radially-directed fluid passages extending from said grooves to the inner periphery of the ring, the fluid passages from the respective grooves being disposed in alternation circumferentially of the ring.

2. In a stuffing box assembly the combination of a shaft, a stuffing box therefor, a pair of packing members in the stuffing box for confining fluid on one side thereof, a spacer-ring having a plurality of fluid-conducting channels and being positioned between said packing members and standing clear of said shaft so as to define a passage for fluid thereabout, and means for conducting fluid to and from said passage, said spacer-ring being provided with flow-restricting lands between its channels for effecting positive circulation of the fluid through said passage in contact with the shaft.

3. In a stuffing box assembly the combination of a shaft, a stuffing-box therefor, a pair of packing members in the stuffing box for

confining fluid on one side thereof, a structure including a spacer ring positioned between said packing members and defining with said shaft a passage for fluid there-  
5 about, said structure being formed with inlet and outlet channels communicating with said passage, at least one of said channels being circumferentially disposed with respect to the shaft, and means to prevent the flow  
10 of fluid from the inlet to the outlet channels except by way of said passage.

In witness whereof I have hereunto set my hand this 27th day of September, 1928.

GEORGE F. WILSON.

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