April 29, 1924. 1,491,874

A. A. MARTELL

DRIVE FOR FLOATING REAMERS

Filed May 3, 1920

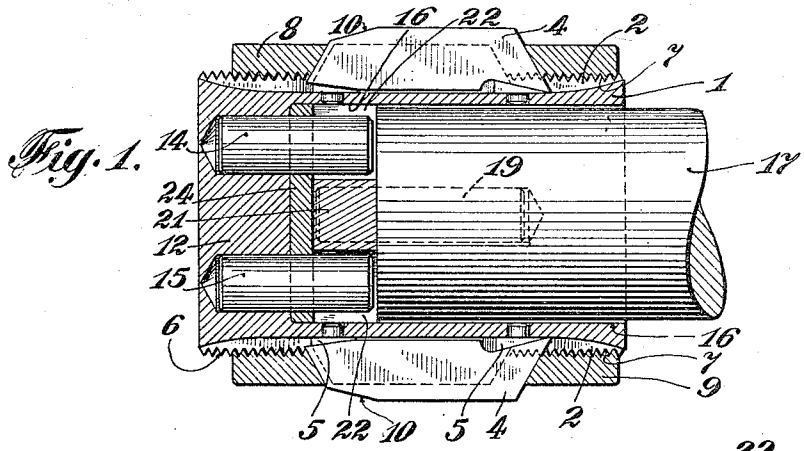


Fig. 1.

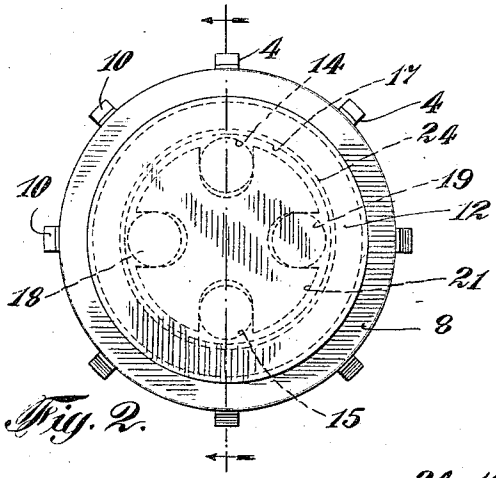


Fig. 2.

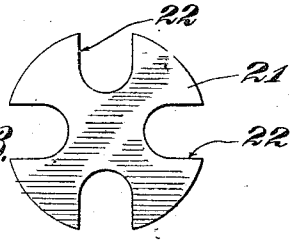


Fig. 3.

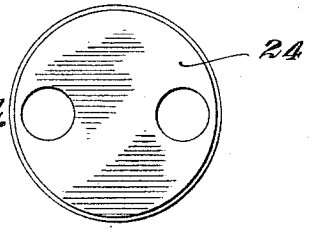


Fig. 4.

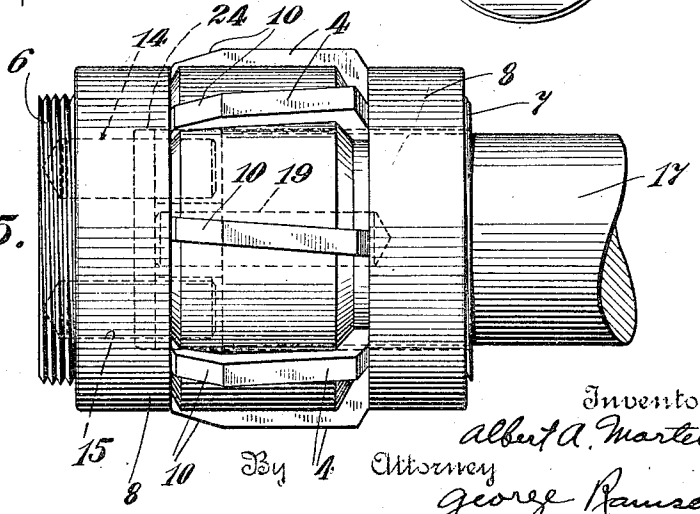


Fig. 5.

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UNITED STATES PATENT OFFICE.

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DRIVE FOR FLOATING REAMERS.

Application filed May 3, 1920. Serial No. 378,374.

To all whom it may concern:

Be it known that I, ALBERT A. MARTELL, a citizen of the United States, residing at Woonsocket, in the county of Providence, State of Rhode Island, have invented certain new and useful Improvements in Drives for Floating Reamers, of which the following is a specification.

