Aug. 25, 1936. V. F. LIPPARD 2,052,355

MACHINE FOR RESHAPING AND ENLARGING PISTONS

Filed Jan. 30, 1936

Fig. 1.

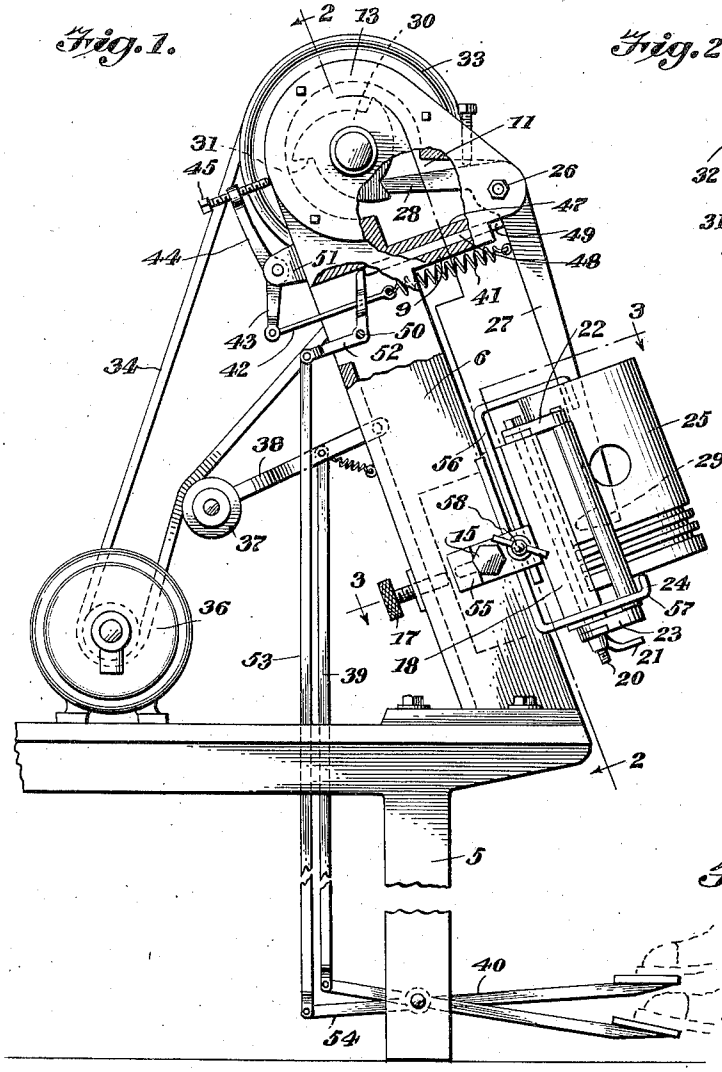


Fig. 2.

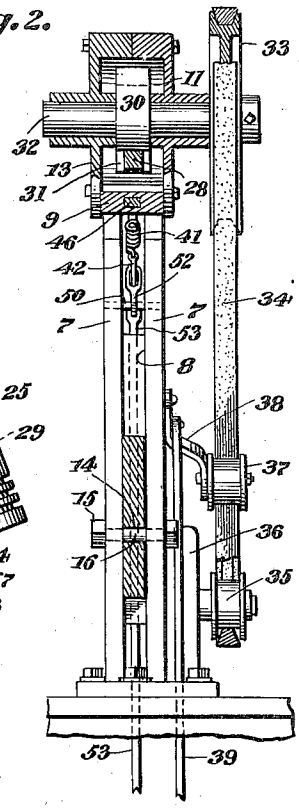


Fig. 4.

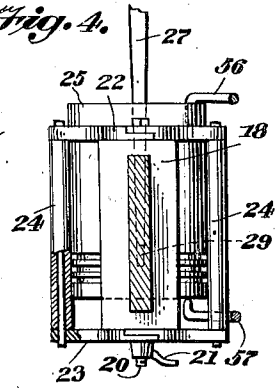


Fig. 3.

