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VALVE SPRING LIFTER

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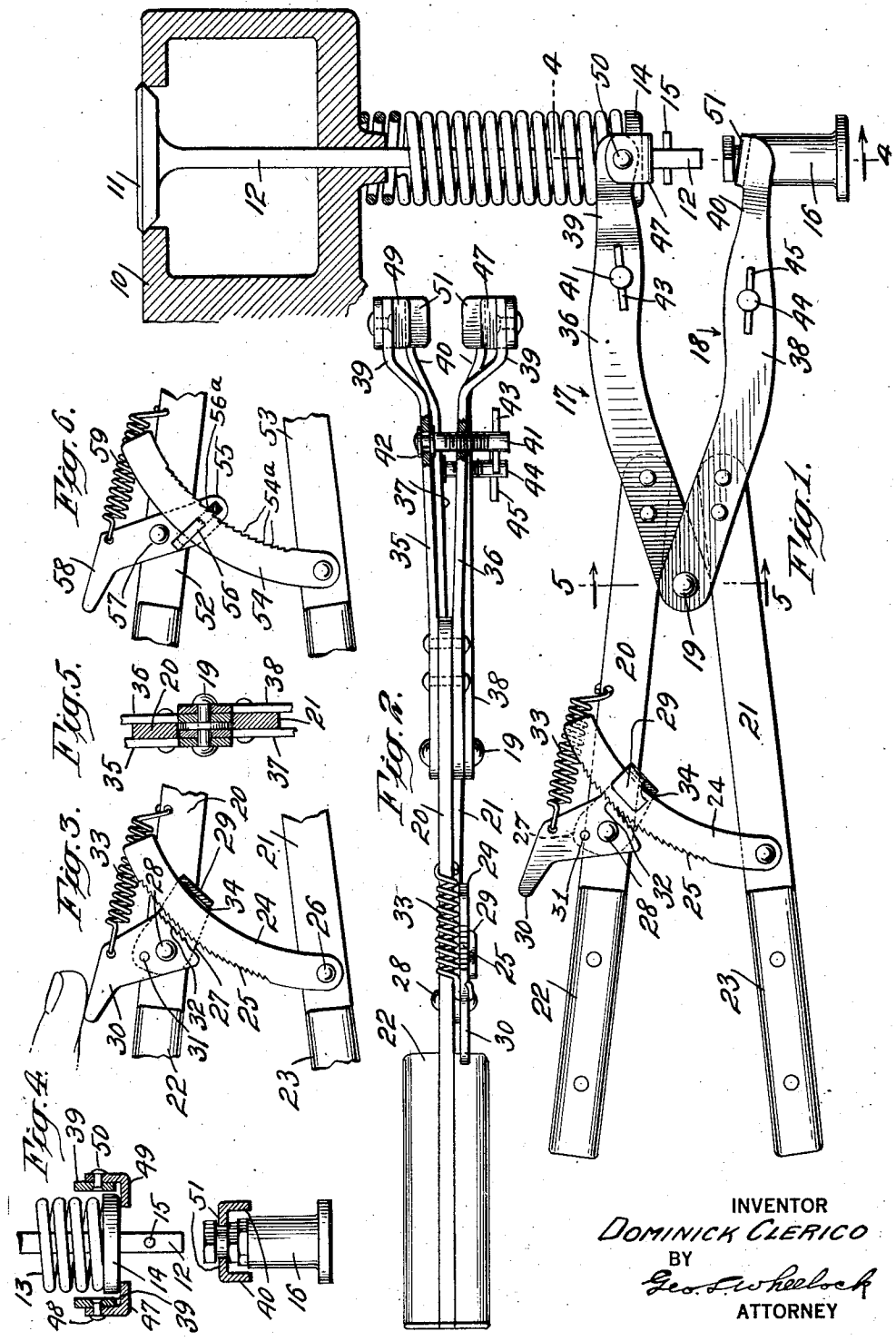

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VALVE-SPRING LIFTER.

