Feb. 7, 1950 A. J. DAVIS 2,496,383

APPARATUS FOR HEAT TREATING METAL OBJECTS

Filed Oct. 22, 1948 2 Sheets-Sheet 1

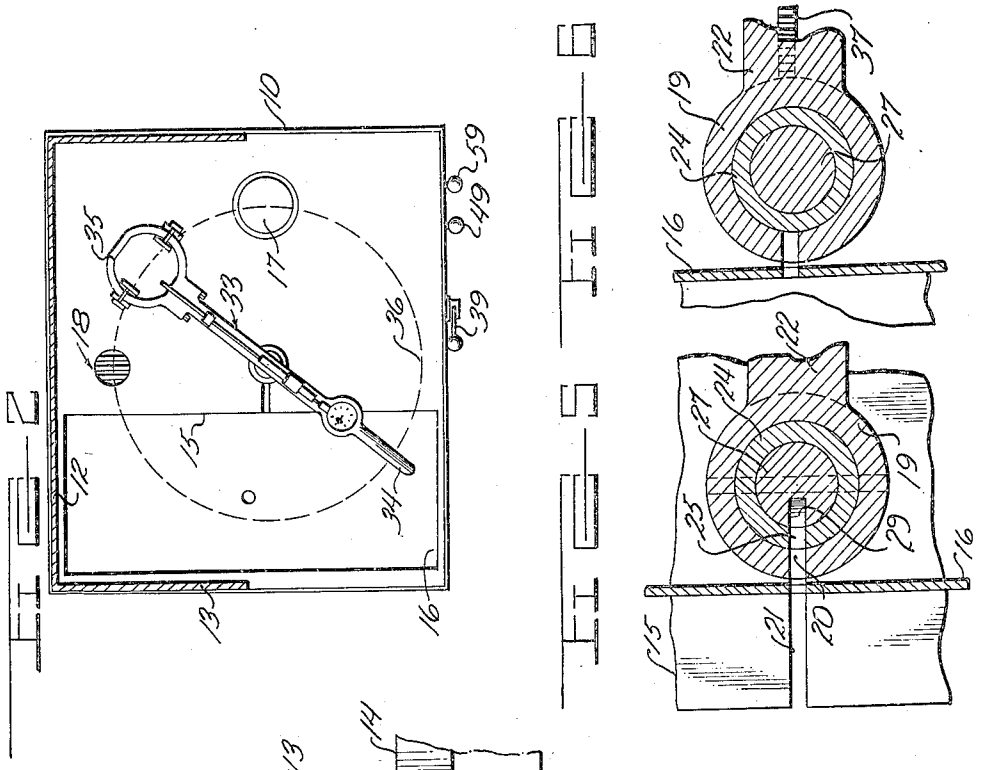


FIG. 2

FIG. 5

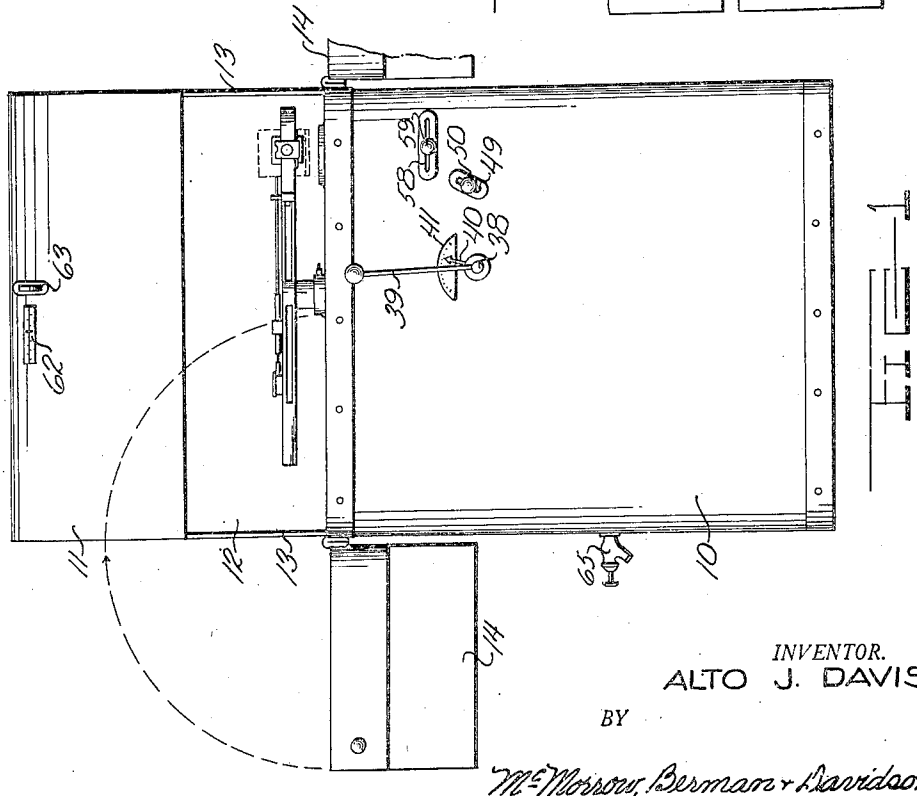


FIG. 1

INVENTOR.
ALTO J. DAVIS

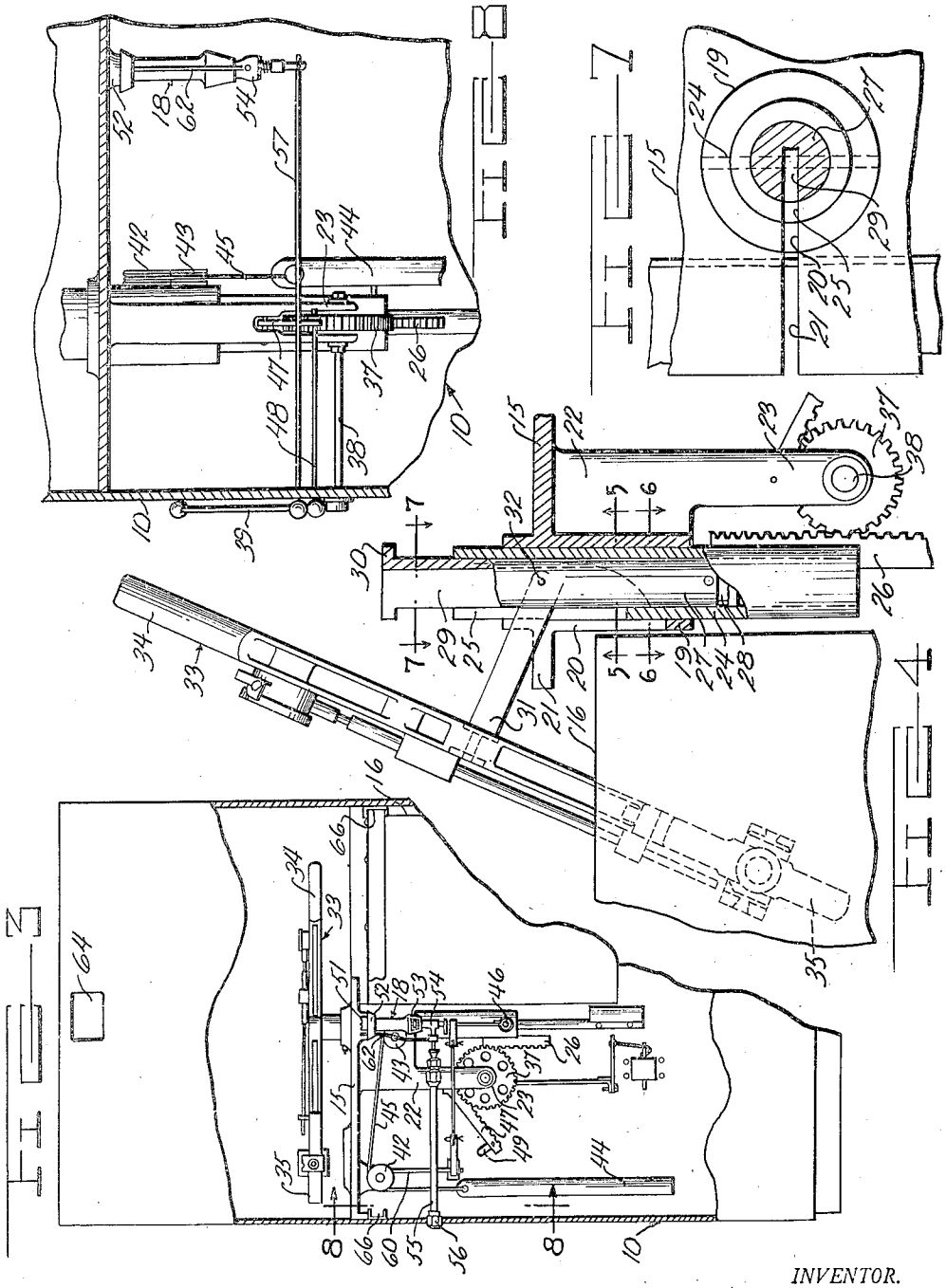
BY

McMorrow, Berman & Davidson
ATTORNEYS

Feb. 7, 1950 A. J. DAVIS 2,496,383

APPARATUS FOR HEAT TREATING METAL OBJECTS

Filed Oct. 22, 1948 2 Sheets-Sheet 2



INVENTOR.
ALTO J. DAVIS

BY

McMorrow, Berman & Davidson
ATTORNEYS

Patented Feb. 7, 1950 2,496,383

UNITED STATES PATENT OFFICE

2,496,383

APPARATUS FOR HEAT-TREATING METAL OBJECTS

Alto J. Davis, Montgomery, Ala.

Application October 22, 1948, Serial No. 56,013

3 Claims. (Cl. 266—4)

1

This invention relates to apparatus for heat-treating metal objects and more particularly to apparatus for heat-treating internal combustion engine pistons for expanding the same to compensate for wear.

