J. H. KLASSEN.

CYLINDER INLAYING MACHINE.

APPLICATION FILED JUNE 6, 1916.

1,295,992.

Patented Mar. 4, 1919.

2 SHEETS—SHEET 1.

Fig. 1

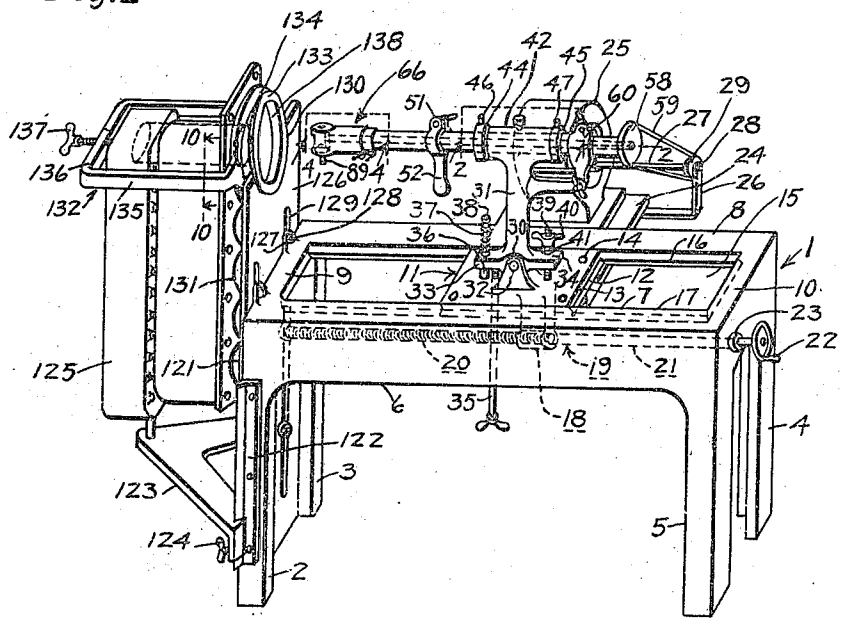


Fig. 2.

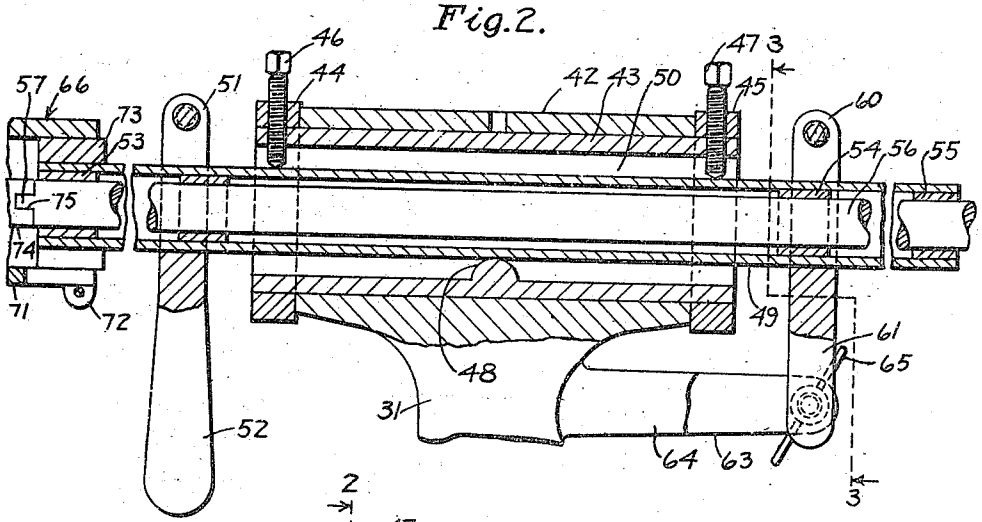
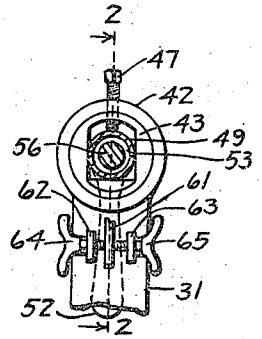


Fig. 3.



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2 SHEETS—SHEET 2.

Fig. 4.

