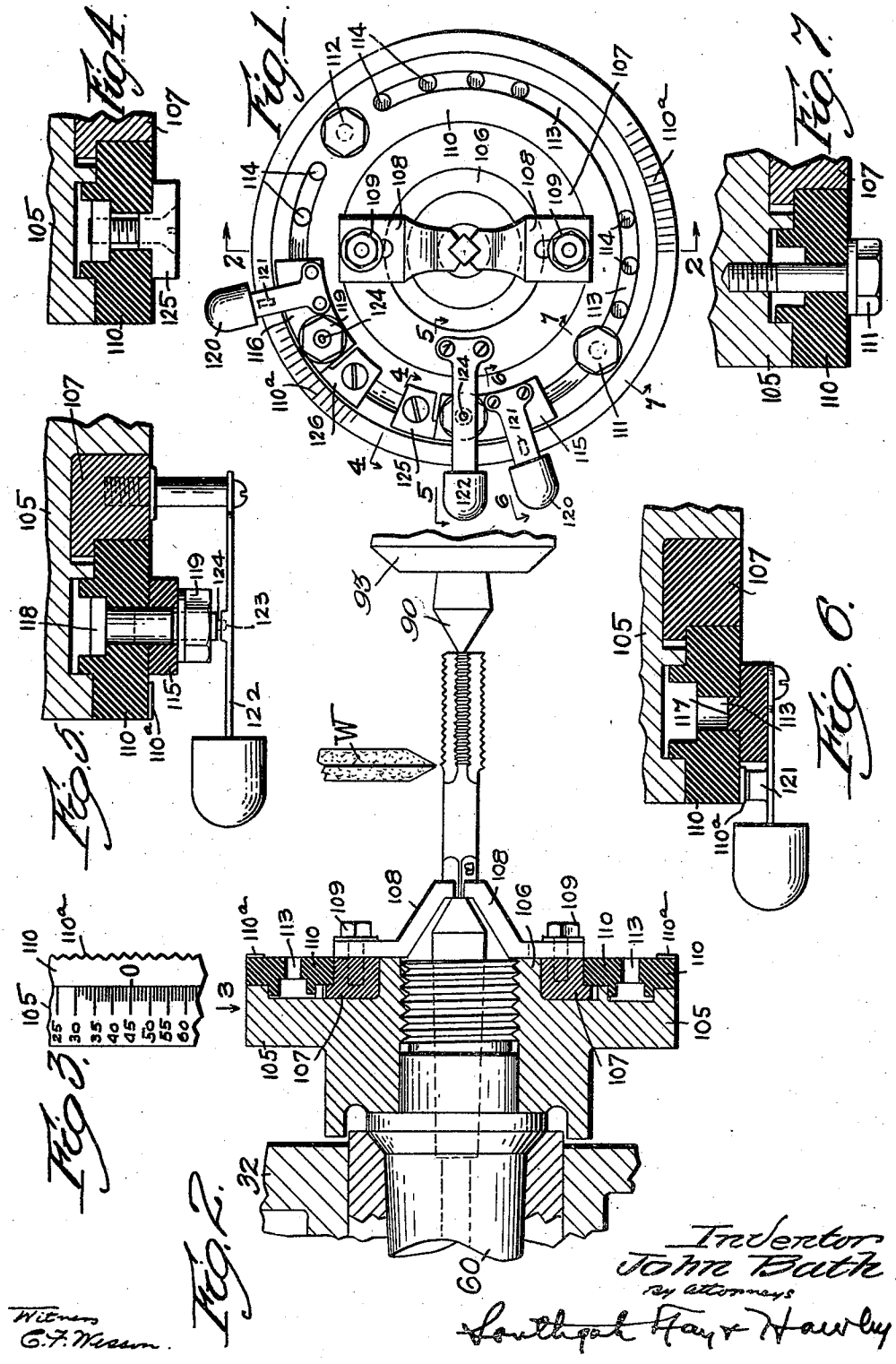
Jan. 29, 1929. 1,700,663

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METHOD OF GRINDING THREADS

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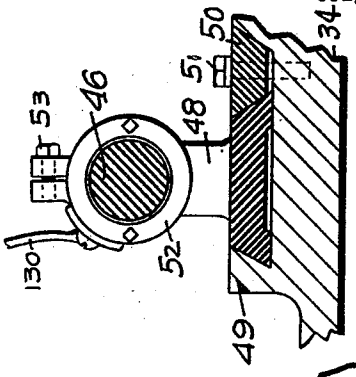


Fig. 9.