It is among the objects of the invention to provide improved heat-treating apparatus by means of which internal combustion engine pistons can be quickly seized in proper position in a movable holder, carried by such holder to a heating burner and then to a quenching tank and released from the holder whereby such pistons are rapidly and easily handled in the heat-treating process, which apparatus is quickly and easily adjustable to accommodate it to pistons of different dimensions, is highly accurate in operation and easy to use, is of simple, durable and economical construction, and constitutes a unitary and self-contained device of neat and attractive appearance.

Other objects and advantages will become apparent from a consideration of the following description and the appended claims in conjunction with the accompanying drawings, wherein:

Figure 1 is a front elevation of heat-treating apparatus illustrative of the invention;

Figure 2 is a top plan view of the apparatus, a portion being broken away and shown in cross-section to better illustrate the construction thereof;

Figure 3 is a rear elevation of a fragmentary portion of the apparatus, the outer casing being broken away to show the internal mechanism;

Figure 4 is a transverse cross-section on an enlarged scale of a fragmentary portion of the operating mechanism illustrating constructional details of the mechanism;

Figure 5 is a transverse cross-section on an enlarged scale and is taken substantially on the line 5—5 of Figure 4;

Figure 6 is a transverse cross-section on an enlarged scale taken substantially on the line 6—6 of Figure 4;

Figure 7 is a transverse cross-section on an enlarged scale taken substantially on the line 7—7 of Figure 4; and,

Figure 8 is a vertical cross-section of a fragmentary portion of the apparatus taken substantially on the line 8—8 of Figure 3.