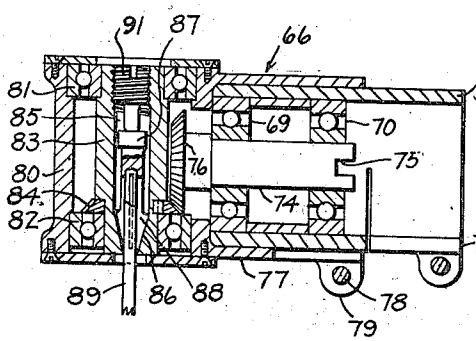


Fig. 5.

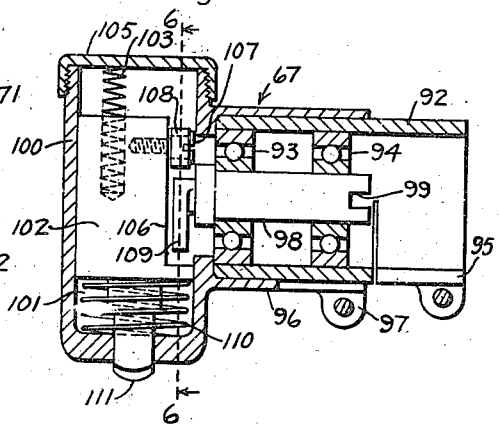


Fig. 7.

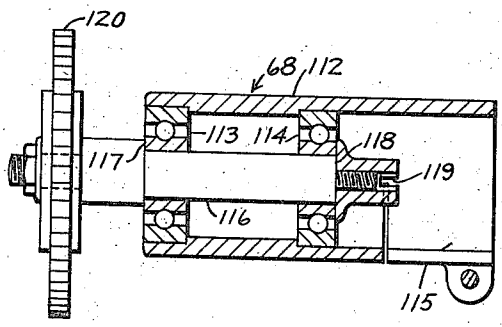


Fig. 6.

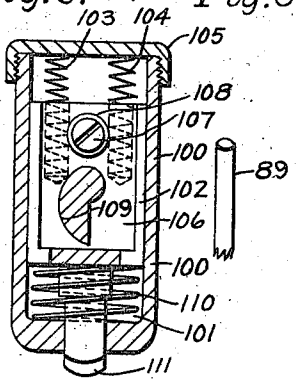


Fig. 8.

Fig. 9

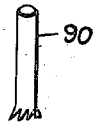


Fig. 10.

Fig. 11.

Fig. 12.

Fig 13.

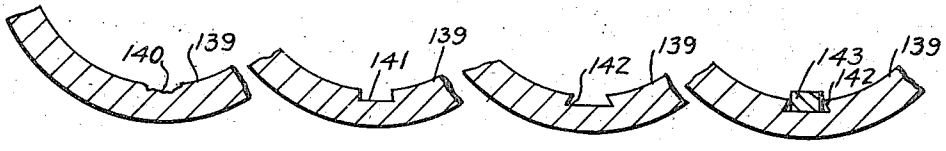
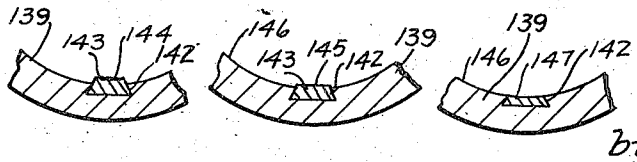


Fig. 14.

Fig. 15.

Fig. 16.



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UNITED STATES PATENT OFFICE.

JACOB H. KLASSEN, OF LOS ANGELES, CALIFORNIA.

CYLINDER-INLAYING MACHINE.

1,295,992. Specification of Letters Patent. Patented Mar. 4, 1919.

Application filed June 6, 1918. Serial No. 238,615.

To all whom it may concern:

Be it known that I, JACOB H. KLASSEN, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented new and useful Improvements in Cylinder-Inlaying Machines, of which the following is a specification.

My object is to make a cylinder inlaying machine and my invention consists in the novel features herein shown, described and claimed.

Specifically, my object is to make a machine by which an engine cylinder may be inlaid and patched instead of boring out the cylinder to remove the worn spots and make the cylinder round. By the old method, it is necessary to rebore all the cylinders in order to preserve a well balanced engine having the same amount of power generated in each cylinder. By the use of my invention it is only necessary to repair the worn or scored cylinder, thus avoiding the expense of reboring the other cylinders of the engine which are not in need of repairs.