This invention relates broadly to reamers and more particularly to a driving mechanism for floating reamers.

The principal object of the present invention is a driving mechanism for a floating reamer with the driving forces applied substantially opposite to the portion of the reamer performing the maximum of the cutting.

Another object of the present invention is a floating reamer with a universally movable connection between the driving shaft and the reamer body with the driving connection substantially opposite the maximum cutting zone of the blades on the reamer.

Another object of the present invention is a floating reamer having a driving shaft extending part way into the reamer body and with interlocking driving means adjacent the forward end of the body whereby the driving forces are transmitted to the reamer body at the front end thereof.

Another and important object of the present invention is the provision of separate driving members mounted between the body of the reamer and the driving shaft therefor in such manner that the members may be accurately ground and hardened without danger of distortion of the body of the reamer during heat treatment of the hardening process.

Another object of the present invention is a reamer having a closed forward end on the body portion and provided with a cup into which a driving shaft extends with a universal connection between the forward end of the reamer shaft and the closed end of the body.

Other and further objects of the present invention will in part be obvious and will in part be pointed out hereinafter in the specification following wherein like parts are represented by like characters throughout the several figures thereof. Realizing that the present invention may be embodied in constructions other than the specific structures herewith described and shown, it is desired that this disclosure shall be understood as illustrative and not be considered in the limiting sense.

Figure 1 is a sectional view taken on the line indicated by the arrows in Figure 2 and showing driving pins and driving shaft in the full lines.

Figure 2 is an end view of the reamer.

Figure 3 is a detailed view of the driving connector.

Figure 4 is a detailed view of the thrust plate.

Figure 5 is an assembly view of the complete reamer.

Heretofore in the art of floating reamers it has been customary to provide the reamer body with an opening extending entirely through the reamer and to provide a driving shaft with guiding members for both the front and rear portions of the reamer body In such constructions it has been customary to drive the reamer body by the driving connection operatively engaging the rear portion of the reamer body. Under these conditions there is a tendency to restrict the free movement of the reamer so that the reamer does not float freely with reference to the driving member.

The present invention overcomes the difficulties of the known art by providing a driving connection having a universal movement and wherein the driving forces are transmitted substantially adjacent to the zone wherein the reamer blades are formed to provide the maximum cutting portion of the blades.

In view of the fact that the forces are applied at this point the reamer follows the lead established by the forward cutting edges and the direction of the reamer is accurately maintained during the reaming operations. In the prior art the reaming forces have applied as pushing forces. In the present invention the reamer forces are substantially pulling forces. In former cases it was necessary that the reamer be guided positively to obviate any deviations of the axis of the reamer from the desired line of operations. In the present case the cutting edges of the reamer blades are maintained in the desired line and the remaining or finishing

portions of the reamer blades trail the path established at the cutting zone.

Referring now to the drawings wherein is illustrated, one form of construction embodied in the present invention, a body 1 is provided with slots 2 which are adapted to receive cutting blades 4. The small wedge shaped seats 5 are provided in the bottom of the slots 2 and comprises the supports for the cutting blades 4. The body portion 1 is screw threaded on its exterior as at 6 and 7 and adjusting collars 8 and 9 are mounted on these screw threaded portions. The ends of the cutting blades 4 are inclined and the inner sides of the adjusting collars 8 and 9 are portions of conical surfaces so that these collars securely seat the blades against the wedge shaped supports 5. By adjusting the collars the blades are caused to move upon the wedge shaped supports and thereby the effective diameter of the reamer is adjustable. It will be noted that the blades 4 are provided on the forward portions with cutting zone 10 wherein the edges of the blades are inclined towards the axis of the reamer and the remainder of the blades comprise a finishing zone wherein the cutting edge is substantially parallel to the axis of the reamer body. The forward end of the reamer body comprises a solid metal head 12. Reamer driving pins 14 and 15 preferably are driven into openings provided in the reamer head 12 so that the pins provide polished cylindrical projections that extend into the cup shaped opening 16. The driving shaft 17, upon the reamer body is loosely mounted, is also provided with openings into which a pair of driving pins 18 and 19 are driven. All of the pins 14, 15, 18 and 19 are preferably hardened and finished with smooth polished sides in order to obviate friction as will be pointed out later. Before the pins 18 and 19 are set in the driving shaft, the end of the driving shaft is also highly polished. The connector plate 21 is provided in its periphery with notches 22 which preferably are arranged in pairs disposed so that the axes of pairs of notches are at right angles to each other. This connector plate is adapted to be set between the end of the driving shaft 17 and the head 12 of the reamer body in such manner that the reamer driving pins 14 and 15 fit into one pair of the notches 22 while the shaft driving pins 18 and 19 fit into the other pair. The notches are slightly deeper than the distance between the edges of the driving pins so that the connector plate may have a slight movement in any direction. In order to provide a suitable end thrust bearing a bearing plate 24 is provided between the head 12 and the reamer and the connector plate. This bearing plate is provided with openings through which the reamer driving pins 14 and 15 extend. One of the advantages obtained by the use of bearing plate and the connector plate is that both of these members may be made of hardened steel and then ground so that the surfaces are very smooth and provide accurate means for guiding the reamer body in such manner that the axis thereof is substantially parallel to the axis of the driving shaft. The notches 22 are also carefully ground to provide very smooth hard surfaces to engage the driving pins. It would be difficult and expensive to attempt to harden the end of the reamer body and internally grind an accurate surface thereon at right angles to the axis of the reamer body. By providing the separate plates all danger of distortion during manufacture is completely overcome.