With continued reference to the drawings, the operating mechanism of the apparatus is enclosed in a generally rectangular casing 10 the bottom end of which is adapted to rest upon a floor and the upper end of which is positioned at a convenient height for a table upon which the heat-treating operation is carried out. A hood

2

11 is disposed above the upper end of the casing 10 and includes a portion spaced above and partially overlying the area of the upper end of the casing. This hood has a back wall 12 continuous with the back wall of the casing and side walls 13 which are continuous with the corresponding side walls of the casing but of less width than the latter. A pair of hollow covers 14 are hinged to the casing 10 at the upper ends of the casing side walls and are movable between an open position, as illustrated in Figure 1, in which they are disposed laterally of the casing side walls and a closed position in which they cover the space between the upper end of the casing 10 and the upper portion of the hood 11.

A flat rectangular table 15 is supported by the casing 10 and disposed at the upper end of the latter. This table has a width less than the width of the casing and the space between one side wall of the casing and the adjacent edge of the table is occupied by a rectangular quenching tank 16.

Opposite the quenching tank the table is provided on its upper surface with a raised, preferably circular, pillow 17 and at a location between the pillow 17 and the adjacent edge of tank 16 is provided with an aperture receiving a heating burner 18.

Near the center of its inner edge the table is provided with an elongated, depending tubular boss 19 having in its side adjacent the tank 16 a longitudinally extending slot 20 which slot extends through the adjacent edge portion of the table, as indicated at 21.

A pair of spaced-apart, substantially-parallel extensions 22 project outwardly from the opposite side of sleeve 19 and are connected at their upper ends to the undersurface of the table 15, and these projections are extended downwardly substantially parallel to the longitudinal center line of the boss and spaced therefrom to provide a pair of spaced-apart, apertured lugs 23 laterally offset from the center line of the boss.

A tubular sleeve 24 longer than the boss 19 is slidably mounted in the boss and has in one side a longitudinally extending slot 25 which registers with the slot 20 in the boss. A toothed rack 26 is secured to the side of the sleeve 24 opposite the slot 25 near the lower end of the sleeve and this rack extends downwardly below the sleeve and is provided with rack teeth on its outer face.

A cylindrical post 27 is rotatably mounted in the sleeve 24 and projects upwardly above the upper end of the sleeve. While freely rotatable in the sleeve this post is held against longitudinal

movement relative to the sleeve by suitable means such as one or more set screws extending through the sleeve and into an annular groove 28 provided in the post near the lower end of the latter. The post is provided with a deep, radially-extending groove 29 which extends from near the mid-length location of the post to the upper end of the latter and the upper end of the post is provided with an external annular flange 30 providing a shoulder engageable with the upper end of the sleeve 24 to positively limit movement of the post downwardly relative to the sleeve.

A flat arm 31 of rectangular cross-sectional shape is receivable in the post groove 29 and is pivotally connected to the post near the lower end of the arm by a pivot pin 32 extending transversely through the arm and the post.

A piston carrier, generally indicated at 33, has at one end a handle 34 and at its opposite end an annular piston-holder 35 operative to seize internal combustion engine pistons and carry them through the heat-treating operation. This carrier is connected at a location between the handle 34 and holder 35 to the upper end of arm 31.

The pillow 17, the burner 18 and the tank 16 are substantially centered on an arc 36 centered on the axis of rotation of the post 27 and having a radius substantially equal to the distance from the axis of rotation of post 27 to the center of the annular piston holder 35 so that, as the piston carrier is rotatably moved about the axis of the post, a piston can be carried from the pillow 17 to the burner 18 and from the burner to the quenching tank 16.

A pinion 37 is journaled in the apertured lugs 23 by a suitable shaft 38 or other convenient means such as journal bosses provided on the pinion and has teeth which mesh with the teeth of the rack 26. An operating shaft 38 is drivingly connected at one end to the pinion 37 and extends through an aperture provided in the front wall of the casing 10. A hand lever 39 is connected to the end of operating shaft 38 at the outer side of the front wall of the casing to manually rotate the pinion 37 and a pointer 40 is connected to the shaft 38 and is movable over a dial 41 on the outer surface of the casing front wall to indicate the rotational position of hand lever 39.

