July 28, 1942. W. E. LAW 2,291,164

GRINDING TOOL

Filed Oct. 10, 1940 2 Sheets-Sheet 1

FIG. 1

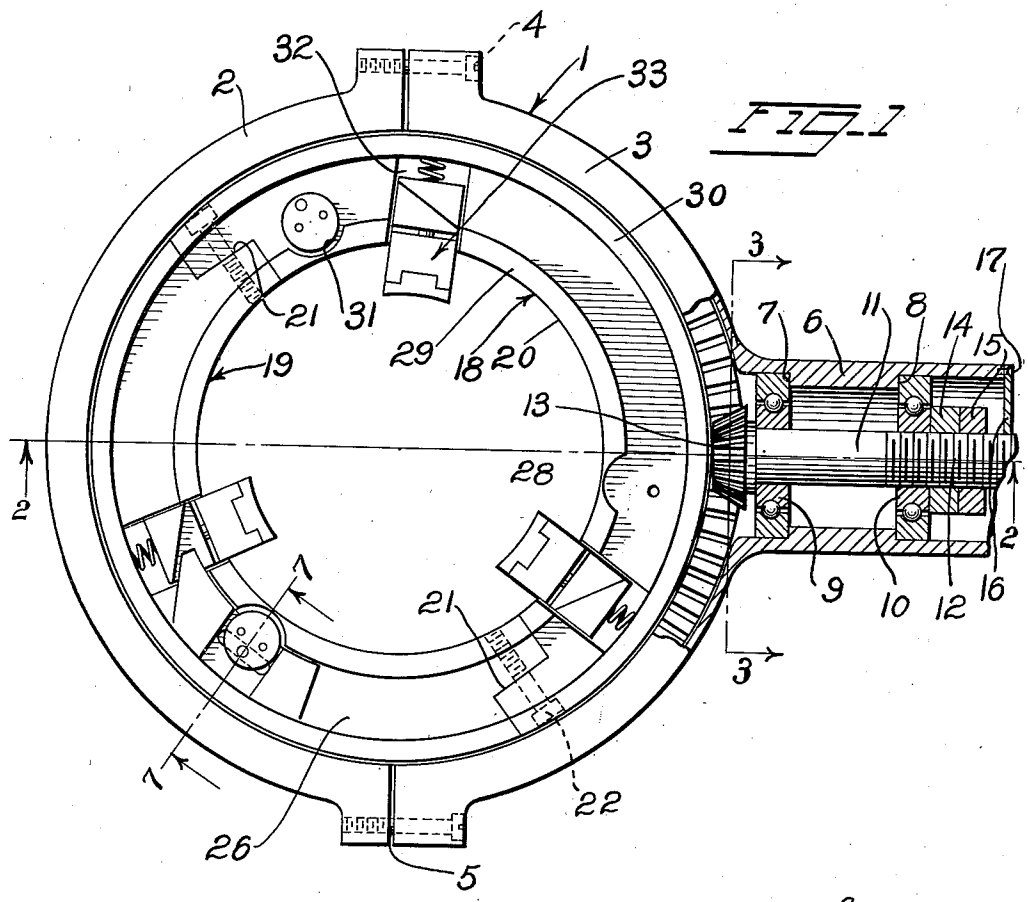
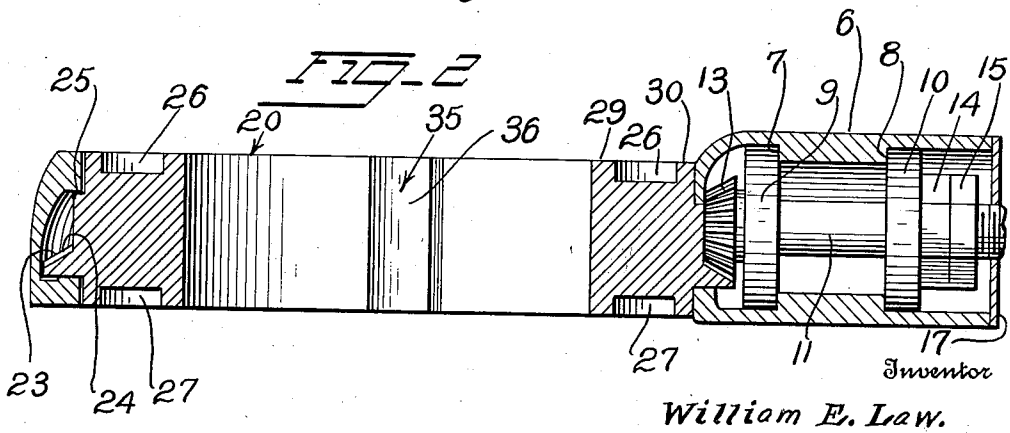


