M. J. ACTON.

BROACHING MACHINE ATTACHMENT FOR SPLITTING PISTON RINGS.

APPLICATION FILED MAY 2, 1918.

1,292,219.

Patented Jan. 21, 1919.

3 SHEETS—SHEET 1.

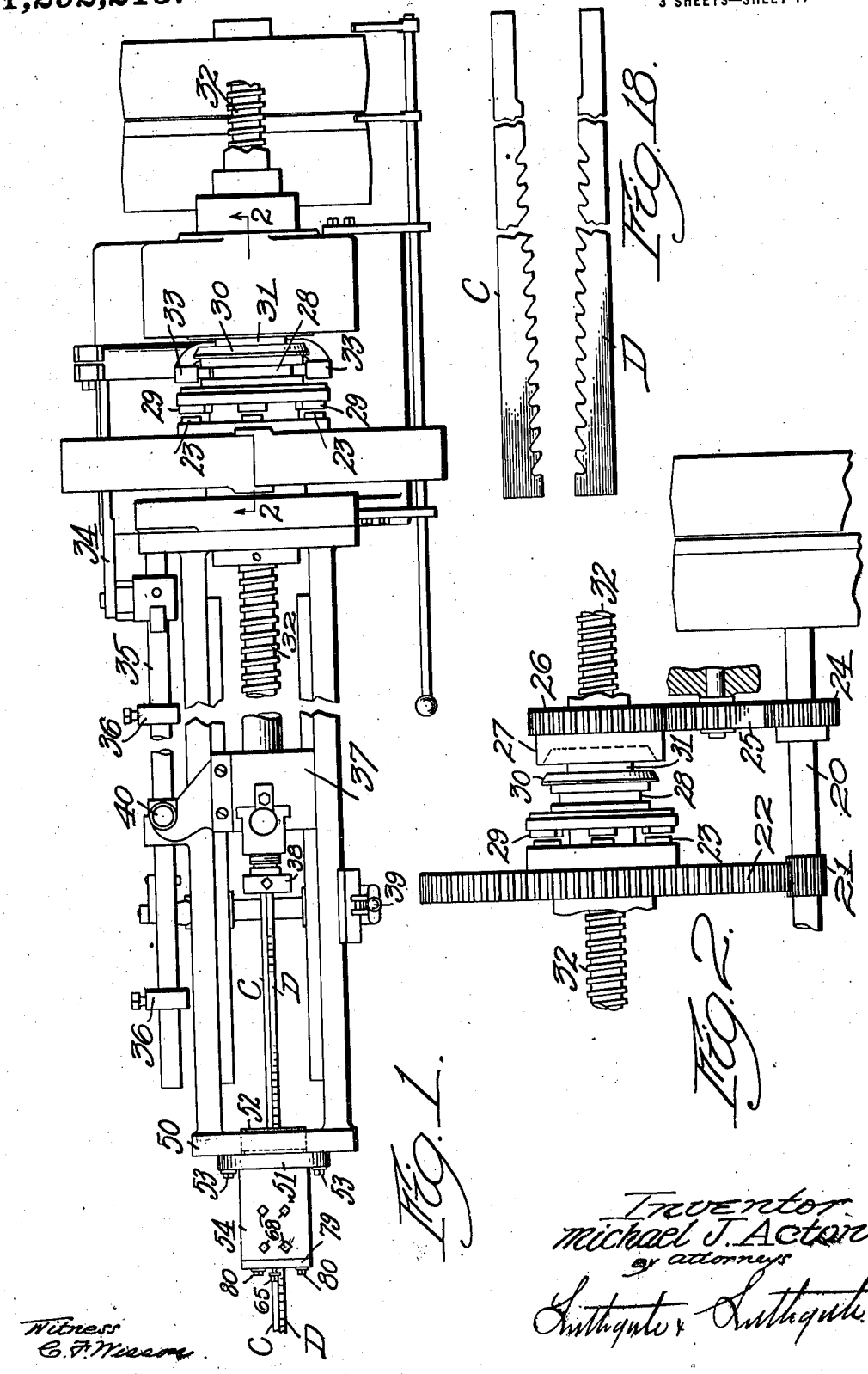


Fig. 1.