Figure 1 is a perspective of a cylinder inlaying machine, embodying the principles of my invention, in use, the cylinder being mounted upon the machine ready for operation.

Fig. 2 is an enlarged fragmentary sectional detail substantially on the line 2—2 of Fig. 1.

Fig. 3 is a fragmentary cross-section on the line 3—3 of Fig. 2.

Fig. 4 is an enlarged vertical longitudinal central section of the router chuck removed from its support, as indicated by the line 4—4 of Fig. 1.

Fig. 5 is a view analogous to Fig. 4 and showing the trip hammer chuck.

Fig. 6 is a cross-section on the line 6—6 of Fig. 5.

Fig. 7 is a view analogous to Figs. 4 and 5 and showing the miller chuck.

Fig. 8 is a perspective of the straight router.

Fig. 9 is a perspective of the dove-tail router.

Fig. 10 is a fragmentary cross-section of the wall of a cylinder, showing the spot which is to be removed and inlaid.

Fig. 11 shows the spot removed by the use of the straight router shown in Figs. 4 and 8 and producing a straight walled slot.

Fig. 12 shows the same slot dove-tailed by the use of the router shown in Fig. 9.

Fig. 13 shows the section of inlay material loosely in the dove-tail slot.

Fig. 14 shows the inlay material hammered down to expand it into the dove-tail slot.

Fig. 15 shows the rough surface removed from the inlay shown in Fig. 14 by the use of the miller shown in Fig. 7.

Fig. 16 shows the finished job.

The stand 1 is all cast integral and comprises straight vertical legs 2, 3, 4 and 5, the front horizontal brace 6 connecting the forward edges of the legs 2 and 5, the front bed plate 7 connecting the upper ends of the legs 2 and 5 and extending backwardly from the upper edge of the brace 6, the rear bed plate 8 connecting the upper ends of the legs 3 and 4, and the frame ends 9 and 10 connecting the ends of the bed plates 7 and 8; the end 9 connecting the upper ends of the legs 2 and 3 and the end 10 connecting the upper ends of the legs 4 and 5.

The carriage 11 consists of a lower plate 12 and an upper plate 13 secured together by bolts 14. The plates 12 and 13 fit in the opening 15 between the bed plates 7 and 8 and the inner edges 16 and 17 of the plates 7 and 8 are A-shaped in cross-section to fit in V-shaped slide-ways formed at the edges of the plates 12 and 13, so that the carriage will slide from one end of the opening 15 to the other.

A screw-threaded bearing 18 extends downwardly from the carriage 11 and a feed screw 19 has an enlarged screw-threaded portion 20 fitting in the bearing 18 and a reduced smooth portion 21 which will slide through the bearing, and the feed screw is rotatably mounted in the ends 9 and 10 and has a handle 22, so that when the handle 22 is manipulated the carriage 11 will be reciprocated to the extent of the screw 20 and when the screw 20 runs out of the bearing 18 the carriage may be moved back and forth to the extent of the smooth portion 21 without manipulating the handle 22. The feed screw 19 is provided with collars 23 to hold it from endwise motion.

The motor platform 24 is formed integral with the lower carriage plate 12 and extends backwardly under the bed plate 8 to a distance beyond the back side of the bed plate, and the motor 25 is mounted upon this platform back of the bed plate 8. A bracket

26 is secured to the motor platform 24 and extends upwardly. The motor shaft 27 is extended and operates in a bearing 28 in the upper end of the bracket 26, and the pulley 29 is fixed upon the shaft 27.

Two bearings 30 extend upwardly from the center of the carriage 11. The spindle post 31 is mounted between these bearings upon a pivot 32. Arms 33 and 34 extend horizontally and longitudinally from the lower end of this spindle post 31. An adjusting screw 35 is screw-seated upwardly through the carriage 11 against the lower face of the arm 33. A stud 36 is fixed in the carriage 11 and extends upwardly loosely through the arm 33, a spring 37 is placed upon the stud 36 on top of the arm 33, and a spring seat 38 is fixed in the upper end of the stud 36 against the spring 37, the tension of the spring being exerted to hold the arm 33 against the adjusting screw 35. A stud 39 is fixed in the carriage 11 and extends upwardly loosely through the arm 34 and jam nuts 40 and 41 are screw-seated upon the stud 39 on top of the arm 34, so that by manipulating the jam nuts 40 and 41 and the set-screw 35 the spindle post 31 may be tilted on a transverse axis and accurately adjusted to a desired tilted position and rigidly held in that position.