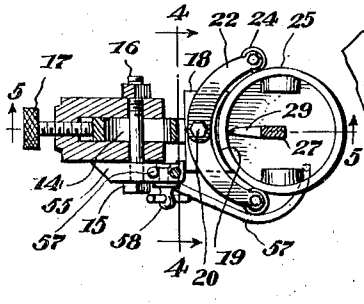
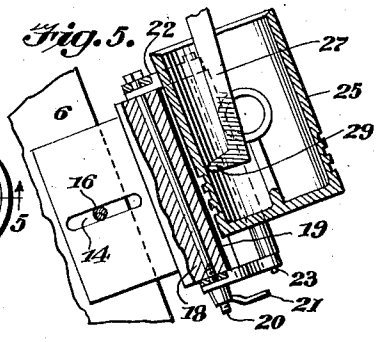


Fig. 5.



Inventor

VAN F. LIPPARD

By Henry L. Foster

Attorney

Patented Aug. 25, 1936 2,052,355

UNITED STATES PATENT OFFICE

2,052,355

MACHINE FOR RESHAPING AND ENLARGING PISTONS

Van F. Lippard, Washington, D. C.

Application January 30, 1936, Serial No. 61,619

8 Claims. (Cl. 78—13)

The present invention relates to a machine, by the use of which pistons may be reshaped, and more particularly by means of which worn pistons may be refitted to the cylinder walls.

It is common practice in modern internal combustion engines, and more particularly automobile engines, to use pistons which are not in the form of true cylinders, but which are slightly less in diameter on the sides through which the pin passes than on the other sides. In making such pistons, they are first made in the form of true cylinders, and before installation in the engine they are ground into a slightly oval form on a special machine, this operation being known as "cam grinding".

In the operation of a motor having such cam ground pistons, over a period of time the portions which are not ground down and which therefore extend slightly more than the others, wear down, permitting piston slap and the escape of the gas under compression past the piston at these points. Heretofore the only remedy which has been suggested for this condition is the use of expanders which are inserted inside the piston and which bear downwardly against the worn portion, thus tending to force the piston walls outwardly against the cylinder walls. The use of these expanders tends to distort the piston walls and tends to cause an undesirable friction and wear on both the piston walls and the cylinder walls, and sometimes causes pistons to break up in cylinders.

It is the object of the present invention to provide a machine by means of which pistons can be reshaped in any desirable manner.

By this machine, for example, cam ground pistons which have their larger portions worn away by use, may be recammed or expanded outwardly to reform the piston to its original dimensions. True round pistons which have been worn in certain areas may be reformed to fit the cylinders or unworn pistons may be expanded to fit larger cylinder bores. For a machine to successfully perform such a variety of operations, it is necessary that the operator have complete control over the portion of the piston operated on since each piston wears differently both as to the amount which is worn away and also as to the extent where the wear had occurred, and therefore each piston requires individual treatment.

The above object is attained by providing a machine having an anvil and a power hammer, and means associated with the power hammer, whereby both its speed and the force of its blows may be accurately controlled, thus giving the operator an accurate control over the action of the hammer on the part of the piston which is being operated upon. Associated with the hammer is an anvil which is held in fixed relation to the hammer, and means are provided for positioning a piston upon the anvil in a certain relation to the anvil, and yet which will permit the piston to be moved longitudinally or be rotated in order to permit the operator to select that portion of the piston upon which the hammer operates. Removable and adjustable stops are provided to adjust the longitudinal portion of the piston with regard to the hammer head.

In the accompanying drawing:

Figure 1 is an elevation of the machine shown partly in section.

Figure 2 is a sectional view on the line 2—2 of Figure 1.

Figure 3 is a sectional view on the line 3—3 of Figure 1.

Figure 4 is a sectional view on the line 4—4 of Figure 3.

