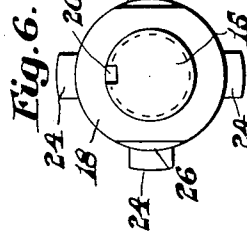
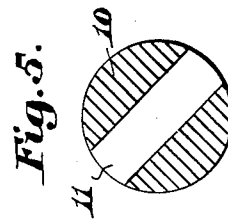
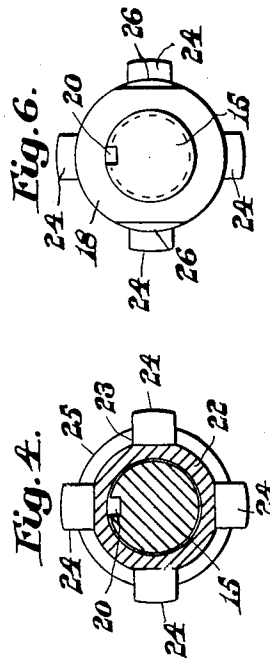
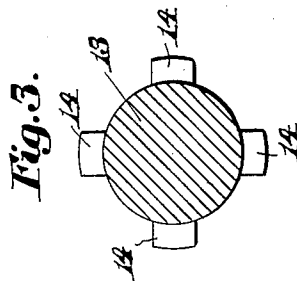
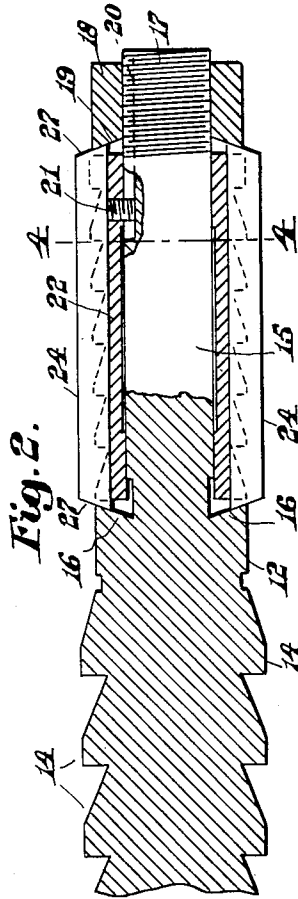
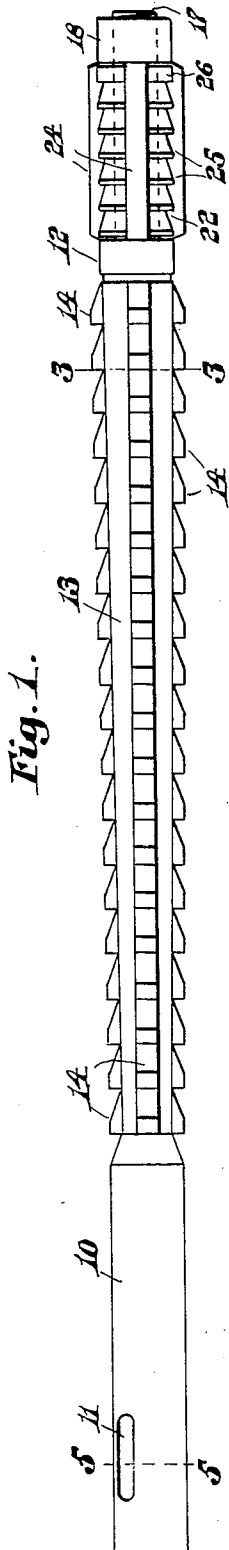


F. J. LAPOINTE.
 SPLINE FINISHING BROACH.
 APPLICATION FILED JAN. 27, 1920.

1,376,709.

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Inventor:
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UNITED STATES PATENT OFFICE.

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SPLINE-FINISHING BROACH.

1,376,709.

Specification of Letters Patent.

Patented May 3, 1921.

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To all whom it may concern:

Be it known that I, FRANCIS J. LAPOINTE, a citizen of the United States of America, and a resident of Ann Arbor, in the county of Washtenaw and State of Michigan, have invented certain new and useful Improvements in Spline-Finishing Broaches, of which the following is a specification.

This invention relates to spline finishing broaching tools and has for its object the provision of means whereby, in a single operation, the central opening in the work being operated upon will be made concentric with the outer ends of the splines cut therein.