When pinion 38 is rotated by manual lever 39 sleeve 24 is moved upwardly or downwardly, raising or lowering the piston carrier 33 to adjust the pistons between the piston-holder 35 of the carrier and the top surface of the table pillow 17 to accommodate the apparatus to pistons of different height or other different characteristics.

A pair of spaced-apart cable sheaves 42 and 43 are rotatably supported from the table 15 below the latter and a counter-weight 44 is connected at its upper end to one end of a strand or cable 45 which is led over the sheaves 42 and 43 and connected at its opposite end to the tubular sleeve 24 near the lower end of the latter, as indicated at 46. The counter-weight 44 counterbalances the weight of the sleeve 24, the post 27, the arm 31 and the piston carrier 33 so that this assembly can be moved upwardly and downwardly by the hand lever 39 with a minimum of manual effort.

A toothed locking bar 47 is pivotally connected at one end between the lugs 23 and has along one end edge rack teeth which mesh with the teeth of pinion 37. An operating rod 48 is connected at one end to the free end of the locking

bar 47 and extends through an arcuate slot 49 in the front wall of the casing 10 and is provided on its end at the outer side of the casing front wall with a hand knob 50 by means of which the rod can be moved to raise the locking bar 47 to free the pinion 37 for rotation or lowered to releasably lock the pinion against rotational movement.

Before the pinion can be rotated by the hand lever 39 the knob 50 must be lifted to unlock the pinion and when the pinion has been brought to the desired position, as explained above, the knob 50 is released to permit the locking bar to descend into locking engagement with the pinion teeth.

The heating burner 18, as illustrated, is a gas-type burner and has its tip 51 disposed in an apertured depending boss 52 of the table directly to the rear of the boss 19. This burner is provided with an air inlet 53 and a gas valve 54 disposed between the air inlet and the adjacent end of a gas conduit 55 which extends through one side wall of the casing 10 and is provided on its outer end with a coupling 56. A link 57 extends through a horizontally elongated slot 58 in the front wall of the casing 10 and is provided on its end outside of the casing front wall with a hand knob 59. The inner end of this link or lever 57 is supported by a strut 60 extending downwardly from the table 15 and is connected through a link 61 with the gas valve 54 so that the gas can be turned off and on by operation of the hand knob 59. The burner is provided with a pilot 62 of conventional construction.

With the above arrangement and with the piston carrier properly adjusted for height by the hand lever 39, the piston carrier is moved to bring the annular piston holder 35 directly over the pillow 17 and a piston is placed in the holder and permitted to rest upon the table to position the piston properly to the holder. The piston is then clamped in the holder and carried to the burner 18 by rotationel movement of the holder about the axis of the post 27. The knob 59 is then operated to open the gas valve of the burner and when the proper amount of heat has been applied to the piston the gas valve is closed and the piston carrier swung until the piston is brought over the quenching tank 16 and the arm 31 is brought into alignment with the slots 20 and 25 in the boss 19 and sleeve 24, respectively. The piston carrier is then tilted to immerse the piston in the cooling liquid contained in the tank 16. After the piston has been quenched the carrier is tilted back to its substantially horizontal position returning the arm 31 to the groove 29 whereupon the piston carrier is again moved rotationally to bring the treated piston over the table 15 where it is removed from the piston holder. The heat-treating process can thus be very rapidly carried out by a unit-directional, rotational movement of the piston carrier and extremely accurate treating of the piston can be accomplished.