Figure 5 is a sectional view on the line 5—5 of Figure 3.

Describing the drawing more particularly the machine is mounted on a suitable base or table 5, and has an upstanding rearwardly inclined supporting member 6 which may be advantageously channel shaped, having side walls 7 with a space 8 between them. At the upper end of the member 6 is a transverse wall 9 arranged at substantially a right angle to the member 6, and extending forwardly thereof. One end of a substantially circular wall 10 having spaced ends, is supported by the rear portion of the wall 9 and encloses a circular chamber 11. An opening 12 between the ends of the wall 10 is located at the forward lower portion of the chamber, immediately above the central part of the wall 7. The chamber 11 is closed at its sides by side walls 13 that extend forwardly in advance of the wall 9. The supporting member 6 is attached to the base 5 by any suitable means, and the support is inclined rearwardly at an angle of approximately 30 degress from the vertical.

An anvil is attached to the support 6 by means of a lug 14 which is slidably entered in the space 8, and which is held in position by a bolt 15 engaged in a slot 16 in the lug so that the assembly may be moved outwardly or inwardly with respect to the support. An adjusting screw 17 may be utilized to fix this adjustment. To the front of the lug 14 is fixed the anvil 18, comprising a longitudinal body having a somewhat concave

striking surface 19, the body 18 and surface 19 being substantially parallel to the support 6.

In order to fix the position of a piston upon the anvil a cradle is provided. Longitudinally passing through the anvil and parallel thereto is a clamping bolt 20 having a thumb nut 21. A pair of relatively movable arms is pivoted upon each end of the clamping bolt, the pairs of arms being designated 22 and 23 respectively. The arms of each pair are curved oppositely outwardly and forwardly to a point in front of the anvil 18, with one arm on each side thereof. A roller 24 extends from the end of each arm of the pair 22 to the end of the corresponding arm of the pair 23. The two rollers are parallel and are journaled for rotation in the ends of the arms. It will be seen from Figures 1 and 3 that with the arms properly adjusted for a particular size of piston and tightened by means of the thumb nut 21, that a piston 25 placed between them and rested against the surface 19 of the anvil, will be held parallel to the anvil, and yet will be movable longitudinally with respect thereto, and also will be rotatable thereon.

The forward extremities of the walls 13 support between them a pin 26 on which a hammer shank 27 is pivotally mounted. This hammer shank has an arm 28 arranged at an angle thereto and extending rearwardly of the pin 26 through the opening 12 and into the chamber 11. The shank of the hammer, it will be seen, is substantially in the form of a bell crank which is fulcrumed upon the pin 26. The shank 27 extends downwardly from the bearing 26 to a point adjacent the anvil 18 where it is provided with a removable head 29. From Figure 1 it will be seen that a piston 25 may be placed upon the anvil with its open end up and with the shank 27 of the hammer extending into the piston with the hammer head in a position to operate upon the inside of the piston wall.

The arm 28 of the hammer which extends rearwardly of the pin 26 into the chamber 11, there engages a rotary cam wheel 30 having a plurality of lifting surfaces 31 which act to raise the hammer head 29 as the wheel 30 rotates. The cam wheel 30 is mounted upon a shaft 32 suitably journaled in the walls 13 of the casing. One end of the shaft 32 is provided externally of the casing with a V-pulley 33, around which passes a V-shaped belt 34 connecting the pulley 33 to a flat pulley 35 mounted upon the shaft of a motor 36. An idler pulley 37 is mounted upon a swinging arm 38 suitably pivoted to the support 6 and this arm is connected as by a link 39, to a foot lever 40 in order that the operator may move the idler to tighten or loosen the belt. The combination of the V-pulley 33 and the flat pulley 35 allows the speed of the cam wheel 30 to be varied as the V-shaped belt 34 tends increasingly to slip on the flat pulley 35 as the idler 37 swings down and allows the belt to loosen.