The invention consists in providing a spline broaching tool with a removable member at the outer end having a plurality of teeth thereon adapted to cut away the portions of the stock between the splines previously cut and thereby form a central bore or opening the cylindrical walls of which will be concentric to the outer ends of said splines.

The invention further consists of certain novel features of construction and arrangement of parts which will be understood readily by reference to the description of the drawings and to the claims to be hereinafter given.

For the purpose of illustrating the invention, one preferred form thereof is illustrated in the drawings, this form having been found to give satisfactory and reliable results although it is to be understood that the various instrumentalities of which the invention consists can be variously arranged and organized and the invention is not limited to the precise arrangement and organization of these instrumentalities as herein shown and described except as required by the scope of the appended claims.

Of the drawings:

Figure 1 represents an elevation of a broaching tool embodying the principles of the present invention.

Fig. 2 represents a longitudinal section of the finishing end of said tool, drawn to an enlarged scale.

Fig. 3 represents a transverse section on line 3, 3, on Fig. 1.

Fig. 4 represents a transverse section on line 4, 4, on Fig. 2.

Fig. 5 represents a transverse section on line 5, 5, on Fig. 1, and

Fig. 6 represents an elevation of the finishing end of said tool.

Similar characters indicate like parts throughout the several figures of the drawings.

In the drawings, 10 is a cylindrical portion of the broaching tool having a diametrical slot 11 extending therethrough by which said tool may be secured to the broaching machine.

Near the outer end of the broaching tool is a cylindrical flange 12 which preferably has a diameter a trifle greater than that of the diameter of the portion 10.

Between the portion 10 and the flange 12, the broaching tool is provided with a tapered portion 13 larger at the outer end than at the inner end adjoining the cylindrical portion 10.

This tapered portion 13 is provided with a plurality of sets of alined teeth 14, the teeth of each set adjacent to the cylindrical portion 10 extending slightly beyond the periphery of said cylindrical portion and each succeeding tooth in each row toward the outer end of the broaching tool extending slightly beyond the preceding tooth.

As this portion of the broaching tool is drawn through a cylindrical opening in a piece of work, a plurality of splines will be cut into the work, said splines radiating from the axis of said cylindrical opening in said work.

The opening in the work has a diameter slightly greater than the diameter of the portion 10 of the broaching tool and as a consequence, owing to the play between the cylindrical wall of the opening in the work and the periphery of the cylindrical portion 10, it is not always possible to make the bottoms of the splines which are cut into the work, concentric with the axis of the opening through the work.

This is very objectionable particularly when it is desired to cut gear teeth on the periphery of the work for obviously the pitch circle of the teeth, the bottoms of the splines and the cylindrical opening through the gear should all be concentric.

In order to accomplish this result, the broaching tool is provided with a cylindrical shank 15 between the outer end thereof and the flange 12.

This flange 12 is provided at its outer end with a cone-shaped recess 16 and the outer end of said shank 15 is threaded at 17 to receive a nut 18 having a similar cone-shaped recess 19 on its inner end.

In the periphery of the shank 15 near the outer end thereof, is a longitudinal slot 20 adapted to receive the inner end of a screw 21 threaded to a sleeve 22 fitted over and surrounding the shank 15.

This sleeve 22 is provided preferably with as many longitudinal grooves 23 as there are sets of alined teeth 14 in the tapered portion 13 of the broaching tool although a smaller number may be used.

In each of the grooves 23 is disposed a bar 24, the width of which is the same as the width of the splines cut by the teeth 14.

Between these bars 24, the sleeve 22 is provided with a series of cutting teeth 25 each succeeding tooth toward the outer end of the broaching tool being slightly greater in diameter than the tooth preceding it.

The diameter of the teeth 25 nearest the flange 12 is the same as the diameter of the spline-cutting tooth 14 adjacent to the cylindrical portion 10.

The sleeve 22 at its outer end is provided with a cylindrical portion 26 of the same diameter as the last cutting tooth 25 or a trifle less than said cutting tooth, this cylindrical portion 26 being adapted to remove the burrs from the opening and polish the cylindrical wall thereof. The opposite ends of the bars 24 are inclined as indicated at 27 with the lower ends thereof positioned within the recesses 16 and 19 of the flange 12 and nut 18 respectively.