If desired, a roller carrying suitable instructions may be mounted in the hood 11, as indicated at 62 and rotated by hand wheel 63 to make the desired information available through a suitable sight opening provided in the hood and a vent 64 for the burner may be provided in the upper rearward portion of the hood. A drain valve 65 is connected to the bottom of the tank 16 and extends through one side wall of the casing 10 and a suitable re-inforcing framework 66 is provided in the casing for supporting the table 15 and the tank 16. The casing and the tank

may be formed of suitable material such as sheet-iron or sheet-aluminum but the table is preferably formed as an aluminum casting and given such machining operations as may be necessary.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment is, therefore, to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are, therefore, intended to be embraced therein.

What is claimed is:

1. Heat-treating apparatus for internal combustion engine pistons comprising a table, means supporting said table, a raised piston-supporting pillow on said table, a burner supported by said table at a location spaced from said pillow, a quenching tank supported adjacent said table at a location spaced from said pillow and said burner, an elongated, tubular boss depending from said table and having a longitudinal slot in the side thereof adjacent said tank and a pair of apertured lugs at the opposite side thereof, a sleeve slidably mounted in said boss, a toothed rack on said sleeve disposed between said apertured lugs, said sleeve having in the side thereof opposite said rack a slot registering with the slot in said boss, a post rotatably mounted in said sleeve and having a groove in one side opening to the upper end thereof, an arm in said groove pivotally connected at its lower end to said post and extending above said post at its upper end, a piston carrier having at one end a piston holder and its opposite end a handle, said carrier being secured between said holder and said handle to the upper end of said arm for rotational movements about the axis of said post and tilting movements about the axis of said pivotal connection between said arm and said post when said arm is brought into registry with the slots in said sleeve and said boss, said pillow, said burner and said tank being substantially centered on an arc centered on the axis of said post so that carrier can move a piston from said pillow to said burner and from said burner to said tank by a uni-directional movement, a pinion journaled on said lugs and meshing with said rack, a handle secured to said pinion to rotate the latter and thereby adjust the distance between said piston holder and the surface of said pillow, a counter-weight carried by said table and connected to said sleeve, and a manually operated lock bar supported by said table and engageable with said pinion to releasably lock the latter against rotation.

2. Heat-treating apparatus for internal combustion engine pistons comprising a piston carrier, means supporting said piston carrier for rotational movements and for tilting movements about an axis substantially perpendicular to the axis of said rotational movements, a piston-supporting pillow, a heating burner and quenching tank arranged in spaced-apart relationship about said axis of rotational movement of said carrier, and manually-operated means connected to said carrier supporting means for adjustably raising and lowering said carrier relative to said pillow, said carrier supporting means comprising a tubular boss, a sleeve slidable in said boss, a post rotatable in said sleeve and having a longitudinally-extending groove, and an arm received in said groove rigidly connected at its upper end to said carrier and pivotally connected at its lower end to said post, said boss and said sleeve having registering slots therein for receiving said arm when said carrier is tilted.

3. Apparatus for heat treating metal objects comprising a table, means supporting said table at a height convenient to an operator using the apparatus, a post extending through said table, means carried by said table supporting said post for rotation about its longitudinal center line and for longitudinal movement relative to said table, an object carrier pivotally connected intermediate its length to said post above said table for tilting movements about an axis substantially perpendicular to the axis of rotation of said post, an object holder at one end of said carrier movable in an arcuate path about said post, an object supporting pillow on said table within the arcuate path of movement of said holder for supporting an article while being positioned in said holder, a quenching tank spaced from said pillow along said arcuate path of travel and positioned below said table, a heating burner between said pillow and said quenching tank and directed to heat the bottom end of an object supported in said holder, and means carried by said table restraining said carrier against tilting movement except when said holder is over said quenching tank.

ALTO J. DAVIS.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,592,659	Gilman	July 13, 1926
1,836,337	Riblett	Dec. 15, 1931
2,291,034	Gridley	July 28, 1942
2,379,627	Davis	July 3, 1945
2,459,183	Roth, Jr.	Jan. 18, 1949

FOREIGN PATENTS

Number	Country	Date
310,347	Great Britain	Apr. 23, 1929