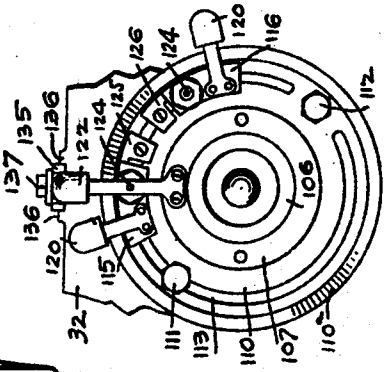


Fig. 10.

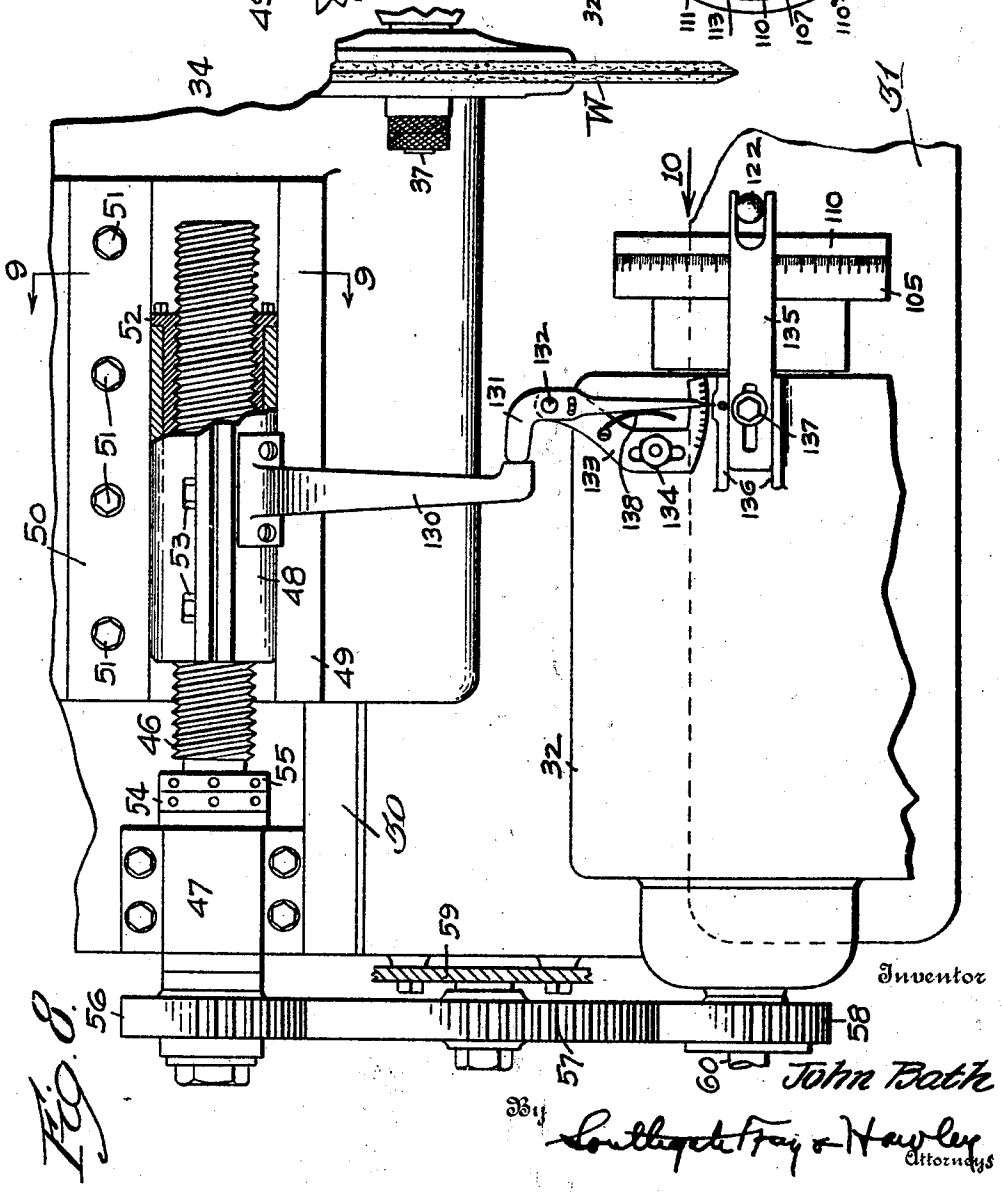


Fig. 8.

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UNITED STATES PATENT OFFICE.