Fig. 1a.

Fig. 2.

Witness
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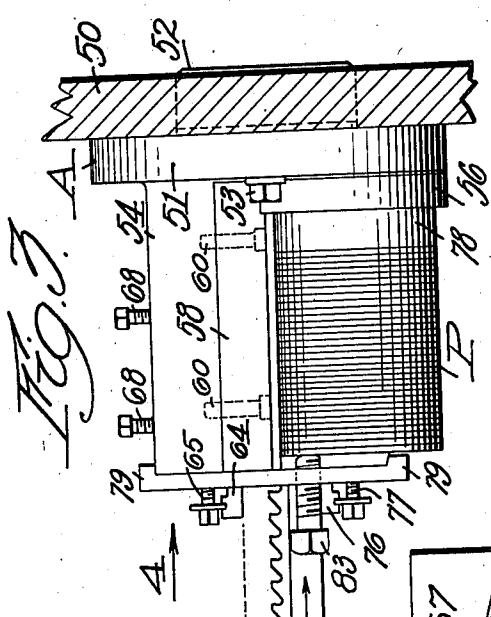


Fig. 3.

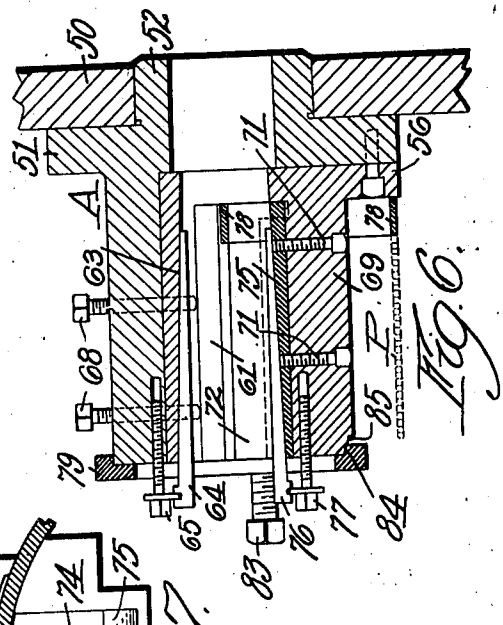


Fig. 6.

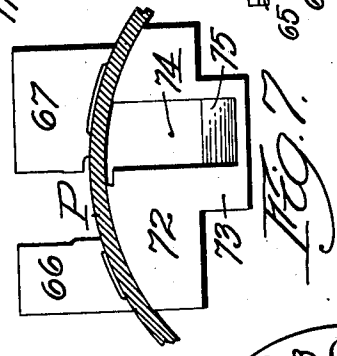


Fig. 7.

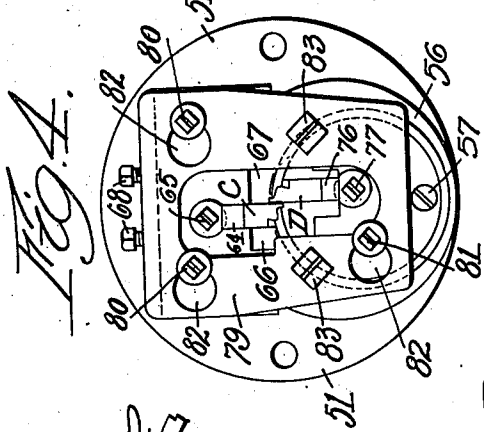


Fig. 4.

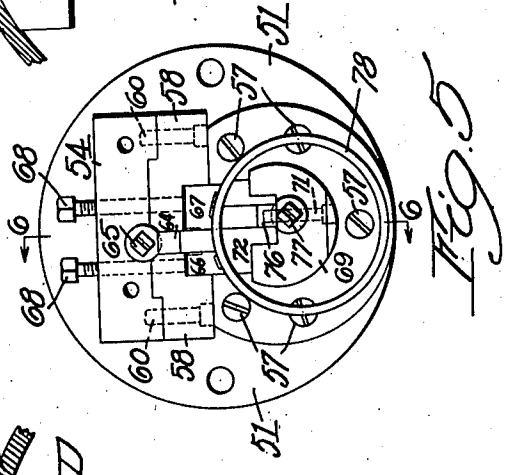


Fig. 5.