The cutting edge of the outer teeth 25 is below the outer face of the bar 24 a distance equal to the required depth of spline.

When the broaching tool is in use, the work is positioned upon the portion 10, the tool is then connected to the tool holder on the carriage of the broaching machine and the broaching tool is drawn through the work thereby cutting into the work a plurality of splines.

After the cutting of the splines has been completed, the continued movement of the broaching tool, will cause the bars 24 to enter the splines previously cut and the teeth 25 will be drawn through the opening in the work cutting away sufficient material from the work to cause the finished opening to be concentric with the bottoms of the splines.

The threaded member 21 in the longitudinal slot 20 retains the sleeve 22 in position so that the bars 24 will always be in alignment with the rows of spline-cutting teeth 14.

The body portion of the broaching tool including the spline-cutting teeth 14 will outlast several of the sleeves 22 and when one of these sleeves becomes worn or broken, it may readily be removed from the shank 15 and replaced by another sleeve.

In the same manner the bars 24 when worn, may be removed from the sleeve 22 and replaced by new bars 24.

By the use of a tool of this description an

annular piece of metal may be placed upon the portion 10 and the required number of splines cut therein and the central opening in said work then may be reamed out so that its cylindrical wall will be concentric with the bottoms of the splines thereby making it possible to place the same upon a gear machine and more accurately cut the gear teeth on the periphery of said work.

While only four sets of alined teeth 14 and bars 24 are shown, it is obvious that any number of sets of teeth and bars may be used without affecting the invention.

It is believed that the operation and many advantages of the invention will be thoroughly understood without further description.

Having thus described my invention, I claim—

1. A broaching tool provided with a plurality of spline-cutting teeth and having a reduced shank at the outer end thereof; and a non-revoluble member, surrounding said shank, provided with ribs adapted to project into the splines cut into the work and having cutting teeth between said ribs.

2. A broaching tool provided with a plurality of spline-cutting teeth and having a reduced shank at the outer end thereof; and a non-revoluble member, surrounding said shank, provided with removable ribs adapted to project into the splines cut into the work and having cutting teeth between said ribs.

3. A broaching tool provided with a plurality of spline-cutting teeth and having a reduced shank at the outer end thereof; and a non-revoluble member, surrounding said shank, provided with ribs adapted to project into the splines cut into the work and having cutting teeth between said ribs of less depth than said ribs.

4. A broaching tool having a plurality of spline-cutting teeth and provided at its outer end with means for cutting away portions of the material between the splines cut by said teeth.

5. A broaching tool having a plurality of spline-cutting teeth and provided at its outer end with a plurality of sets of members for cutting away portions of the material between the splines cut by said teeth.

6. A broaching tool having a plurality of spline-cutting teeth and provided at its outer end with a cylindrical shank; a toothed sleeve fitted onto said shank and having a plurality of peripheral grooves extending longitudinally thereof; ribs in said grooves and extending into said splines; and means for retaining said sleeve and ribs in position.

7. A broaching tool having a plurality of spline-cutting teeth and provided at its outer end with a recessed flange and a cylindrical shank; a toothed sleeve fitted onto said shank and having a plurality of pe-

ripheral grooves extending longitudinally thereof; ribs in said grooves extending into said splines and beyond the ends of said sleeves; and a recessed nut threaded to said shank for retaining said sleeve and ribs in position with the ends of said ribs in the recesses of said flange and nut.

8. A broaching tool provided with a plurality of spline-cutting teeth and having a reduced shank at the outer end thereof; and a non-revoluble member on said shank provided with ribs adapted to extend into the splines cut into the work, said member also having a plurality of sets of teeth between said ribs, each set of teeth nearest the outer end having a greater depth than those next adjacent thereto toward the inner end of said member.

9. A broaching tool provided with mem-

bers for cutting a plurality of splines in a piece of work having a cylindrical opening therethrough and provided with means at the outer end thereof for enlarging said opening.

10. A broaching tool provided with members for cutting a plurality of splines in a piece of work having a cylindrical opening therethrough and provided with means at the outer end thereof for enlarging said opening and making its cylindrical wall concentric to the bottoms of said splines.

Signed by me at 746-7 Old South Bldg., Boston, Mass., this 12th day of January, 1920.

FRANCIS J. LAPOINTE.

Witnesses:

WALTER E. LOMBARD,
NATHAN C. LOMBARD.