In order to cause the hammer to deliver a blow upon the anvil, a contractile spring 41 is secured to the rear side of the shank 27 at a point between the pivot 26 and the head 29. At its rearward end the spring is connected by means of a link 42 to one arm of a bell crank 43 suitably pivoted to the support 6, the other arm 44 of which may be provided with an adjusting screw 45 for regulating the tension that the spring exerts on the hammer shank.

The wall 9 of the casing is enlarged at 46 and has therein a guide 47. Within this guide is slidably mounted a stop 48 which is in the form of an elongated bar, which may be moved from a position wholly within the enlargement 46 to a position with its front end 49 in front of the enlargement and directly in the path of the shank 27. To control the position of the stop 48, a crank 50 is pivoted in the space 8 of the support 6 and has an arm 51 which bears against the rear of the stop 48 and the arm 52 extending rearwardly of the support and which is connected by a link 53 to a foot lever 54 adjacent the foot lever 40. The adjustable stop is located closely adjacent to the pivot point upon which the hammer swings, and consequently where the motion of the shank is relatively small, thus allowing an accurate control of the amount of motion of the hammer head.

Stops are provided by means of which the longitudinal position of the piston on the anvil may, if desired, be adjusted. Secured on the bolt 15 is a block 55 which has slidably and rotatably mounted therein two rods 56 and 57 parallel to the support 6, and respectively having bent ends that may be swung around to overlie and underlie respectively the ends of a piston positioned on the anvil. By adjusting the rods longitudinally the longitudinal movement of the piston may be limited as desired and consequently the area on which the hammer heads may operate. Thus if it is desirable to operate only upon a single line, the stops are adjusted to hold the piston against any longitudinal movement, with the line to be operated upon, held at the point where the hammer strikes.

The operation of the machine is as follows: The cradle is adjusted for the diameter of the piston being operated upon, and the piston is positioned on the anvil with the hammer shank 27 extending into the piston and the head 29 inside. If it is necessary to confine the work to a particular longitudinal area of the piston, one or both of the stops are swung into operative position. The motor 36 being started the pedal 54 is depressed, moving the stop outwardly until the end 49 bears against the shank 27. Thereafter the pedal 40 is depressed, tightening the belt 34 and rotating the cam wheel 30, thus together with the action of the spring 41, causing the hammer to reciprocate. The pedal 54 may now be moved so that the stop 48 adjusts the force with which the hammer head 29 strikes the inner side of the wall of the piston. The operator stands or sits with his head bent slightly over the open upper end of the piston in order that he may look down into and watch the operation of the hammer head, there being preferably a light so positioned as to illuminate the interior of the piston. He moves the piston to select the particular area being operated upon. By moving the foot pedal 54 he controls the force of the blow, and by moving the pedal 40 he controls the rapidity of the hammer blows.

The chief advantage of this machine is the combination of the accurate control that can be exercised over both the rapidity of the hammer blows and the force thereof, and the control which he exercises over the portion of the piston being operated upon. The piston being rotatable and longitudinally movable on the anvil, the operator can control the point at which the hammer blows take effect. By having the operation so entirely under his control very fine work may be done and any worn portion of a piston expanded very accurately to cause such worn part to be enlarged just the correct amount, so that the

piston will regain its original form. Likewise any piston or any area of a piston may be expanded either to new larger dimensions, or to any desired shape. The point of the piston at which the hammer operates being also under control of the operator permits him to operate upon only the portion requiring it.

From the foregoing, it is thought that the construction, operation and many advantages of the herein described invention will be apparent to those skilled in the art without further description and it will be understood that various changes in the size, shape, proportion and minor details of construction may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

What I claim, is:

1. In a machine for reshaping pistons, the combination of an anvil set at angle to perpendicular, a hammer fulcrumed at a point above the anvil and having a head cooperating with the anvil, means for driving the hammer, and adjustable means in the form of a movable rigid bar closely adjacent the fulcrum limiting the movement of the hammer toward the anvil.