The spindle head 42 is formed integral with the upper end of the spindle post 31, a sleeve 43 is rotatably mounted longitudinally in the head 42, set collars 44 and 45 are placed upon the ends of the sleeve 43 against the ends of the head 42, set-screws 46 and 47 are screw-seated through the collars 44 and 45 and through the ends of the sleeve 43, and a fulcrum 48 extends from the inner face of the sleeve 43 at its longitudinal center.

The tubular spindle casing 49 extends through the sleeve 43 and rests on the fulcrum 48 and is engaged by the set-screws 46 and 47, so that by manipulating the set-screws 46 and 47 the casing 49 may be adjusted into a line parallel with the sleeve 43 or it may be adjusted into any desired angular line within the limits of the chamber 50, said chamber 50 within the sleeve 43 being considerably larger than the casing 49.

The clamp 51 is placed upon the casing 49 and has a handle 52 so that when the clamp 51 is tightened the casing 49 may be rotated by manipulating the handle 52, and if the set-screws 46 and 47 are tight against the casing 49 the sleeve 43 will rotate with the casing 49, thereby carrying the set-screws 46 and 47 and the fulcrum 48 to change the augularity of the swing of the casing 49 as desired.

Sleeves are inserted into the casing 49 to form the spindle bearings 53, 54 and 55, and the spindle 56 is mounted in these bearings, there being a tongue 57 extending from the chuck end of the spindle and a pulley 58 upon the other end of the spindle. A belt 59 connects the pulley 29 to the pulley 58, so that when the motor 25 operates, the spindle 56 will be rotated.

A clamp 60 is mounted upon the casing 49 and an arm 61 extends from the clamp 60. Arms 62 and 63 extend from the spindle post 31 and the arm 61 is located between these arms 62 and 63. Set-screws and jam nuts 64 and 65 are screw-seated through the arms 62 and 63 against opposite sides of the arm 61 so that when the clamp 60 is tightened upon the casing 49 the casing 49 may be rotated to accurately guide the chucks 66, 67 and 68 by manipulating the jam nuts and set-screws 64 and 65.

The details of the chuck 66 are as follows: Ball bearings 69 and 70 are fixed in one end of a tubular socket 71 and the other end of the socket is split to form a clamp 72, said clamp fitting a split collar 73 and said split collar 73 fitting the end of the spindle casing 49, so that when the clamp 72 is tightened the socket is rigidly mounted upon the spindle casing. A stub shaft 74 is mounted in the ball bearings 69 and 70 and has a groove 75 in one end to fit the tongue 57, so that the stub shaft 74 will rotate with the spindle 56. A bevel gear 76 is fixed upon the opposite end of the shaft 74 from the groove 75. A split socket 77 fits upon the socket 71 around the end carrying the bearings 69 and 70, and the socket is clamped in place by a screw 78 extending through ears 79. A casing 80 is formed integral with the socket 77 and ball bearings 81 and 82 are mounted in the casing 80, the axis of the ball bearings 81 and 82 being at right angles to the axis of the bearings 69 and 70. A spindle 83 is rotatably mounted in the ball bearings 81 and 82. A bevel gear 84 is fixed upon the lower end of the spindle 83 in mesh with the bevel gear 76. A bore 85 is formed from the upper end of the spindle 83 and has a tapered seat 86 at its lower end. A head 87 has clutching jaws 88 fitting the tapered seat 86 and a central bore extending between the jaws 88 to receive the routers 89 and 90. A set-screw 91 is screw-seated in the upper end of the bore 85 against the head 87 so that by manipulating said screw the jaws 88 are tightened or loosened upon the router.