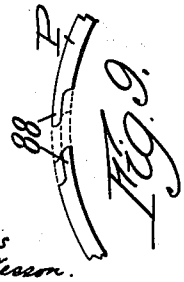


Fig. 9.

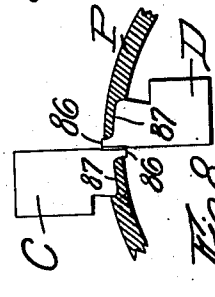


Fig. 8.

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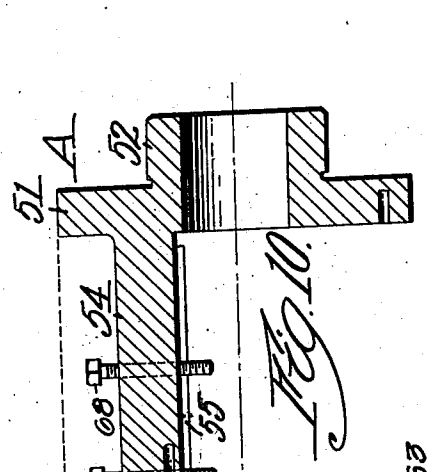


Fig. 10.

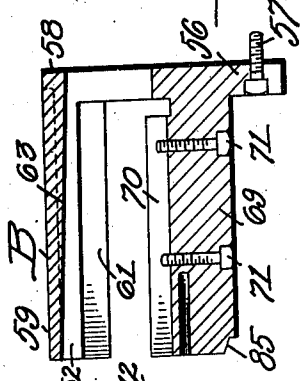


Fig. 12.

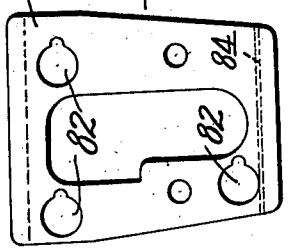


Fig. 16.

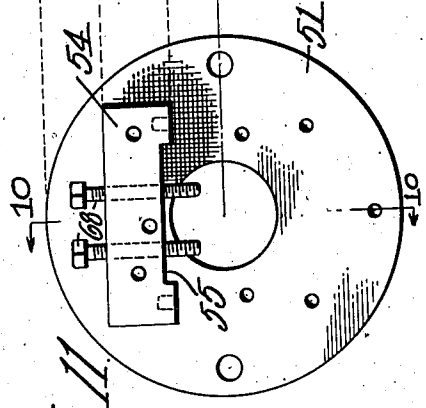


Fig. 11.

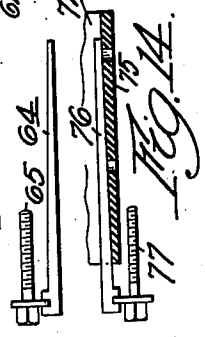


Fig. 14.

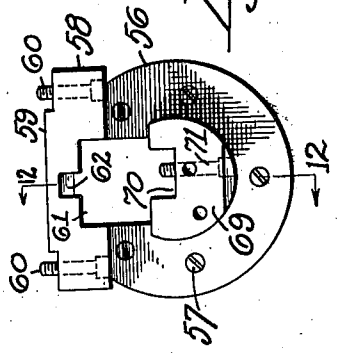


Fig. 13.

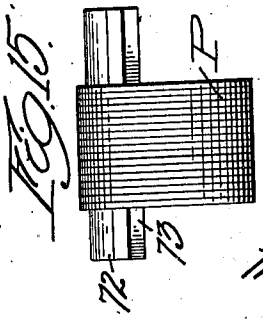


Fig. 15.

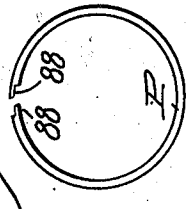


Fig. 17.

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UNITED STATES PATENT OFFICE.

MICHAEL J. ACTON, OF FRAMINGHAM, MASSACHUSETTS, ASSIGNOR TO LAPOINTE MACHINE TOOL COMPANY, OF HUDSON, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

BROACHING-MACHINE ATTACHMENT FOR SPLITTING PISTON-RINGS.