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This invention relates to valve spring lifters which are adapted for compressing the helical spring around the stem of the valve of a gas engine for the purpose of freeing from the spring pressure the cross-pin or cotter-pin which holds the spring on the valve stem, so that the said pin may be readily removed to enable the removal of the spring and the valve. One of the objects of the present invention is to provide simple and efficient operating means for the working jaws of the device, adapted to be held in the desired adjusted position by a very efficient locking means which may be readily unlocked and which automatically and securely locks the jaws in adjusted position. Another object of the invention is to provide on one of the levers of the operating mechanism of the lifting tool, a pivoted rack which is adapted to be engaged at various points of its length by a locking dog having a plurality of teeth set reversely to the teeth of the rack, the dog being so constructed and operable that when the dog is released by the operator its spring will cause a binding relation between the teeth of the dog and a biting edge of the dog on the untoothed edge of the rack.

These being among the objects of the present invention, the same consists of certain features of construction and combinations of parts to be hereinafter described and then claimed with reference to the accompanying drawings illustrating the preferred form of the invention and in which,

Fig. 1 is a side elevation of the improved valve spring lifting tool showing it in actual use, parts of the engine being shown in elevation and parts in section;

Fig. 2 is a top plan view of the device;

Fig. 3 is a detail sectional view showing the locking dog and rack released so that the jaws of the two may be adjusted;

Fig. 4 is a section on the line 4—4 Fig. 1;

Fig. 5 is a section on the line 5—5 Fig. 1; and

Fig. 6 is a broken detail view illustrating a modified jaw locking and releasing mechanism.

Referring to Fig. 1, the portion 10 of the engine, valve 11, valve stem 12, helical valve-seating spring 13, spring retaining cup 14 and securing pin 15 are illustrated together with the guide post or member 16 in which the valve stem push rod is guided. These parts or their equivalents are so well known in the gas engine art that the utility of the improved valve spring lifter according to the present invention will become readily apparent to those skilled in the art.

The improved valve spring lifter or tool of the present invention comprises a pair of arms 17, 18, and the arm 17 may be considered the upper arm, and the arm 18 the lower one, said arms being connected at their inner ends by a pivot 19. Riveted or otherwise rigidly secured to the arms 17, 18 are levers 20, 21, respectively, their points of attachment to the arms being in advance of the pivot 19, that is, such points are located between the pivot 19 and the opposite ends of the arms 17, 18. Handles 22, 23 are provided at the outer ends of the levers 20, 21, adapted to be conveniently and mutually grasped by one hand, and the location of the pivot 19 with respect to the points where the power is applied to the arms 17, 18 is such that a considerable leverage can be obtained on the arms by means of the levers 20, 21. When the handles are brought together the outer ends of the arms will be spread apart, and vice versa.

An arcuate link member or rack 24 is pivoted preferably to the lever 21 for the arm 18, by means of a pivot 26, so that the said rack 24 may be positioned to extend towards the other lever 20, whereat the locking means are arranged which cooperate with the rack. The rack shown in Figs. 1 and 3 is bowed in a direction away from the connecting pivot 19, and at the outwardly curved edge of the rack it is provided with a series of ratchet teeth 25, which extend over a considerable length of the rack. A locking dog 27 is mounted for a pivotal movement on the stud 28 extending from the lever 20, and said dog is provided with a hook-like guide portion 29 at its outer end which receives and guides the pivoted rack 24. Thereby also, the back of the rack is adapted to engage the extreme outer portion of the guide 29. The general inclination or the effect of

the guiding surfaces of the guide 29 is such that in the assembled relation between the rack 24 and the guide, said rack is canted in a direction inwardly of its pivot 26 towards the direction of the arms 17, 18. As will be seen herefrom, the guide 29 constitutes an abutment for the back of the rack 24.

The locking dog 27 is provided with a finger member 30 which is in position for being conveniently pressed upon by a thumb of the operator when the handles are grasped. The thumb member 30 may be connected rigidly by a rivet 31 with the locking dog 27, although it is obvious that the said parts may be made in one piece, and in either case the locking dog is considered herein as comprising the inner portion of the thumb member 30 through which the pivot stud 28 passes. The locking dog is provided with a series of ratchet teeth 32 which are directly opposite the ratchet teeth 25 for engagement therewith, the two series of ratchet teeth being respectively inclined in opposite direction the one to the other. A tension spring 33 is attached at one end to the thumb member 30 and at the other end it is connected to the lever 20 at a point between the pivot stud 28 and the arms 17, 18. The bottom of the guide 29 has a biting edge 34 adapted to bite upon the untoothed edge of the rack 24, as will hereinafter be explained.