2. In a machine for reshaping pistons, the combination of an anvil, a hammer having a head adapted to cooperate with the anvil and a shank in the form of a bell crank, said shank being fulcrumed at a point removed from the hammer head, means for intermittently moving the hammer head away from the anvil, spring means located between the head and the fulcrum point for urging the hammer towards the anvil, and an adjustable stop, comprising an elongated rigid bar having its longitudinal axis in the plane in which the hammer moves, located closely adjacent the fulcrum and between the fulcrum and the spring means, and movable longitudinally forward into the path of the hammer shank to lessen the force of the hammer blows upon the anvil.

3. In a machine for reshaping pistons, in combination a support upstanding at an angle toward the rear of the machine, an anvil mounted upon the front of the support and having a striking face substantially parallel thereto, a cradle for holding a piston longitudinally parallel to the anvil and permitting it to be freely rotated and moved longitudinally with respect to the anvil, a hammer including a head cooperating with the anvil and a shank pivoted to the support at a point above, and to the rear of the anvil, a rotary cam mounted upon the support above and behind the pivot point for intermittently raising the hammer head from the anvil, variable speed means for driving the cam, spring means located between the fulcrum and the anvil for causing the hammer head to strike the anvil, and an elongated rigid stop bar mounted for longitudinally movement on the support closely adjacent the fulcrum point and rearwardly of the hammer shank and in the plane of the motion thereof, and means for moving the said bar into the path of the hammer shank for controlling the force of the hammer blows on the anvil.

4. In a machine for reshaping pistons, in combination a support upstanding at an angle toward the rear of the machine, an anvil mounted upon the front of the support and having a striking face substantially parallel thereto, a cradle for holding a piston longitudinally parallel to the anvil and permitting it to be freely rotated and moved longitudinally with respect to the anvil, adjustable means for fixing limits for longitudinal movement of a piston upon the anvil, a hammer including a head cooperating with the anvil and a shank pivoted to the support at a point above, and to the rear of the anvil, a rotary cam mounted upon the support above and behind the pivot point for intermittently raising the hammer head from the anvil, variable speed means for driving the cam, spring means located between the fulcrum and the anvil for causing the hammer head to strike the anvil, and an elongated rigid stop bar mounted for longitudinal movement on the support closely adjacent the fulcrum point and rearwardly of the hammer shank and in the plane of the motion thereof, and means for moving the said bar into the path of the hammer shank for controlling the force of the hammer blows on the anvil.

5. In a machine for reshaping pistons, the combination with an anvil, a hammer having a shank fulcrumed at a point spaced from the anvil, a head cooperating with the anvil and variable speed means for operating the hammer, of a bar longitudinally movable in the plane of motion of the hammer, the end of the said bar forming a stop for limiting the movement of the hammer toward the anvil, and means for longitudinally adjusting the position of the bar, whereby the force of the blows of the hammer upon the anvil is controlled.

6. A machine for reshaping pistons, including a hammer for insertion into a piston, an anvil having means for holding a piston centered in the path of the hammer upon the anvil, said means permitting longitudinal and/or annular movement relative to the hammer, and means for rapidly reciprocating the hammer against the centered portion of the piston.

7. A machine for reshaping pistons, including a hammer for insertion into a piston, an anvil, an adjustable cradle for holding a piston upon the anvil and centered in the path of the hammer, the cradle permitting rotation and longitudinal movement of the piston, with respect to the anvil, and means for rapidly reciprocating the hammer against the centered portion of the piston.

8. A machine for reshaping pistons, including a hammer for insertion into a piston, an anvil, piston holding means angularly spaced from the anvil, said piston holding means permitting longitudinal and annular movement relative to the hammer and said means being adjustable relative to the anvil for adaptation to different sizes of pistons, and means for rapidly reciprocating the hammer against the portion of the piston on the anvil.

VAN F. LIPPARD.