1,292,219. Specification of Letters Patent. Patented Jan. 21, 1919.

Application filed May 2, 1918. Serial No. 232,128.

To all whom it may concern:

Be it known that I, MICHAEL J. ACTON, a citizen of the United States, residing at Framingham, in the county of Middlesex and State of Massachusetts, have invented a new and useful Broaching-Machine Attachment for Splitting Piston-Rings, of which the following is a specification.

The object of this invention is to provide a new and improved broaching machine attachment for splitting piston rings.

Piston rings are commonly made out of rings of iron and then are split so as to have engaging end faces. A common form of piston ring is that which has opposing wings which mesh against each other when the piston ring is compressed.

The object of this invention is to provide an attachment by which a plurality of piston rings can be split by two complementary cuts, preferably made at the same time. This object is provided by arranging a mechanism so that a plurality of piston rings can be clamped concentrically in position, and by providing guiding means so that an outer broaching tool and an inner broaching tool can be engaged with the bunch of piston rings simultaneously to make complementary cuts part way through the piston rings, which cuts will come together so as to leave the ends of the piston rings with the necessary complementary wings. The operation is such that a plurality of piston rings will be rapidly severed with a clean overlapping split.

Referring to the accompanying three sheets of drawings, forming part of this application,

Figure 1 is a plan view of a broaching machine with my invention applied thereto;

Fig. 2 is a partial sectional elevation taken on the line 2—2 of Fig. 1, illustrating the gearing;

Fig. 3 is an enlarged view illustrating the attachment;

Fig. 4 is an end elevation thereof;

Fig. 5 is a view similar to Fig. 4 with the locking plate removed;

Fig. 6 is a cross sectional elevation;

Fig. 7 is an enlarged view illustrating the clamping blocks for holding the rings;

Fig. 8 is an enlarged end view illustrating the way the cutters engage the piston rings;

Fig. 9 is an end view illustrating the cuts made in the piston rings;

Figs. 10 and 11 are a sectional view and an end elevation respectively of the upper member;

Figs. 12 and 13 are a sectional view and an end elevation respectively of the lower member or work support;

Fig. 14 is an end elevation of the adjustable gib mechanism for adjustably positioning the broaching tools or cutters;

Fig. 15 is a side elevation of the lower supporting block;

Fig. 16 is an end elevation of the locking plate;

Fig. 17 is an end view of one of the split piston rings, and

Fig. 18 is a side elevation on reduced scale of the complementary or upper and lower broaching tools.

In the drawings I have shown an approved form of broaching machine to which my invention or attachment is applicable. This broaching machine consists of a suitable frame or support journaled in which is a driving shaft 20 on which are arranged the usual tight and loose pulleys so that power can be imparted to the machine by a belt, and the belt shifted from one pulley to the other by any belt shifter of approved form.

On shaft 20 is arranged a pinion 21 which meshes with a large driving gear 22 which has clutch teeth 23. Also arranged on the driving shaft 20 is a pinion 24 which meshes through an intermediate 25 with a reverse gear 26 having the female member 27 of a friction clutch. A sliding clutch 28 having teeth 29 opposed to the clutch teeth 23 and a cone 30 opposed to the member 27 is keyed on a nut 31 arranged on the driving or pulling screw 32 which passes through the driving and reverse gears 22 and 26. The clutch 28 is engaged by a yoke 33 connected by an arm 34 to a shifting rod 35 having adjustable tappets 36—36. The end of the pulling screw 32 is connected to a carriage 37 which is mounted on suitable ways in the framework, and which has a coupling or clamp-

ing head 38 to engage and hold the ends of the broaching tools or cutters. A suitable handle 39 is journaled in the frame and attached by suitable connections to the shifting rod 35.