Preferably the arms 17, 18 have a duplex construction, that is, each arm is forked. To that end, arm 17 comprises two members 35, 36, side by side, and the connection with the lever 20 is between the two members in advance of pivot 19. Similarly the other arm 18 comprises two members 37, 38, spaced apart, and the other lever 21 attached thereto. The forks of each arm thereby provided have their ends spread apart. The fork of arm 17 has spread ends 39, and the fork of arm 18 spread ends 40, and, preferably for the specific purpose of lifting a valve spring, the ends 39 are more widely spread apart than the ends 40 of the lower arm 18. For obvious reasons, an adjusting screw 41 has a swivel connection 42 with the arm member 35, the screw being threaded into the arm member 36 and having at its outer end a turning handle 43. An adjusting screw 44 is also swiveled to the arm member 37, it being threaded into the arm member 38 of the arm 18 and provided also with a turning handle 45. By means of these adjusting screws 41 and 44, the ends of the forks may be spread more or less, the members of the arms being composed of resilient metal enabling this to be done. The described screw adjusting feature has been previously patented by me.

Each bifurcation of the fork of the arm 17, which in this case happens to be the upper arm, is provided with a pivoted angle jaw. Angle jaw 47 is connected with arm member 36 by a pivot 48, and angle jaw 49 is connected with arm member 35 by a pivot 50. This feature is provided because it is intended that the more widely spread fork of the tool be the one to engage the spring, and the pivoting of the said jaws permits an automatic adjustment thereof to the conditions brought about by the compressing of the spring. The members of the arm 18 are provided with jaws 51 which are integral therewith and extend inwardly, the one toward the other, while the operative ends of the pivoted jaws 47 extend in the same direction.

The operation of the described parts will be apparent from Fig. 1. The user grasps the tool with the handles moved more or less apart, the jaws of the arms 17, 18 having been moved as close together as is desired for the purpose of enabling the jaws 51 to engage over the post 16 or some other stationary part of the engine, and the jaws 47, 49 to engage with the back of the spring retaining cup 14. This engagement of the jaws is also shown in Fig. 4, but in both Fig. 1 and Fig. 4 the jaws are shown as having been moved apart so as to compress the spring 13. The retaining pin 15 may then be driven out of the valve stem, and the spring, retaining cup 14 and valve 11 may be disassembled in obvious manner. Referring to Fig. 3, the clearance between the respective teeth of the ratchet device is somewhat exaggerated, and as a matter of fact it is preferred that when the jaws are spread apart to compress the valve spring, the dog teeth 32 simply ride over the ratchet teeth 25 so that the rack 24 may be moved outwardly through the guide 29 of the dog. Of course the clearance could be such as shown in Fig. 3, which would be brought about by compressing the thumb member 30 towards the lever 20. When the thumb is released from the member 30, or when the jaws of the device have been sufficiently spread apart, the spring 33 automatically causes the engagement of a number of the dog teeth 32 with the ratchet teeth 25, as shown in Fig. 1. In the locked position of the parts, it is clear that the spring 33 also acts to press the rack 24 against the bottom of the guide 29, or, more specifically, against the biting edge 34 of the guide, so that the rack 24 is firmly gripped and held by the mutual binding or locking action of the biting edge 34 and those teeth of the dog which are in engagement with the ratchet 25. This mutuality of action of the binding parts is due to the fact that any lines between the teeth which are locked and the biting edge 34 of the guide are tangent to the arc through which the dog swings. In other words, the said lines are excentric to the pivot stud 28. Also, this locking is brought about by the fact that the square

shoulders of the ratchet teeth are disposed towards the pivot of the rack and that the locking dog has its tooth end automatically moved towards such pivot. By thus causing the mutual binding relation between the locking members, the jaws of the tool are positively and reliably held in their outwardly spread position.