FIG. 2



Inventor

William E. Law.

By Lacey & Lacey,

Attorneys

July 28, 1942. W. E. LAW 2,291,164

GRINDING TOOL

Filed Oct. 10, 1940 2 Sheets-Sheet 2

FIG. 3

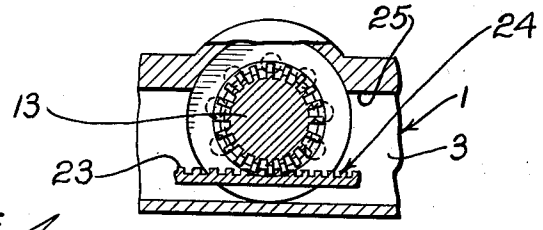


FIG. 4

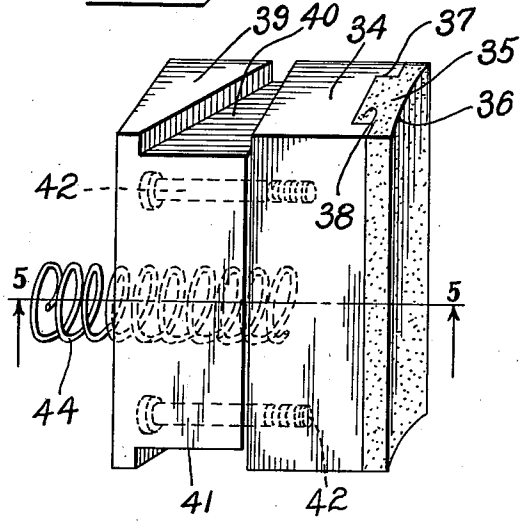


FIG. 5

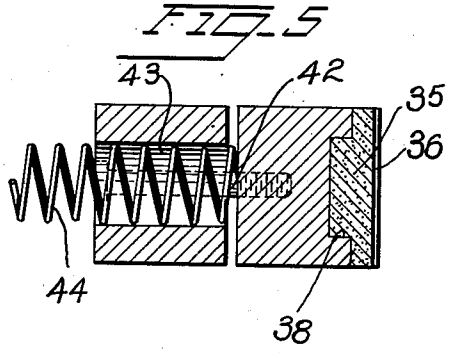


FIG. 6

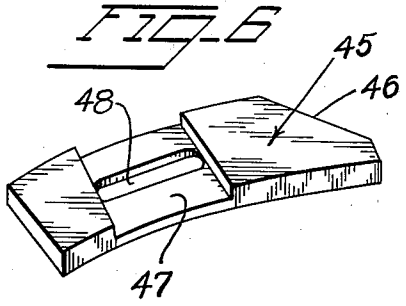
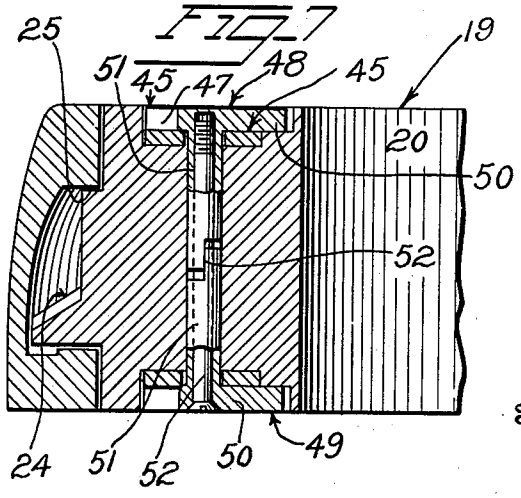


FIG. 7



Inventor

William E. Law.