When the handle is thrown to the left, the teeth 29 of the clutch 28 will be engaged with the clutch teeth 23 on the driving gear 22, and the nut 31 will be revolved on the pulling or drawing screw 32 to draw the same to the right and thus give the power stroke to the machine. This motion will continue until the right-hand tappet is engaged by an arm 40 extending from the carriage, when the clutch teeth will be disengaged and the motion stopped. The handle 39 is then thrown to the right which will engage the cone 30 with the member 27 so that power will be imparted to the nut 31 through the pinion 24, intermediate 25 and reverse gear 26, which will revolve the nut 31 rapidly in reverse direction and give the carriage 37 a quick return movement. This return movement will continue until the carriage arm 40 engages the left-hand tappet, when the conical clutch will be thrown out of engagement.

The parts previously described constitute an improved form of broaching machine to which my invention can be applied. The power movement of the broaching tools is at slow speed to the right as illustrated, and the left-hand movement of the broaching tools is a quick return movement. I will now describe the attachment which constitutes my present invention.

The face or end plate of the machine is designated by 50, and the same has a hole therethrough. A designates the upper member of my attachment. This member has a circular head 51 having a projecting hub 52 which fits into the hole in the face plate, the head being secured to the face plate by screws 53—53. Projecting from the head 51 is a rectangular-shaped section 54 having a groove 55 along its lower surface.

B designates the lower member or work support of my attachment. The same has a partial circular head 56 which bears on the head 51 of the part A and which is held thereto by screws 57, five being shown as employed for this purpose. Extending from the upper part of the head 56 is a rectangular section 58 which has a tenon or projection 59 adapted to fit into the groove 55 of the section 54 of the member A. The two sections 54 and 58 are held together by screws 60. A groove 61 is formed on the under side of the section 58 and a smaller groove 62 is cut in the top of the groove 61, the top of this smaller groove being inclined as shown at 63.

Fitting in the groove 62 is a tapered gib or key 64 which can be adjusted longitudinally by means of a screw 65 threaded in the section 54, which screw has a collar engaging a notch in the end of the gib. The upper cutting tool C is fitted in the groove 62, which thus forms guiding means therefor, and by adjusting the screw 65 and thereby the gib 64 the relation of the upper cutting tool to the piston rings can be very accurately adjusted.

Fitting in the groove 61 are clamping blocks 66 and 67 which clamp the piston rings in place, and which together with the upper cutting tool C fill up the groove 61. Two screws 68 are threaded in the sections 54 and 58 and engage the blocks 66 and 67 for clamping purposes. Also extending from the head 56 of the member B is a partial circular hub or work support 69 which has a groove 70 cut in its upper face. In the bottom of this groove are screws 71—71 and also a clamping and supporting block 72 which has a tenon 73 adapted to fit into the groove 70. This clamping block 72 has a groove 74 in the upper part of the same, the lower wall of which 75 is inclined, and fitting therein is a tapered gib 76 which can be accurately adjusted by a screw 77 which has a collar fitting into a notch in the gib. The lower cutting tool D works in the groove 74 which thus forms guiding means therefor, and its relation to the work or piston rings can be accurately adjusted by the screw 77.

The opposing faces of the clamping blocks 66, 67 and 72 are made circular as indicated in Fig. 7 so that the piston rings can be accurately clamped in position by tightening the screws 68. A spacing ring 78 may be hung on the right-hand end of the lower clamping block 72 if desired. This spacing ring is made in the shape of the completed piston ring, as shown in Fig. 17.

A locking plate 79 is held to the section 54 of the member A by two screws 80 and by a screw 81 to the work support 69 of the lower member B. The holes 82 through the locking plate through which the screws 80 and 81 pass are made offset in shape as shown in Fig. 16, so that the locking plate can be placed in position over the heads of the screws 80 and 81 and then moved to the left and the screws engaged, whereby the locking plate can be put into and out of position without withdrawing the screws 80 and 81. Two clamping screws 83 are threaded into the locking plate 79 to clamp the piston rings in place. The lower engaging edge of the locking plate 79 is made slightly tapered as at 84, and the outer end of the hub 69 is correspondingly slightly tapered as at 85 so that the locking plate can be very accurately engaged in position.