JOHN BATH, OF WORCESTER, MASSACHUSETTS.

METHOD OF GRINDING THREADS.

Original application filed December 27, 1921, Serial No. 524,817. Divided and this application filed July 13, 1925. Serial No. 43,418.

This invention relates to a method of grinding threads and is a division of my prior application, Serial No. 524,817, filed December 27, 1921 and patented February 28, 1928, No. 1,660,468.

It is the general object of my present invention to provide a method of grinding threads on taps, thread gauges, screws, and similar articles by which the operation of the machine may be made substantially continuous, with the grinding wheel acting on the work in both directions of axial travel.

In the attainment of this object I provide a novel sequence of operations by which the back lash of the machine is taken up at the completion of each cut by the grinding wheel in each direction and by which the wheel is accurately aligned with the preceding cut upon its return travel.

My invention further relates to certain details of operation which will be hereinafter described and more particularly pointed out in the appended claims.

A form of mechanism suitable for the carrying out of my improved method is shown in the drawings, in which

Fig. 1 is an end elevation of a driving spindle and work driving attachments thereon adapted for the carrying out of my improved method;

Fig. 2 is a sectional elevation taken along the line 2—2 in Fig. 1;

Fig. 3 is a partial plan view looking in the direction of the arrow 3 in Fig. 2;

Figs. 4, 5, 6 and 7 are detail sectional views taken respectively along the lines 4—4, 5—5, 6—6, 7—7 of Fig. 1;

Fig. 8 is a plan view of certain parts of the machine, illustrating the procedure by which the amount of back lash is determined;

Fig. 9 is a detail sectional elevation taken along the line 9—9 in Fig. 8; and

Fig. 10 is an end elevation looking in the direction of the arrow 10 in Fig. 8.

Referring particularly to Figs. 1 and 8 I have shown parts of a thread grinding machine including a head center mounted in a spindle 60 rotatable in bearings in a head stock 32 and also including a tail center 90 mounted in a tail stock 93. A grinding wheel W is mounted on a wheel shaft 37 rotatably supported on a wheel table 34 slidable on a base or bed 30 which also supports the work table 31 on which the head and tail stocks are mounted. A nut 48 is slidably adjustable in guideways 49 and 50 in the wheel table 34 and may be clamped thereto by bolts 51. A lead screw 46 is rotatable in a fixed bearing 47 and engages the nut 48 to reciprocate the wheel table. The screw 46 is connected to rotate with the spindle 60 by a train of gears 56, 57 and 58 so that each rotation of the spindle and work corresponds to a definite axial movement of the wheel. For a more complete description of the parts above referred to, reference is made to the prior application above identified.

In the operation of my improved grinding machine, I use work driving devices of novel construction which devices will now be described, particular reference being made to Figs. 2 to 7.

The usual face plate 105 is threaded on the end of the spindle 60 and is provided with a hub or extension 106 on which is mounted a ring 107 supporting a pair of work driving dogs 108. These dogs are radially adjustable on the ring 107 and are secured thereto by binding screws 109. The inner ends of the dogs are shaped to receive and engage the shank of a tap or other article to be ground which is mounted on the head and tail centers of the machine.

The ring 107 is flanged and is held against the face plate by an outer ring 110 secured to the face plate by binding screws 111 and 112 (Figs. 1 and 7). A slot 113 extends nearly around the ring 110 and the binding screw 111 is shown as extending through this slot, while the screw 112 extends through a hole in the ring 110 between the ends of the slot 113. A series of tapped holes 114 may be provided in the face plate to receive the screws 111 and 112.

Segmental blocks 115 and 116 (Figs. 1 and 5) are provided with curved ribs or projections 117 (Fig. 6) fitting the segmental slot 113. These blocks are secured in angular adjusted position by clamping bolts 118 and nuts 119 (Fig. 5). A spring handle 120 is secured to each block 115 or 116 and is provided with a spur 121 engaging notches 110^a formed at the outer edge of the ring 110.

A similar spring handle 122 is secured to the inner ring 107, this handle being provided with a socket or recess 123 adapted to receive pins or studs 124 formed on the ends of the bolts 118 which secure the blocks 115 and 116 in position. Stops 125 and 126 (Figs. 1 and 4) are also slidable in the slot 113 of the ring

110 and may be clamped in position as will be hereinafter described.

In the operation of my improved machine, the blocks 115 and 116 are so located that the movement of the handle 122 from one pin or stud 124 to the other will cause an angular movement of the dogs 108 exactly equal to the back lash in the connections between the work spindle and the grinding wheel table. The extent of this angular adjustment of the work required with a particular set-up of the machine is determined experimentally by use of the indicating device shown in Figs. 8 to 10.