The details of the chuck 67 are as follows: The tubular socket 92 has ball bearings 93 and 94 fixed in one end, and the other end is split to form the clamp 95. A socket 96 is split to form the clamp 97 and the clamp 97 fits upon the socket 92 and the clamp 95 fits upon the split collar 73. A spindle 98 is mounted in the bearings 93 and 94 and has a groove 99 to receive the tongue 57. A casing 100 is formed integral with the socket 96 and has a chamber 101 at

right angles to the axis of the spindle 98. A hammer head 102 is slidingly mounted in the chamber 101. Expansive coil springs 103 and 104 are mounted in seats extending downwardly from the upper end of the hammer head 102 and extend upwardly above the upper face of the hammer head. A cap 105 is placed upon the casing 100 to hold against the springs 103 and 104. The hammer head 102 is circular in plan with one flat side 106. A cap screw 107 is inserted through a roller 108 and tapped into the flat side 106 near its upper end. A lifting cam 109 is fixed upon the end of the spindle 98 in position to engage the roller 108 to raise the hammer head 102 at each revolution of the spindle, the cam being flat on its back side, so that when the hammer head has been raised to its limit the roller 108 passes from the cam and the hammer head drops. A spring cushion 110 is placed in the casing 100 below the hammer head 102. The peen 111 of the hammer extends downwardly from the hammer head 102 through the lower end of the casing 100, so that as the spindle 98 rotates, the peen 111 is reciprocated, the striking blow of the peen being caused by the expansion of the springs 103 and 104 and the falling weight of the hammer head 102.

The details of the chuck 68 are as follows: The tubular socket 112 has ball bearings 113 and 114 fixed in one end, and the other end is slotted to form a clamp 115, said clamp 115 fitting the split collar 73. A spindle 116 is mounted in the ball bearings 113 and 114, there being shoulders 117 and 118 to hold the spindle from endwise motion and a groove 119 at the inner end of the spindle to fit the tongue 57. A milling wheel 120 is removably mounted upon the outer end of the spindle 116.

The chucks 66, 67 and 68 are interchangeable and the tools are driven by the spindle 56.

The end face 121 of the main frame is straight up and down and crosswise. Track bars 122 are secured to the outer faces of the legs 2 and 3. A sliding platform 123 is mounted on these track bars to move up and down, said sliding platform being held in its adjusted position by set-screws 124 and said platform forming a horizontal sliding platform for supporting the cylinder case 125. A plate 126 fits against the face 121. Ears 127 extend upwardly from the upper face of the frame and clamping bolts 128 are inserted through vertical slots 129 in the plate 126 and through the ears 127 so that the plate 126 may be adjusted up and down and held in its adjusted position by tightening the bolts 128. A semi-circular notch 130 is formed from the upper edge of the plate 126. The cylinder case 125 is placed upon the platform 123 against the plate 126 with the open ends 131 of the cylinders facing the plate 126.

A shackle 132 comprises the head 133 having an annular groove 134 to receive the upper edge of the plate 126, arms 135 extending backwardly from the head 133 on each side of the cylinder case 125, a cross bar 136 connecting the rear ends of the arms 135, and set-screws 137 inserted through the cross bar to engage the back side of the cylinder case 125 and hold the case against the head 133. The head 133 has a circular opening 138 as large or larger than the bores of the cylinders and adapted to line up with the bore of a cylinder, and the chucks 66, 67 and 68 mounted upon the spindle casing 49 will pass through the opening 138 into the bore of the cylinder.

If a cylinder 139 has been operating with a loose wrist pin and the wrist pin has gouged out a groove 140, in the old practice it is necessary to bore out the cylinder to remove the groove 140 and then enlarge the piston either by using new rings or a new piston. In accordance with my practice, I place the chuck 66 in place and place the cylinder case 125 in place, as shown in Fig. 1, and I operate the chuck and the machine to route out the groove 140 with the router 89 to produce the straight clean groove 141. Then I place the router 90 in the chuck 66 and change the straight side groove 141 to the dove-tail groove 142. Then I place a bar of copper 143 in the groove 142, said bar of copper being rectangular in cross-section and as wide as will go in the slot and considerably thicker than the depth of the slot. Then I remove the chuck 66 and place the chuck 67 upon the spindle casing 49 and manipulate the machine so that the peen 111 will travel back and forth over the bar 143 and hammer the bar into the slot 142 to produce the unfinished inlay 144. Then I remove the chuck 67 and put the chuck 68 into operation and manipulate the machine to mill off the rough face of the inlay 144 to produce the semi-finished inlay 145. Then I grind or polish the inlay until it is flush with the inner face 146 of the cylinder, thereby producing the finished inlay 147. After the top cylinder is finished, the cylinder case 125 is raised by manipulating the sliding platform 123 and the set-screws 124 to bring the next cylinder into line with the opening 138 and so on until the set of cylinders are all inlaid.