By Lacey & Lacey, Attorneys

Patented July 28, 1942 2,291,164

UNITED STATES PATENT OFFICE

2,291,164

GRINDING TOOL

William E. Law, Windsor, Calif.

Application October 10, 1940, Serial No. 360,675

12 Claims. (Cl. 51—73)

This invention relates to a grinding tool, and seeks, among other objects, to provide a device of this character which is particularly adapted for use in truing out of round crank pins of a crank shaft without removing said crank shaft from the engine.

Another object of the invention is to provide a grinding tool which may be easily manipulated by hand for assuring efficient honing of the surface of a crank pin or the like.

And another object of the invention is to provide a grinding tool which may be operated by a motor of the type employed for use with small electric drills and other light tools.

The invention seeks, as a still further object, to provide a tool of this class wherein the stones employed may be effectively adjusted throughout a wide range.

Still another object of the invention is to provide a grinding tool which is so constructed that operating stresses will be evenly distributed.

A still further object of the invention is to provide a grinding tool having carriers for the grinding stones which carriers are of improved construction.

And another object of the invention is to provide a grinding tool wherein the case or frame employed is stationary, which construction permits the device to be held in the hand while working and permits the stones to be shifted back and forth along a crank pin, for assuring effective honing.

Still other objects of the invention, not mentioned hereinbefore, will become apparent during the course of the following description.

In the drawings:

Figure 1 is a top plan view of my improved grinding tool, partly in section,

Figure 2 is a longitudinal sectional view of the tool on the line 2—2 of Figure 1 looking in the direction indicated by the arrows,

Figure 3 is a fragmentary transverse sectional view on the line 3—3 of Figure 1,

Figure 4 is a perspective view showing one of the grinding stone units employed,

Figure 5 is a transverse sectional view on the line 5—5 of Figure 4,

Figure 6 is an enlarged detail perspective view showing one of the adjusting plates, and

Figure 7 is an enlarged detail vertical sectional view on the line 7—7 of Figure 1.

In the accompanying drawings, like numerals of reference will be seen to designate like parts throughout the various views.

In the drawings, reference is first particularly had to Figures 1 and 2, whereon the numeral 1 indicates in general the frame of my improved grinding tool. The frame 1 is preferably formed of cast metal of suitable weight, and said frame includes semi-circular sections 2 and 3 which are normally connected to each other by means of bolts 4 and 5. As best seen in Figure 2 of the drawings, the frame 1 is substantially U-shaped in cross section.

The section 3 of the frame 1 is formed, substantially medially thereof, with an enlarged radially extending portion which defines a housing. The housing 6 is circular in shape and, in addition to serving as a housing, also serves as a handle for the frame. The housing is of pivotal formation and is bored to define shoulders 7 and 8. Carried in the housing and abutting the shoulders 7 is a ball bearing 9. A ball bearing 10 is also carried in the housing and abuts the shoulders 8, said ball bearings 10 being in axial alinement with the bearing 9. Rotatably mounted in the bearings 9 and 10 within the housing 6 is a driving shaft 11, said driving shaft having a threaded portion 12 thereon. A beveled drive pinion 13 is mounted on the shaft 11 at its inner end and, of course, at the inner end of the housing, the pinion extends into the section 3. The drive shaft 11 and the pinion 13 are maintained in proper position within the housing 6 by means of nuts 14 and 15 which are screwed on the threaded portion 12 into abutting relation with the bearing 10. A cap 16 is employed for closing the outer end of the housing, said cap being held in place by means of screws 17 and said cap, of course, being axially apertured to receive the drive shaft 11 therethrough.