An arm 130 (Fig. 8) is fixed on the lead screw nut 48 and extends forwardly and upwardly to a position for engagement by the short end of an index lever 131, pivoted at 132 on a stand 133. The stand is adjustably secured to the head stock 32 by a clamping bolt 134. A lock plate 135 is slidably mounted in guideways 136 on the head stock 32 and may be secured in adjusted position by a clamping bolt 137. An index or zero line is formed on one of the guide-ways 136 as a reference mark for the index lever 131.

In order to determine the exact amount of back lash in the connections between the spindle and the wheel table, the spindle is moved in the direction in which it has been rotating until the handle 122 of the dog-supporting ring 107 is aligned with the jaws of the lock plate 135. This plate is then advanced in its guideways 136 until it releases the handle from the pin or stud 124 on which it has been seated and locks it from further angular movement. The stand 133 of the index lever or pointer 131 is then adjusted so that the rear end of the pointer will be pressed against the arm 130 by the pointer spring 138, while at the same time the other end of the pointer coincides with the zero mark on the guideway 136.

The spindle 60 is then turned backward or in the opposite direction to that in which it has been rotating until the lead screw 46 begins to move the nut 48, such movement being instantly indicated by movement of the pointer 131. The second sliding block 115 or 116 is then moved to bring its stud 124 into alignment with the recess in the handle 122, in which position it is then secured.

With the positions of the blocks 115 and 116 thus accurately located, it is merely necessary to swing the handle 122 from one stud 124 to the other, when the direction of the table feed is reversed to cause the grinding wheel to accurately follow the thread in both directions of table feed. If it is found that the wheel when thus adjusted engages slightly harder on one side than on the other, one of the blocks 115 or 116 may be further adjusted by moving its handle 120 one or more notches along the ring 110.

When adjustment is once made for a particular set-up of the machine, no further attention is necessary beyond swinging the handle 122 from one stud 124 to the other at each end of the wheel travel. The output of the machine is thus greatly increased, as the usual idle return feed of the grinding wheel is entirely avoided.

When grinding certain types of thread, such as the Acme thread, it is sometimes desirable to feed the wheel sideways to widen the thread groove. The stops 125 and 126 are then used to preserve the original setting so that the slides 115 or 116 may be moved the required number of notches sideways to widen the thread and may then be returned to their original positions when a new thread is to be ground and widened.

The face plate 105 may be provided with graduations as shown in Fig. 3 and the ring 110 may have an index mark cooperating therewith to indicate the angular relation of these parts. These graduations are useful when it is desired to advance the ring a certain angular amount relative to the face plate.

Having thus described my improved method it will be seen that this method renders the grinding operation substantially continuous and entirely eliminates the idle return run of the wheel which has been the usual prior practice. I am also able to take up the back lash by a very simple manual operation after a machine has once been set for the work to be ground and the output of the machine is very greatly increased over the amount of work which can be done when grinding in one direction only.

This method of grinding has been particularly described with reference to grinding taps but it is to be understood that the method is equally applicable to grinding screws, worms, thread gauges and any other articles of a similar nature in which threads or helical grooves are to be produced by grinding.

Having thus described my invention and the advantages thereof I do not wish to be limited to the details herein disclosed otherwise than as set forth in the claims but what I claim is:—

1. The method of grinding threads which comprises taking a grinding cut with the work rotating in one direction, making a relative adjustment of parts between the work and the wheel equivalent to the back lash in the connections between the work and wheel, and then taking a second cut over the same threads with the direction of rotation of the work reversed and with the wheel moving axially along the work in a direction reversed to that of the first described cut, the direction of wheel feed reversed.

2. The method of grinding threads which comprises taking a grinding cut with the work rotating in one direction, angularly adjusting the work a definite predetermined

amount, and taking a second cut with the work rotating in the opposite direction.

3. The method of grinding threads which comprises taking a grinding cut with the work rotating in one direction, adjusting the work an amount equivalent to the back lash between the work and the wheel, and taking a second cut with the direction of rotation of the work reversed.

4. The method of grinding threads which comprises taking a grinding cut with the work rotating in one direction, angularly adjusting the work relatively to the spindle an amount equal to the back lash between the work and the wheel, and thereafter taking a second cut with the work rotating in the opposite direction, the wheel remaining in position advanced toward the work during all steps of the operation.

In testimony whereof I have hereunto affixed my signature.

JOHN BATH.