It will be noted that the connector plate 21 through which the driving forces are transmitted is located in the transverse section of the reamer which includes the cutting zone 10 of the reamer blades so that the driving forces are transmitted to the reamer body at, or slightly in advance of, the plane of the maximum cutting resistance. This arrangement causes stability in the reamer in operation and in view of the fact that the opening 16 in the reamer body is slightly larger than the diameter of the driving shaft it will be seen that the reamer tends to float while the reaming operation is being performed.

Having thus described my invention what I claim is:

1. In a floating reamer the combination of a body portion, a plurality of cutting blades mounted on said body portion, a driving shaft, and enclosed connecting means on the interior of the body portion and between the body portion and the end of the driving shaft with the driving forces transmitted adjacent the cutting blades and with the body of the reamer movable relatively to the driving shaft.

2. In a floating reamer the combination of a body portion, a plurality of cutting blades mounted on said body portion, a driving shaft entering the rear of said body portion, and connecting means comprising a floating thrust plate between the forward end of the body portion and the driving shaft with the driving forces transmitted adjacent the cutting blades and with the body of the reamer movable relatively to the driving shaft.

3. A floating reamer comprising in combination a body portion, a plurality of blades mounted upon said body portion a driving shaft entering the rear of said body portion, and a slidable connection between the forward end of the body portion and shaft, said connection comprising a thrust member and being adjacent the forward ends of the cutting blades, and said connec-

tion permitting movements of the body portion in any direction in a plane at right angles to the axis of the driving shaft.

4. A floating reamer comprising in combination a body portion having a closed end and an open end, a plurality of blades mounted upon said body portion, a driving shaft extending into the open end of the body portion, and a slidable connection between closed end of the body portion and the end of the shaft, said connection being adjacent the forward ends of the cutting blades, and said connection permitting movements in any direction in a plane at right angles to the axis of the driving shaft.

5. A floating reamer comprising in combination a body portion having a closed forward end, a plurality of blades mounted upon said body portion, a driving shaft, and a slidable connection between body portion and shaft, said connection being directly under the forward ends of the cutting blades, and said connection comprising driving pins and a slotted member between the pins permitting movements in any direction in a plane at right angles to the axis of the driving shaft.

6. A floating reamer comprising in combination a body portion having a closed end and an open end, a plurality of blades mounted upon said body portion, a driving shaft extending into the open end of the body portion, and a slidable connection between closed end of the body portion and the end of the shaft, said connection being adjacent the forward ends of the cutting blades, and said connection comprising driving pins and a slotted member between the pins permitting movements in any direction in a plane at right angles to the axis of the driving shaft.

7. In a floating reamer the combination of a body being provided with a closed cup-shaped opening a driving shaft of a lesser diameter than said opening and being adapted to extend into said opening, interlocking driving means operatively connecting said shaft with said body portion, and a plurality of cutting blades carried by said portion over the said driving means.

8. In a floating reamer the combination of a body being provided with a closed cup-shaped opening, a driving shaft of a lesser diameter than said opening and being adapted to extend into said opening, interlocking driving means operatively connecting said shaft with said body portion, said means comprising pins on the body portion and pins on the shaft with a connection between the pins, and a plurality of cutting blades carried by said body portion over the said driving means.