Normally rotatably mounted within the frame 1 is a grinding assembly which is shown generally at 18. The grinding assembly 18 is, like the frame 1, preferably formed of cast metal and is disposed concentrically with respect to said frame 1. The driving assembly comprises a pair of sections 19 and 20 which are normally connected with each other by means of stepped joints 21, bolts 22 extending inwardly through said stepped joints to retain the sections, normally, in operative position. As best seen in Figure 2, the sections include outwardly projecting beveled gear portions 23 which define a beveled gear 24, said beveled gear normally meshing with the pinion 13. The sections also include shoulders 25 which cooperate with the under surfaces of the beveled gear portions 23 for engaging with the upper and lower marginal edges of the frame 1 for retaining the grinding assembly in position within said

frame. It will now be understood that rotation of the grinding shaft 19 and the pinion 13 will, by reason of the fact that the pinion meshes with the gear 24, cause rotation of the grinding assembly 18.

The grinding assembly 18 is formed with upper and lower annular grooves 26 and 27, respectively, said grooves being relatively wide but being of relatively shallow depth. Formed in the sections 19 and 20 of the grinding assembly 18, and extending throughout the thickness of said sections are openings 28. As will be seen clearly in Figure 1, wherein one of the openings is clearly shown, said openings are disposed medially of the width of the grooves 26 and 27, each of said openings communicating with said grooves. The grooves 26 and 27 define inner and outer annular flanges 29 and 30, said inner flange 29 being formed with arcuate cut-away portions 31, the purpose for which will be set forth hereinafter.

Formed in the grinding assembly are recesses 32, said recesses extending throughout the major portion of the width of the sections 19 and 20 of the assembly. More specifically, the recesses terminate, at their corresponding inner extremities, on the same vertical plane with the outer flanges 30. The recesses extend through the entire thickness of the sections. While I have shown three of the recesses 32, it should be understood that any number of said recesses may be employed, this depending upon the number of grinding stones to be used. The recesses are disposed equi-distantly about the circumference of the grinding assembly. It will also be understood that the recesses intersect both the upper and lower grooves 26 and 27.

In order to carry out the actual grinding operation, I employ grinding units 33. The grinding units are identical in construction so that a description of one will suffice for all. The grinding units are carried in the recesses 32 and are held against displacement from said recesses by means to be described hereinafter.

A typical grinding unit is shown in Figures 4 and 5 of the drawings and reference is now had particularly to these figures. The grinding unit includes a carrier 34 and a grinding stone 35, said grinding stone being formed of carborundum or other suitable material and having an arcuate grinding surface 36. The stone 35 is held in place by means of a key 37 which is carried in a groove 38 in the carrier. The stone carrier 34 has connected therewith a shifting block 39, said shifting block having upper and lower cam grooves 40 and 41, respectively, said cam grooves being in vertical alinement and being of a depth substantially equal to that of the grooves 26 and 27. Also, the cam grooves 40 and 41 communicate with the grooves 26 and 27. The block 39 is connected to the carrier 34 by means of a pair of bolts 42, said bolts being adjustable for varying the distance between the block 39 and said carrier. The shifting block 39 is formed, medially of its height and width, with a relatively large opening 43. Normally carried within the opening 43 is a compression spring 44, said compression spring having one end bearing against the inner face of the carrier 34 and the other end bearing against the end face of the recess 32 in which the grinding unit is mounted. The spring 44 normally urges the carrier 34 and the block 39 toward the axis of the tool.

In order to adjust the grinding units 33 in the recesses 32, I provide adjusting blocks 45, said adjusting blocks being best seen in Figures 6 and 7 of the drawings. The adjusting blocks 45 are arcuate in formation and each includes inclined cam surfaces 46. Two of the adjusting blocks are required for each of the units 33, one of said blocks being carried in the groove 26 and the other in the groove 27. A pair of the adjusting blocks will be disposed in vertical alinement and will operate in unison for retaining the units in proper position in their respective recesses. Also, of course, the adjusting blocks will operate to shift the grinding units inwardly and outwardly into various adjusted positions. Each of the adjusting blocks includes a cut-away central portion 47 which has a slot 48 extending throughout its length, said slot being disposed substantially medially of the width of said block.

