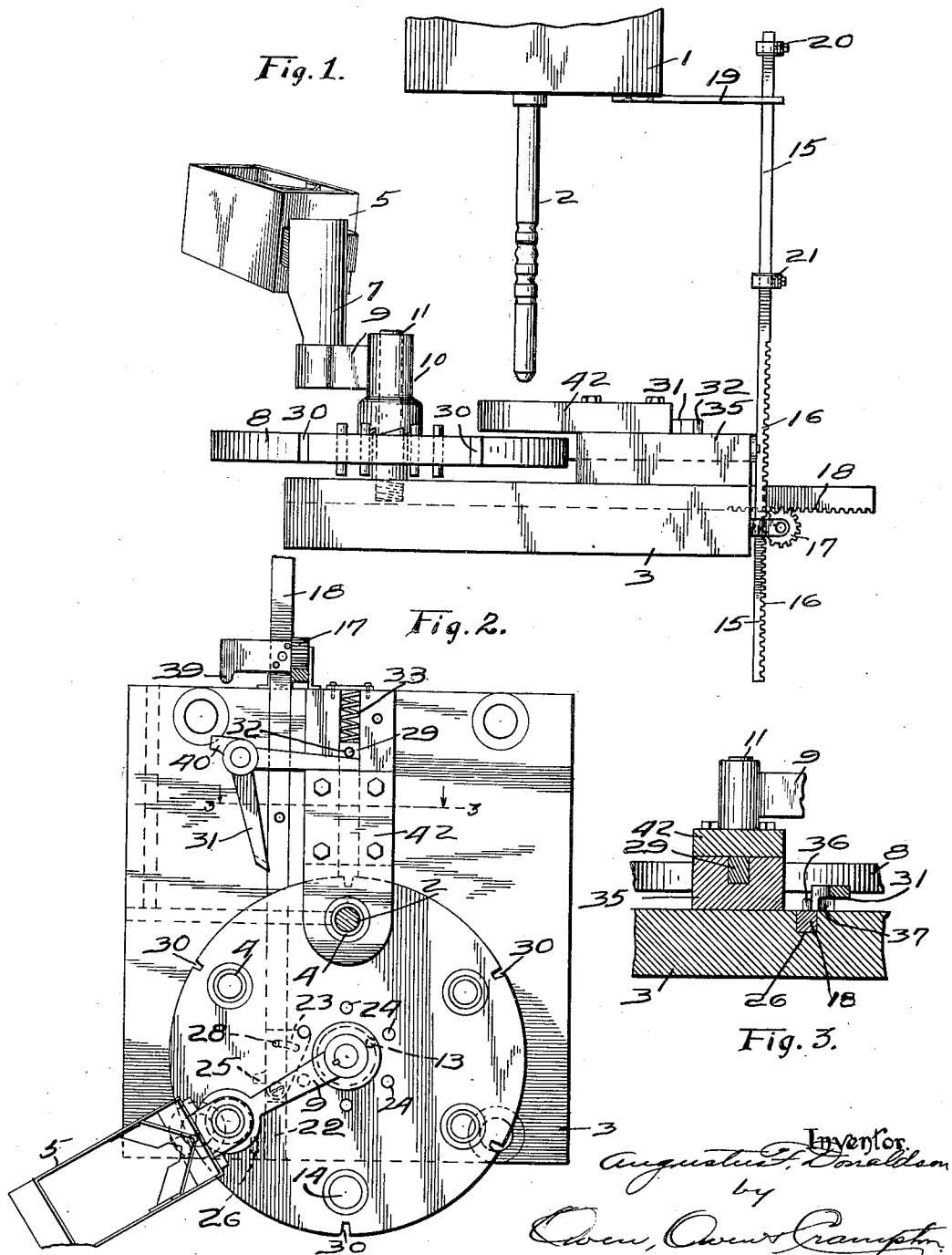


A. F. DONALDSON.
BROACHING MACHINE.
APPLICATION FILED MAY 19, 1917.

3 SHEETS—SHEET 1.

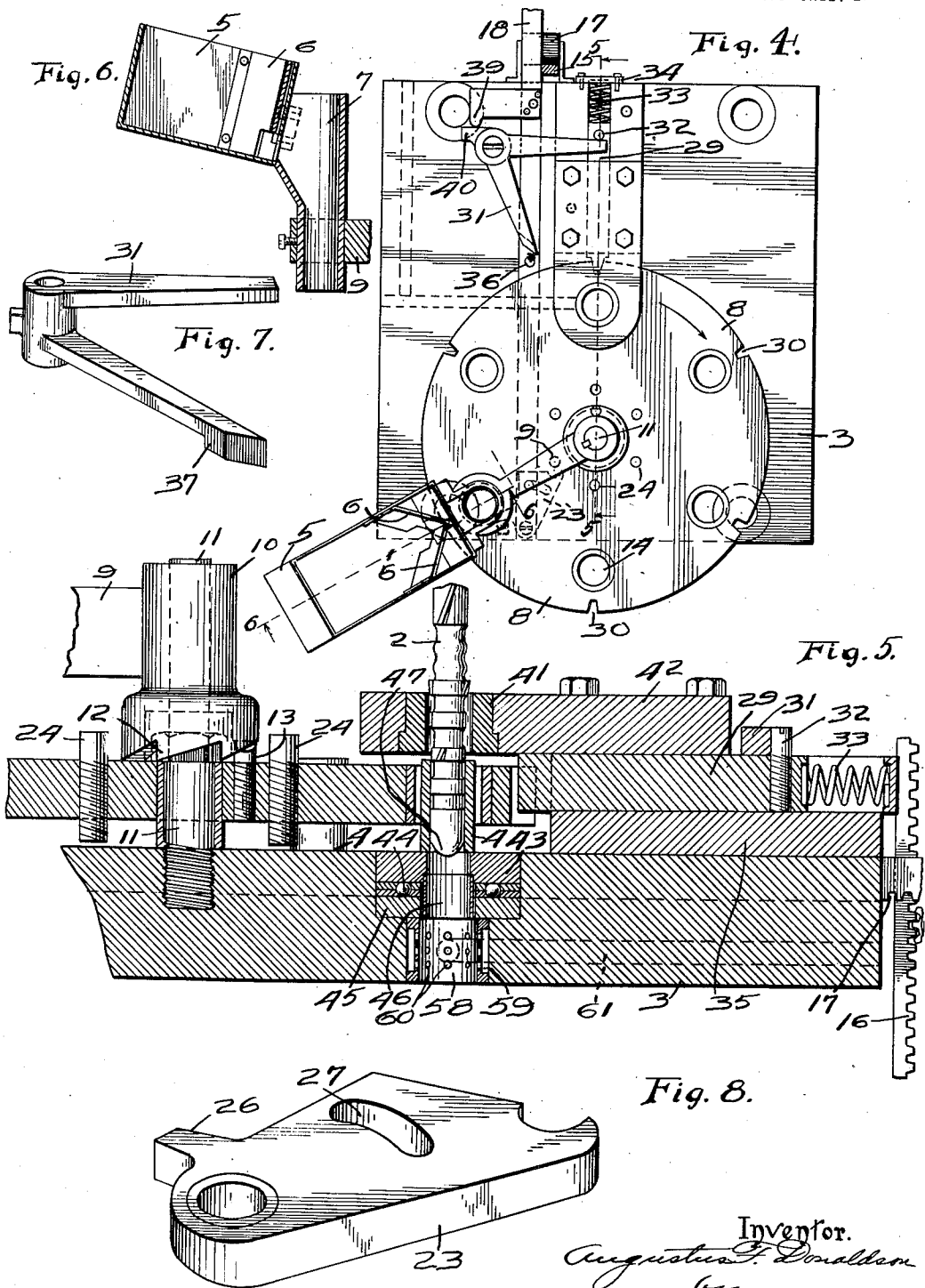


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3 SHEETS—SHEET 2.



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3 SHEETS--SHEET 3.

Fig. 9.

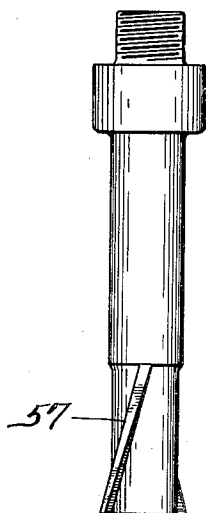
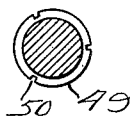
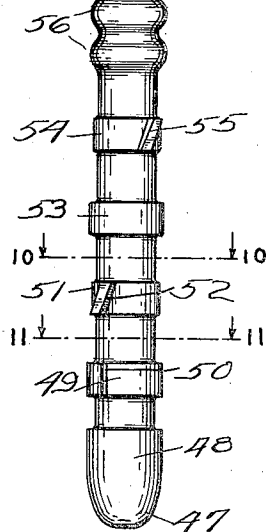


Fig. 10.



Fig. 11.



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UNITED STATES PATENT OFFICE.

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BROACHING-MACHINE.

1,318,487.

Specification of Letters Patent.

Patented Oct. 14, 1919.

Application filed May 19, 1917. Serial No. 169,645.

To all whom it may concern:

Be it known that I, AUGUSTUS F. DONALDSON, a citizen of the United States, and a resident of Toledo, in the county of Lucas and State of Ohio, have invented a certain new and useful Broaching-Machine; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the characters of reference marked thereon, which form a part of this specification.