9. A floating reamer comprising in combination a body portion provided with a closed cup-shaped cylindrical opening, driving shaft of less diameter than said opening and extending into said opening, projections on said body portion, projections on said driving shaft, connecting means between said projections, and a plurality of cutting blades mounted on the body portion over said connecting means.

10. A floating reamer comprising in combination a body portion provided with a closed cup-shaped cylindrical opening, driving shaft of less diameter than said opening and extending into said opening, projections comprising polished cylindrical pins on said body portion, projections comprising polished cylindrical pins on said driving shaft, connecting means between said pins, and a plurality of cutting blades mounted on the body portion over said connecting means.

11. A floating reamer comprising in combination a body portion provided with a closed cup-shaped cylindrical opening, driving shaft of less diameter than said opening and extending into said opening, projections comprising polished cylindrical pins on said body portion, projections, comprising polished cylindrical pins on said driving shaft, connecting means comprising a floating slotted plate between said pins, and a plurality of cutting blades mounted on the body portion over said connecting means.

12. A floating reamer comprising in combination a hollow body portion with one end of the body portion closed, projections extending from said closed end into the opening in the body portion and adapted to comprise means for driving said reamer by a suitable shaft, and a plurality of cutting blades mounted upon said reamer body with a cross section through the forward part of said blades extending through the said projections.

13. A floating reamer comprising in combination a hollow body portion with one end of the body portion closed, projections extending from said closed end into the opening in the body portion and adapted to comprise means for driving said reamer by a suitable shaft, and a plurality of cutting blades mounted upon said reamer body, with the forward portion of said blades comprising the maximum cutting portion and with a cross section through the forward part of said blades extending through the said projections whereby the driving forces may be delivered adjacent the zone of greatest resistance.

14. A floating reamer comprising in combination a reamer body having a closed end, means seated against said closed end comprising a thrust member, a driving shaft extending into the body portion of said reamer with the end of said driving shaft comprising a thrust surface adapted to drive said reamer forward, interlocking means between said shaft and said reamer body in

a zone determined by the radial projection of the cutting portions of the blades whereby said reamer may be driven rotatively, and blades mounted upon said reamer body.

15. A floating reamer comprising in combination a reamer body having a closed end, means seated against said closed end comprising a thrust member, a driving shaft extending into the body portion of said reamer with the end of said driving shaft comprising a thrust surface adapted to drive said reamer forward, interlocking means comprising a sliding connection between the end of said shaft and said reamer body in a zone adjacent the forward end of said reamer body whereby said reamer may be driven rotatively, and blades mounted upon said reamer body.

16. A reamer comprising in combination a body portion, a plurality of blades mounted upon said body portion, the forward end of the said blades comprising cutting edges and the remaining portion of said blades comprising finishing edges, a driving shaft extending into an opening in said body portion and with the shaft smaller than the said opening and a slidable thrust driving member between said shaft and said body portion with said member being located in the zone determined by the radial projection of the cutting portion of the blades.

17. A reamer comprising in combination a body portion having a closed forward end, a plurality of blades mounted upon said body portion, the forward end of the said blades comprising cutting edges and the remaining portion of said blades comprising finishing edges, a driving shaft extending into an opening in said body portion and with the shaft smaller than the said opening, and a slidable thrust driving member between the end of said shaft and the closed end of said body portion with said member being located in the zone determined by the radial projection of the cutting portion of the blades.

18. A reamer comprising in combination a body portion, a plurality of blades mounted upon said body portion, the forward end of the said blades comprising cutting edges and the remaining portion of said blades comprising finishing edges, a driving shaft extending into an opening in said body portion and with the shaft smaller than the said opening, a slidable thrust driving member between said shaft and said body portion with said member being located in the zone determined by the radial projection of the cutting portion of the blades and a thrust plate upon which said driving member is supported.

19. A reamer comprising in combination a body portion having a closed forward end, a plurality of blades mounted upon said body portion, the forward end of the said blades comprising cutting edges and the remaining portion of said blades comprising finishing edges, a driving shaft extending into an opening in said body portion and with the shaft smaller than the said opening, a slidable thrust driving member between the end of said shaft and closed end of said body portion with said member being located in the zone determined by the radial projection of the cutting portion of the blades and a thrust plate upon which said driving member is supported.

ALBERT A. MARTELL.