In order to shift the blocks 45 in the grooves 26 and 27, I provide adjusting cams 48 and 49, a pair of the adjusting cams 48 and 49 being, of course, used with each pair of the blocks 45. The adjusting cams 48 and 49 each include a head 50 and a stem 51, said stems being connected to each other by means of mating stepped joints 52, the stems being rotatably mounted in the openings 28 in the grinding assembly 18. The heads 50 of the adjusting cams are carried in the cut-away portions of the blocks 45 and the stems 51 extend through the longitudinal slots 48 in said cut-away portions. A locking screw 52 is used in conjunction with each pair of adjusting cams 48 and 49. By tightening the adjusting screw, each pair of cams may be effectively locked in an adjusted position. Spanner openings are formed in each of the heads of the cams to permit ready shifting of said heads for shifting the blocks 45. It will now be understood that, when the screw 52 is loosened, either of the heads 50 may be engaged for shifting said heads within the cut-away portions of the blocks 45, with the result that said blocks will be shifted toward or away from the recesses. The cam surfaces 46 engage the cam portions 40 of the blocks 39 with the result that, when the adjusting blocks 45 are shifted toward the block 39, the units 33 will be retracted into the recesses 32. When, on the other hand, the cams are shifted in the opposite direction for moving the blocks 45 away from the blocks 39, the springs 44 will urge the units 33 toward the axis of the tool and, of course, toward the surface to be ground.

While it is believed that the operation of my invention will be understood from the foregoing, a brief description thereof will now follow. When it is desired to grind a connecting rod bearing without removing the crank shaft from the engine, my device is first supported about the bearing. This is done by removing the bolts 4 and 5, for permitting separation of the sections 2 and 3. The bolts 22 are then removed for permitting separation of the sections 19 and 20 of the grinding assembly. After the sections 2 and 19 have been separated from the sections 3 and 20, the frame may be placed about the crank shaft bearing. After this has been done, the section 19 is again connected with the section 20 and the section 2 is again mounted in engagement with the section 3. The screws 52 are loosened for permitting rotation of the cams 48 and 49 for moving the grinding units 33 into engagement with the surface of the bearing to be honed. As hereinbefore set forth, rotation of either of the cams 48 or 49 of the pairs of cams will be sufficient to cause shifting movement of each pair of the blocks 45. After the blocks have been moved for positioning the units 33 for

an effective grinding operation, it is only necessary to tighten the screws **52** for locking the cams in operative position. The cut-away portion **31** in the flange **29** will serve the purpose of permitting free movement of the cam during an adjusting operation. The cams will, during adjustment, move against the end faces which define the cut-away portions **47** of the block. The cams **48** will permit longitudinal shifting of the blocks **45** in the grooves **26** and **27**. Inasmuch as the blocks **45** extend into the grooves **40** and **41** of each of the units **33** at all times, said units will be limited against displacement from the recesses.

My improved grinding tool may be effectively held in the hand of the worker during a grinding operation, due to the fact that the frame **1** is stationary. This is a particularly meritorious feature because the entire tool may be shifted back and forth on the crank pin for assuring effective grinding of the entire surface of said pin.

The shaft **11** may be connected with any small electric motor due to the fact that a large amount of power is not required. Also, the strains and stresses are uniform so that there will be no undue wear upon any one part of the device.

The adjustments for a given size cut may be set before the device is assembled about a crank shaft or bearing. The device is capable of a wide range of adjustment as, if necessary, shims can be placed between the carriers **34** and the blocks **39** by using longer screws **42**. Although my invention is particularly well adapted for grinding crank pins, it is obvious that it may be used for grinding any cylindrical surface within its capacity.

It is believed that the construction and operation of my improved grinding tool will now be thoroughly understood.

Having thus described the invention, what is claimed as new is:

1. In a grinding tool, a frame, a grinding assembly rotatable in the frame and having a recess and a groove, a grinding unit mounted in the recess and including a stone, and wedge means circumferentially movable in the groove for adjusting the position of the grinding unit.

2. In a grinding tool, a frame, a grinding assembly carried by the frame and having a groove and a recess communicating with the groove, a grinding unit mounted in the recess, means movably mounted in the groove and extending into the recess for engaging the unit for adjusting the position of the grinding unit within said recess, a grinding stone carried by the unit, means for shifting said adjusting means, and means for rotating the grinding assembly for effecting a grinding operation.