Referring to Fig. 6 wherein a modification of the jaw adjusting and locking means is shown the handle levers 52, 53 will be understood to be attached to arms 17, 18 similar to those before described. A rack member 54 is pivoted to the lever 53, but in this modification the rack is bowed in the direction of the handles of the tool while the ratchet teeth thereof face in the direction of the arms which carry the jaws. A dog 55 is provided with a guide 56 and connected by a pivot stud 57 with the lever 52, and said dog is provided with a thumb-piece 58. The tension spring 59 connects the dog with the lever 52 and has a tendency to cause the tooth 56^a of the dog to bite between the teeth 54^a of the series of ratchet teeth. The use and action of this modified construction of adjusting and locking mechanism should be clear without further description.

Obviously the invention is susceptible to modification, as parts may be omitted, added and substituted without departing from the scope of the appended claims.

What I claim, is:

1. A tool of the character described, comprising, in combination, arms pivotally connected at corresponding ends and provided with jaws at the other ends, handle levers rigidly secured to the arms at points between the pivot of the arms and the jaws, whereby the said pivot and the pivotally connected ends of the arms are located to the rear of the inner ends of the levers, and automatic locking means for retaining the arms and jaws as adjusted by the handles.

2. A tool of the character described, comprising, in combination, pivotally connected levers, arms provided with jaws and operable by the levers, a ratchet rack pivoted to one lever, a locking dog pivoted to the other lever and having a thumb member adapted to release the dog from the ratchet teeth of the rack, when the levers are pressed together, a tension spring connecting the thumb member with the corresponding lever, and means for mutually locking the dog and rack and causing the rack to prevent separation of the handles.

3. A tool of the character described, comprising, in combination, pivotally connected levers, arms provided with jaws and operable by the levers, a ratchet rack pivoted to one lever, and the teeth of which are presented in a direction away from the pivot, a locking dog pivoted to the other lever and having a thumb member adapted to release the dog from the ratchet teeth of the rack, when the levers are pressed together, said dog having a tooth arranged tangentially of the pivot of the dog, a tension spring actuating the thumb member from the corresponding lever, and means for mutually locking the dog and rack and causing the rack to prevent separation of the handles.

4. A tool of the character described, comprising, in combination, pivotally connected levers, arms provided with jaws and operable by the levers, a bowed ratchet rack pivoted to one lever and the teeth of which are at the outwardly bowed edge, a manually operable locking dog pivoted to the other lever and having a tooth presented in opposite direction to the teeth of the rack, a spring for acting on the dog to cause its teeth to engage the teeth of the rack, and a guide on the dog for the rack, said guide cooperating with the engaged teeth to bind the rack between them in said guide.

5. A tool of the character described, comprising, in combination, pivotally connected levers, arms provided with jaws and operable by the levers, a ratchet rack pivoted to one lever and having the square shoulders of its teeth presented toward its pivot, a spring actuated locking dog pivoted to the other lever and having its tooth directed toward the free end of the rack, whereby the levers are locked against relative outward movement, said dog riding freely over the inclined surfaces of the ratchet teeth when the levers are pressed towards each other, means for releasing the dog from the square shoulders of the rack when the levers are to be moved apart, and an abutment carried by the lever to which the dog is pivoted for holding the rack and dog in mutually locked position and for causing the rack to prevent separation of the levers.

6. A tool of the character described, comprising, in combination, pivotally connected levers, arms provided with jaws and operable by the levers, a ratchet rack pivoted to one lever and having the square shoulders of its teeth presented toward its pivot, a spring actuated locking dog pivoted to the other lever and having its tooth directed toward the free end of the rack, whereby the levers are locked against relative outward movement, said dog riding freely over the inclined surfaces of the ratchet teeth when the levers are pressed towards each other, confining means for guiding the rack and permitting relative slight movement thereof in the plane of its teeth, and means for automatically moving the dog to cause the mutual locking engagement of the teeth and the holding, by the rack, of the levers against separation, except when the dog is positively released.

7. A tool of the character described, comprising, in combination, pivotally connected

levers, arms provided with jaws and operable by the levers, a ratchet rack pivoted to one lever, a locking dog pivoted to the other lever and having a thumb member adapted to release the dog from the ratchet teeth of the rack, when the levers have been pressed together, a tension spring mounted on the same lever as the locking dog and acting thereon to throw its tooth into engagement with the ratchet teeth, and abutment means for mutually locking the dog and rack and causing the rack to prevent separation of the levers.

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