In order to assure that the proper inlay is of substantially the same hardness as the metal of the cylinder and having the same coefficient of expansion and contraction, it is necessary to treat the bar or strip of copper 143 as follows: The same is heated red hot, just below the melting point, and plunged in cold water to anneal and to

render the same flexible. The heating and cooling is preferably repeated three or four times. The strip of copper is then hammered on its edge in order to condense the metal and close the pores. After the strip of copper has been inserted in the groove 142 of the cylinder, it is hammered a sufficient length of time until it has approximately the same degree of hardness as the metal of the cylinder, after which it is milled off and polished so that the inlay is flush and of the same contour with the inner face 146 of the cylinder.

In place of copper, any other metal or metal alloy of a hardness substantially equal to that of the cylinder and having the same coefficient of expansion and contraction, may be used.

In a companion application for method of repairing cylinders, filed June 6, 1918, Serial No. 238,616, I have described and claimed the method of repairing cylinders herein disclosed, and I do not wish to make such claims herein.

Various changes may be made in the details of construction without departing from the spirit of my invention as claimed.

I claim:

1. A cylinder inlaying machine comprising a stand, means for mounting a cylinder rigidly upon the stand with the bore horizontal, a spindle post adjustably mounted upon the stand, a spindle head upon the spindle post, a spindle casing adjustably mounted in the spindle head, a spindle in the spindle casing, means for driving the spindle, and interchangeable chucks adapted to be mounted upon the spindle casing and operated by the spindle; said chucks being adapted for routing a groove from the inner face of the cylinder, dove-tailing the groove, hammering a bar into the dove-tail groove, and removing the rough portion of the hammered bar.

2. In a cylinder inlaying machine, a stand, a carriage mounted to travel on the stand, a spindle post pivotally mounted on the carriage, means for adjustably tilting the spindle post, a spindle head upon the spindle post, a sleeve in the spindle head, a fulcrum in the sleeve, a spindle casing extending loosely through the sleeve and resting on the fulcrum, and set screws screw-seated through the ends of the sleeve, one on each side of the fulcrum, to engage the spindle casing and tilt it on the fulcrum.

3. In a cylinder inlaying machine, a stand, a carriage mounted to travel on the stand, a spindle post pivotally mounted on the carriage, means for adjustably tilting the spindle post, a spindle head upon the spindle post, a sleeve in the spindle head, a fulcrum in the sleeve, a spindle casing extending loosely through the sleeve and resting on the fulcrum, set-screws screw-seated through the ends of the sleeve, one on each side of the fulcrum, to engage the spindle casing and tilt it on the fulcrum, a clamp on the spindle casing, an arm extending from the clamp, arms extending from the spindle post on opposite sides of the first arm, and set-screws in the spindle post arms to engage the first arm; so that by manipulating the set-screws the spindle casing may be rotated to rotate the sleeve and change the angularity.

4. In a cylinder inlaying machine, a hollow spindle head, a sleeve rotatably mounted in the head and held against endwise movement, a fulcrum extending inwardly from the inner face of the sleeve at its longitudinal center, a spindle casing extending loosely through the sleeve and resting on the fulcrum, and set-screws fixed through the ends of the sleeve on each side of the fulcrum to engage the spindle casing and tilt the spindle casing in the sleeve.

5. In a cylinder inlaying machine, a hollow spindle head, a sleeve rotatably mounted in the head and held against endwise movement, a fulcrum extending inwardly from the inner face of the sleeve at its longitudinal center, a spindle casing extending loosely through the sleeve and resting on the fulcrum, set-screws fixed through the ends of the sleeve on each side of the fulcrum to engage the spindle casing and tilt the spindle casing in the sleeve, and means for rotating the sleeve to change the angularity of the spindle casing.

In testimony whereof I have signed my name to this specification.

JACOB H. KLASSEN.