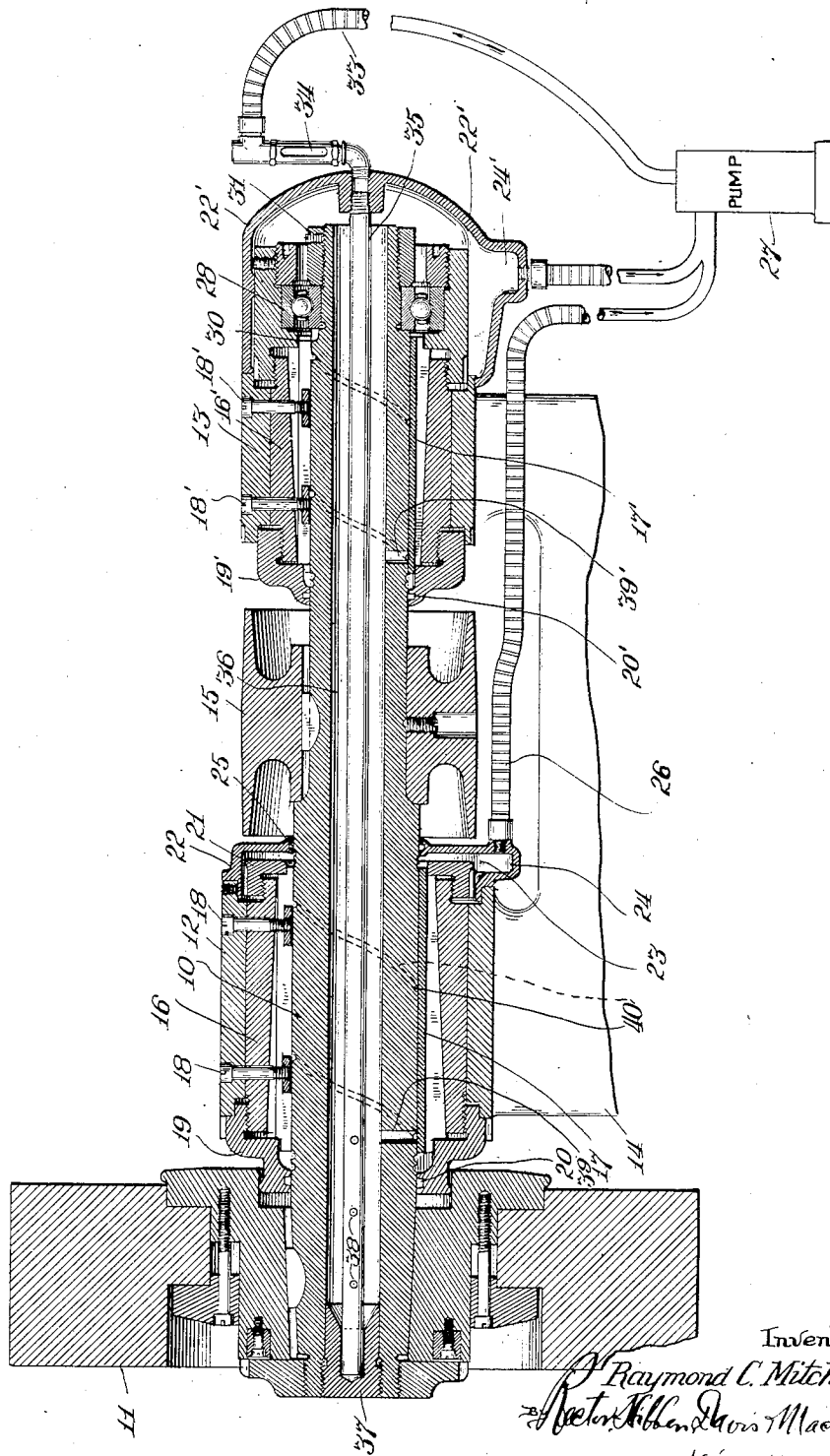


R. C. MITCHELL.
SPINDLE COOLING AND LUBRICATING MEANS.
APPLICATION FILED AUG. 16, 1920.

1,404,538.

Patented Jan. 24, 1922.



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UNITED STATES PATENT OFFICE.

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Specification of Letters Patent. Patented Jan. 24, 1922.

Application filed August 16, 1920. Serial No. 403,998.

To all whom it may concern:

Be it known that I, RAYMOND C. MITCHELL, a citizen of the United States, residing at Springfield, in the county of Clark and State of Ohio, have invented certain new and useful Improvements in Spindle Cooling and Lubricating Means, of which the following is a specification.