My invention has for its object to provide a means for broaching articles and at the same time cutting a channel in the articles. It particularly has for its object to produce a machine wherein a spiral groove may be cut in the articles. It also has for its object to provide an efficient feeding means for articles in broaching and similar machines. It also has for its object to provide a broach which may be used for broaching a groove, particularly a spiral groove in an article such as a bearing bushing, for oil distribution or case securingment.

Constructions containing the invention may partake of different forms. I have selected one of the constructions as an example of such constructions and shall describe it hereinafter. The construction selected is illustrated in the drawing.

Figure 1 of the drawings illustrates a side view of the broaching machine except for supporting parts. Fig. 2 illustrates a top view of the bed plate and parts thereon. Fig. 3 illustrates a sectional view taken on line 3—3 indicated in Fig. 2. Fig. 4 is a view similar to that shown in Fig. 2 but showing a different position of the parts. Fig. 5 is a sectional view taken on line 5—5 indicated in Fig. 4. Fig. 6 illustrates a feeding box. Fig. 7 is an illustration of a lever member. Fig. 8 illustrates a dog which moves the feed mechanism step-by-step. Fig. 9 is a side view of a broach. Figs. 10 and 11 are sectional views of the broach taken on lines 10—10 and 11—11 respectively, Fig. 9.

1, Fig. 1, is a ram to which the broach 2 is secured. They are located above the bed plate 3. Suitable means is provided for guiding and moving the ram such as channeled ways and a crank and connecting rod.

Bushings 4 are placed in an inclined feed box 5 having an end V-shaped guiding wall 6 having an opening through which the bushings may pass one by one into a funnel 7 whence they will pass endwise onto the revolving plate 8. The feed box is secured to the funnel which is supported in an arm 9 connected to a sleeve 10 splined to pin 11 which is secured in bed plate 3, and about which the plate 8 rotates. The lower end of the sleeve is provided with a ratchet 12 and the plate 8 is provided with a pin 13 having a beveled end which acts on the ratchet 12 when the plate 8 is rotated to raise and drop the sleeve, arm and feed box to shake the bushings into the funnel and down on to the surface of the plate 8.

The plate 8 is provided with holes 14 which register with the end of the funnel and permit the bushings to drop to the surface of the bed plate 3. As the plate 8 is rotated, it moves the bushings from beneath the funnel to beneath the broach 2. The plate is rotated by the operation of the ram 1. A rod 15 is provided with a rack 16 which operates on a pinion 17 which in turn operates a rack 18 to push it forward when the rack 16 goes down, and pull it back when the rack 16 goes up. The rack 15 is operated intermittently by a rod 19 which however moves freely between the adjustable stops 20 and 21. The rod 19 is secured to the ram 1. The rack 18 moves in a channel 22 cut in the bed plate 3. The forward end of the rack 18 has a dog 23 which engages a pin 24 to turn the plate 8 each time the rack 18 is moved back. Stops 25 and 26 on the dog and bed plate operate to push the dog into engaging position of the pins upon each forward movement of the ram 18. Upon the return movements the dog engages the pins, it being pushed over by the stops striking together. It is limited in its movement by a slot 27 and pin 28. Thus the plate is moved around step by step, to place the bushings in alinement with the broach 2.

The plate is locked in its position when the broach is operating on the bushings by means of the bolt 29 which sets into notches 30 located in the plate 8. The bolt 29 is removed from the plate by a lever 31 operating on a pin 32 secured in the bolt 29 which moves the bolt against the action of the spring 33 located between the plate 34

and the bolt. The bolt moves in a block 35, secured to the bed plate 3. The lever is actuated by the rack 18 which has a pin 36 that operates upon a cam surface on a downwardly projecting portion 37 of the lever to move the lever just before the dog 23 engages a pin 24 which unlocks the plate 8, and permits the dog to move the plate. The pin 36 slips by the projecting portion 37 and underneath the lever as the rack continues to move back, and permits the spring to push the bolt 29 against the edge of the platen whereupon it will engage the next notch when the plate has been turned by the dog. On the return movement of the rack 18, the nose 39 presses the lug 40 located on the lever 31 to press lever 31 against the pin 32 so as to hold it in contact therewith preparatory to the next operation of the lever. In this way the bushings are moved into and out of the broaching position and to the edge of the bed plate 3 by the step by step movements of the plate 8 and dropped off the bed plate after being broached. The racks are moved by the rod 19 and the stops 20 and 21, the stops 20 and 21 being located so as to move the racks when the broach has been pulled from the bushings.

The bushings are pulled from the broach by the stripper sleeve 41 which is secured in a block 42 that is bolted to the bed plate 3.