3. In a grinding tool, a frame, a grinding assembly carried by the frame and having a groove and a recess communicating with the groove, a grinding unit mounted in the recess, means slidably mounted in the groove and extending into the recess for engaging the unit for adjusting the position of the grinding unit within said recess, a grinding stone carried by the unit, means for shifting said adjusting means, and means for rotating the grinding assembly for effecting a grinding operation, said adjusting means comprising a block having a cut-away portion and said means for shifting the adjusting means comprising a cam in the cut-away portion.

4. In a grinding tool, a frame, a grinding assembly rotatable within the frame and having a pair of grooves and a plurality of recesses, said grooves communicating with said recesses, a plurality of grinding units in the recesses, said grinding units each including a stone, circumferentially slidable means for urging the units outwardly within the recesses, and means for shifting the units against the tension of said last-mentioned means for effecting adjustment of the grinding unit with respect to a surface to be ground.

5. In a grinding tool, a frame, a grinding assembly rotatably mounted in the frame, said grinding assembly having a recess, a grinding unit in the recess, said grinding unit including a carrier, a stone on the carrier and a shifting block, means for urging the grinding unit outwardly with respect to the recess, and adjusting blocks engageable with the shifting blocks for adjusting the position of the grinding unit on the grinding assembly.

6. In a grinding tool, a frame, a grinding assembly rotatably mounted in the frame, said grinding assembly having a recess, a grinding unit in the recess, said grinding unit including a carrier, a stone on the carrier and a shifting block, means for urging the grinding unit outwardly with respect to the recess, adjusting blocks engageable with the shifting blocks for adjusting the position of the grinding unit on the grinding assembly, and cams carried by the grinding assembly and shiftable for moving the adjusting blocks.

7. A grinding tool as recited in claim 6, wherein means is employed for locking the cams and adjusting blocks in an adjusted position whereby the grinding unit will be held in adjusted position.

8. In a grinding tool, a frame, a grinding assembly rotatably mounted in the frame and having annular grooves formed in its upper and lower surfaces, said grinding assembly having recesses communicating with the interior of the assembly, grinding units carried by the grinding assembly, said grinding units having shifting blocks, adjusting blocks carried in the grooves and extending into engagement with the shifting blocks, said adjusting blocks engaging the upper and lower surfaces of the shifting blocks for retaining the grinding units in position within the recesses.

9. In a device of the class described as recited in claim 8, wherein said adjusting blocks are movable for adjusting the position of the grinding units within the recesses and with respect to a shaft to be ground.

10. In a grinding tool, a frame, a grinding assembly rotatable within the frame, said grinding assembly having upper and lower annular grooves and spaced recesses, grinding units carried in the recesses and having shifting blocks provided with cam surfaces, said cam surfaces communicating with the grooves, adjusting blocks in the upper and lower grooves and projecting into engagement with the grinding units for permitting displacement of the grinding units from the recesses, said adjusting blocks having cam surfaces for engaging the cam surfaces of the shifting blocks for adjusting the positions of the units within the recesses, and means for locking the adjusting blocks and grinding units in adjusted positions.

11. In a grinding tool as recited in claim 10, wherein the last-mentioned means comprises cams, one of said cams being engaged in each of the adjusting blocks and said cams having heads and stems, the stems being interconnected where-

by movement of one of said cams will communicate movement to the other of said cams.

12. In a grinding tool, a frame having a pair of sections, means detachably connecting the sections, one of said sections having a housing and said frame being movable to a position about a shaft, bearings carried in the housing, a driving shaft carried by the housing and journaled by the bearings, a pinion on the driving shaft within the frame, a grinding assembly rotatable within the frame and having an integral gear meshing with the pinion, a grinding unit carried by the grinding assembly and having a stone, said driving shaft and pinion being rotatable for transmitting rotative movement to the grinding assembly for rotating the grinding unit and stone, circumferentially movable means on the grinding assembly for adjusting the grinding unit, and means for shifting said circumferentially movable means, said last-mentioned means comprising a pair of adjusting blocks and cams for shifting the blocks toward and away from the grinding unit.

WILLIAM E. LAW.