My invention relates to spindle-cooling and lubricating means, and provides a shaft-mounting, cooling and lubricating construction that may desirably be employed in grinding machines and kindred high-speed mechanisms, for increasing their efficiency and accuracy by obviating the many troubles due to heating of the grinding wheel shaft or spindle. It is well known that grinders, being usually operated at high speeds and often called on for continuous service and heavy duty for long runs, must have long grinding-wheel-spindle bearings and that the spindles must fit snugly to maintain the necessary accurate centering of the grinding wheel. Spindles, so snugly mounted, are hard to lubricate and are subject, therefore, to rapid deterioration by "barking," scaling and rapid wear on account of the heating of the shaft bearing. The snug bearing is initially conducive to deterioration and this tends accumulatively to grow worse, since initial heating up of the parts tends to cause expansion that will tighten the bearing and so increase the initial heating and wearing action. To overcome these difficulties I purpose to cool the grinding wheel spindle internally by the positive circulation therethrough of a cooling liquid that is also a good lubricant and by connecting the circulation passages with the bearing surfaces so that I secure both force-feed and cooling action by the same construction.

In the drawing the single view is a longitudinal section through a grinding-wheel spindle, showing pump connections diagrammatically, 10 indicates a high-speed spindle carrying the grinding wheel or other working element, at one end, and receiving support and bearing from the separated bearing-heads 12 and 13 of a supporting bracket 14. Between said heads the exposed central part of the spindle carries the driving pulley 15.

Of course as to the bearings proper, in heads 12 and 13, these may be of various

constructions, the bearing within the head 12 being shown as made up of an internally tapered sleeve 16 receiving the longitudinally-split brass element 17, of any desired known construction, these parts being held in assembled relation by the bolts 18. The front end of the bearing is closed by a cap 19 carrying a packing 20 and threaded onto the end of the sleeve 16. Ring 21 is threaded onto the rear end of the sleeve 16 and beyond this a hood 22 is provided, secured to the head structure 12 and enclosing an oil chamber 23 that is shaped into a depression or well 24 at its bottom. The hood 22 is packed as at 25. A pipe 26 connects the well 24 to the intake of a pump diagrammatically indicated at 27.

The other bearing, 13, may be of similar construction as the sleeve 16', brass 17', bolt 18', cap 19', all made of suitable size, but a ball tail-bearing 28 of suitable construction, not necessary to describe in detail, may be carried by the sleeve 16' to intervene between a shoulder 30 on the shaft and the tail nut 31. The housing 22' is suitably shaped to enclose the ball bearing structure and provide a well 24' that has a pipe connection 26' to the intake of pump 27.

From the pump an oil pipe 33 is connected through a sight glass 34 and the end wall of housing 22' with an oil tube 35 that runs centrally along the full length of a bore 36 through the spindle, the front end of the pipe bearing in a recess in a plug 37 that is screw-threaded or otherwise fitted into the end of the bore 36. The oil pipe has near its outer end a plurality of outlets 38 to the bore 36, and the latter has communication through two ducts or orifices 39, 39' with the two bearing surfaces of the spindle within the two bearing heads, the spindle preferably having also a spiral oil groove 40 running the length of each of its bearing surfaces.

It will be understood that during the operation of the spindle oil is forced-fed by the pump through the oil pipe 37, flowing out through openings 38 to bore 36, the bulk of the oil returning from bore 36 to the housing 22' and thence by pipe 26' to the pump. Some of the oil, however, is forced out through the ducts 39, 39' to the bearing surfaces of the shaft and, finding its way to the respective wells 24, 24'

of the end housings of the bearings, returns to the pump through pipes 26, 26'; so that not only does the oil keep the shaft cool, but also insures constant and effective lubrication.

While I have herein described in detail a particular embodiment of my invention it will be understood that changes may be made in the specific details thereof without departure from the spirit of my invention within the scope of the appended claims.

I claim:

1. The combination of a shaft, a load element such as a grinding wheel adapted to be driven at high speed at one end thereof, a bearing for said shaft having an oil-receptive housing at one end, said shaft having a central bore closed at one end and at its other end opening to said housing and having a duct leading from said bore to the bearing surface, and an oil supply pipe leading into and opening to said bore.

2. The combination of a shaft having a load element on one end adapted to be rotated at high speed and said shaft having a central bore, an elongated snug bearing for said shaft having an oil housing at one end into which the shaft bore opens, there being a duct from the shaft bore to

the bearing surface of the shaft, an oil circulating means comprising a pump, a pipe connected with the pump outlet and extending into the shaft bore and opening at the load-bearing end thereof, and a return pipe from said oil housing to the pump intake.

3. The combination of a high speed shaft having a central bore, closed at one end and open at its other, an external bearing for said shaft, and positive means for circulating oil within the shaft bore including influx and efflux connections at the open end of said bore, there being a duct from the shaft bore to the bearing surface of the shaft.

4. The combination with an elongated shaft having an axial bore closed at one end and open at its other and a load member carried by said closed end of the shaft, of an oil tube mounted beyond the open end of the shaft and having a running bearing in its closed end, said tube having openings to the bore near the closed end of the latter; a bearing for the shaft, said shaft having an orifice from its bore to its bearing surface; a housing enclosing one end of the bearing and the open end of the shaft, and a pump having its inlet connected with said housing and its outlet connected with said oil pipe.

RAYMOND C. MITCHELL.