If a broach having a means for cutting a groove is used and it is found necessary to have the article such as a bushing move about its axis, the bed plate 3 may be provided with a rotatable plate which will allow free rotary movements of the bushing. This is particularly true where spiral grooves are to be cut in the bushing. A plate 43 is supported on ball bearings 44 which move over a plate 45. They are located in a recess in the bed plate about the opening through which the broach 2 passes. A projecting sleeve 46 may be located within the parts 43, 44 and 45. The broach is provided with cutting lugs or ribs. If a spiral groove is to be cut, the lugs are located spirally, and as the broach is fixed in the ram the bushing turns, it being assisted in its angular movements by the ball bearing supporting plate.

The broach 2 may be provided with a rounded nose 47 to place the bushing in the broaching operation. It is provided with a pilot 48 which assists in keeping the bushing and broach in alignment, a lip 49 of larger diameter than the pilot, having channels 50 which operate to break the chips formed by the lip 49, a channel forming lip 51 having short spiral lugs 52 which extend radially to a greater diameter than the lip 49. A cutting lip 53 which has greater diameter than the cutting lip 49 but less than that of

the outer surfaces of the lugs 52, a channel cutting lip 54 having lugs 55 so disposed angularly around the axis of the broach that they will enter the channel cut by the lugs 52 which cause the bushing to rotate. The lugs 55 cut the channel to a still greater depth. This is followed by compacting beads 56 which in turn are followed by long spiral ribs 57 which operate to clean the edges of the grooves cut into the bushing. When the broach is forced into the bushing, the bushing is turned and the groove is cut. Upon return the bushing is caught by the stripper sleeve 41 and removed from the broach. The spirals are parts of a continuous spiral so that they register, that is, the bushings follow the spiral line.

A means may be provided for directing a fluid with some pressure against the broaches used in the machine after they have passed through the bushing to not only cool and lubricate the broaches but also to wash the chips that are broken up by forming the channels 50 in the cutting lips of the broaches. A sleeve 58 having an outer channel to form an annular chamber 59 is inserted in the bed 3. Holes 60 are formed in the sleeve to afford vents from the chamber and a passage-way 61 communicates with the annular chamber 59. A fluid composed of oil and water is directed into the passage-way 61 under sufficient pressure to wash the chips from the broach.

I claim:

1. In a broaching machine the combination of a ram, a broach having spiral cutting members, a plate rotatable about the axis of the broach for supporting the articles operated upon by the broach.

2. In a broaching machine the combination of a ram, a broach connected to the ram and having spiral cutting members, a plate rotatable about the axis of the broach for supporting the articles operated upon by the broach, a stripper plate for removing the articles from the broach.

3. In a machine, a ram, a tool connected to the ram having means for causing rotation of the articles to be operated upon by the tool, a plate rotatable about the axis of the tool for supporting the articles operated upon by the tool and rotated by the tool.

4. In a broaching machine, a ram, a broach having means for rotating the articles operated upon, a rotatable plate for supporting the articles operated upon by the broach and rotated by the broach.

5. In a broaching machine, a ram, a broach having means causing rotation of the articles to be broached, a plate rotatable about the axis of the broach, a rotatable plate having openings for receiving the articles to be broached, means for rotating the second named plate to bring the articles in

succession in alinement with the broach and the first named plate.

6. In a broaching machine, a ram, a broach having means causing rotation of the
5 articles to be broached, a plate rotatable about the axis of the broach, a rotatable plate having openings for receiving the articles to be broached, a bed plate for supporting the articles in the openings, the circle of
10 movement of the openings extending over the edge of the bed plate, means for rotating the second named plate to move the articles in alinement with the broach and the first named plate and subsequently over the
15 edge of the last named plate in succession.

7. In a broaching machine, a ram, a broach connected to the ram and having means for causing rotation of the article broached.

20 8. In a broaching machine, a ram, a broach connected to the ram, a freely rotatable means for supporting the articles operated upon by the broach and the broach having means for rotating the articles while being broached.

25 9. In a broaching machine, a ram, a broach connected to the ram and having

spiral shaped cutting flanges, a rotatable member for supporting the article broached and rotated when the article is cut by the
30 spiral shaped cutting flanges.

10. In a broaching machine, a ram, a broach connected to the ram, a bed plate having a circular recess, a plate rotatable
35 about the axis of the broach and rotated in the said recess with its upper surface flushed with the upper surface of the bed plate, a rotatable plate having openings for receiving the articles to be broached and
40 maintaining the articles for rotative movements beneath the broach and for moving the articles to and from axial alinement with the broach over the surface of the bed plate and the rotatable plate, means for rotating each of said rotatable plates.

45 11. In a broaching machine for broaching bushings, a ram, a broach connected to the ram and having spiral cutting fins, and a rotatable plate for supporting the bushings operated upon by the broach.

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

AUGUSTUS F. DONALDSON.