The operation is as follows: The machine is stopped with the broaching or cut-

ting tools in their left-hand position. The locking plate 79 is removed and a bunch of piston rings P, say thirty or forty, are slipped into the machine over the broaching tools on to the work support 69 and between the clamping blocks 72, 66 and 67. The locking plate is then secured in position, and the clamping screws 83 lightly adjusted. At the same time the screws 71 are tightened, whereby the bunch of piston rings will be held accurately in position between the clamping blocks. The clamping screws 83 may be given a final turn if desired. The spacing ring 78 may or may not be employed. This will support the plurality of piston rings concentrically in position.

The machine is then started in operation. This will simultaneously draw the upper and lower broaching tools or cutters C and D into the machine between the clamping blocks. The broaching tools are shown particularly in Fig. 18. Each tooth of the tool has an extending nose 86 and a flat portion 87. The extending portions 86—86 come back to back as illustrated and will cut only part way into the rings. This will make complementary cuts in the piston rings, resulting in a clean overlapping split, which will leave each piston ring with an extending complementary wing 88, whereby the ends of the rings can be sprung together as indicated in dotted lines in Fig. 9 when in use. By using different size clamping blocks, piston rings of different diameters can be split.

The broaching tools employed comprise two complementary cutter bars each having a series of teeth gradually increasing in height so as to make successive cuts. The shape of these teeth and the number thereof of course can be varied to suit different jobs. By adjusting the tapered gibs before described, the depth of the complementary cuts made in the piston rings can be very accurately determined.

One attachment, therefore, is capable of doing a great variety of work. By splitting the piston rings by the use of complementary cutting tools or cutter bars so that one tool is cutting on the inside surface while the other is cutting on the outer surface, the work is very rapidly and accurately done.

Modifications of the invention or attachment herein shown and described may be made by a skilled mechanic without departing from the scope of my invention as defined in the appended claims.

Having thus described my invention, what I claim and desire to secure by Letters Patent is—

1. An attachment for broaching machines, comprising means for supporting a plurality of piston rings, guiding means for supporting and guiding a broaching tool outside of said piston rings, and guiding means for supporting and guiding a broaching tool inside of said piston rings.

2. An attachment for broaching machines, comprising means for supporting a plurality of piston rings, guiding means for supporting and guiding a broaching tool outside of said piston rings, guiding means for supporting and guiding a broaching tool inside of said piston rings, and means for simultaneously drawing two broaching tools past said rings.

3. An attachment for broaching machines comprising means for supporting a plurality of piston rings concentrically in position, two broaching tools and means for simultaneously drawing one broaching tool over the rings and the other broaching tool through the same, said broaching tools being shaped to make complementary cuts in the piston rings, whereby the piston rings will be severed but will have complementary wings.

4. A broaching machine attachment comprising a work support, means for clamping a plurality of piston rings thereon, guiding means outside of said piston rings for supporting a broaching tool, guiding means inside said piston rings for supporting another broaching tool, and means for simultaneously moving two broaching tools to make opposed complementary cuts.

5. A broaching machine attachment comprising a projection or support having clamping blocks therein, a work support having a supporting block thereon, the space between the outer clamping blocks forming a guide for a broaching tool, and the lower supporting block having a groove for a broaching tool, and means for simultaneously drawing two broaching tools through said grooves to make complementary cuts in the piston rings.

6. A broaching machine attachment comprising an upper member having a projection, a lower member having a projection and an extending work supporting hub, clamping members fitted in the projection and work support of the lower member so as to leave grooves, and adjustable gibs fitting in the bottom of said grooves.

7. A broaching machine attachment comprising an upper member having a projection, a lower member having a projection and an extending work supporting hub, clamping members fitted in the projection and work support of the lower member so as to leave grooves for the cutter tools, and means for clamping a plurality of piston rings in place comprising a locking plate detachably secured to the end of the structure and clamping screws therein.

8. A broaching machine attachment comprising an upper member having a projection, a lower member having a projection

and an extending work supporting hub, clamping members fitted in the projection and work support of the lower member so as to leave grooves for the cutter tools, and means for clamping a plurality of piston rings in place comprising a clamping plate detachably secured to the end of the structure by screws working in staggered holes and clamping screws fitted in said clamping plate.

In testimony whereof I have hereunto affixed my signature.

MICHAEL J. ACTON.