Nov. 27, 1928. 1,693,280

J. C. LEARY

PISTON

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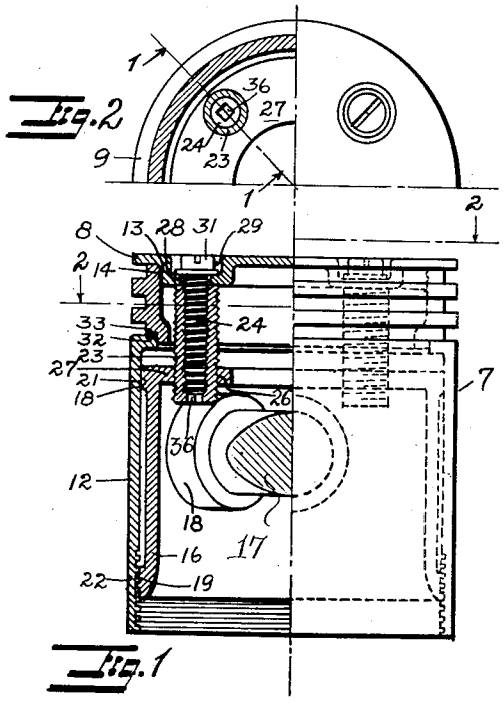


Fig. 2

Fig. 1

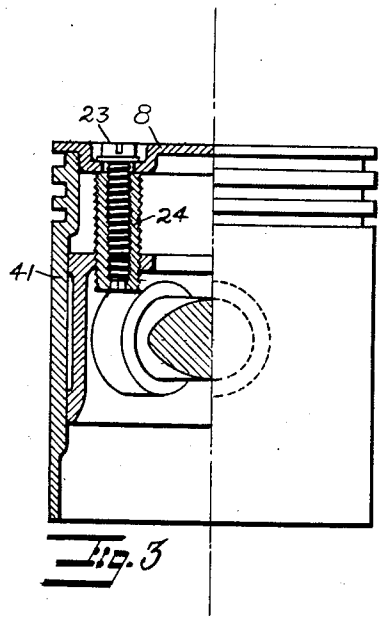


Fig. 3

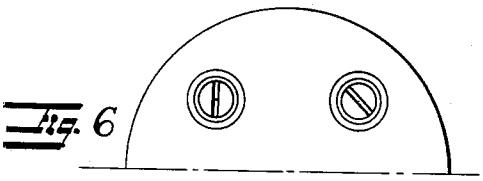


Fig. 6

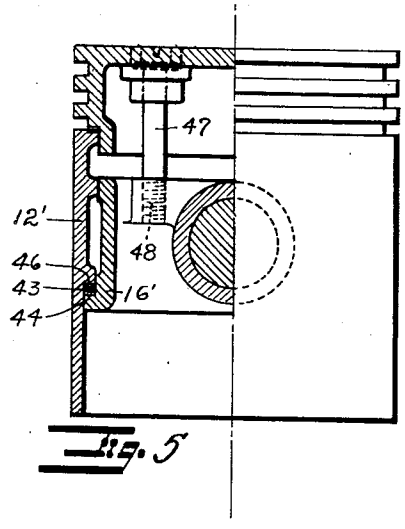


Fig. 5

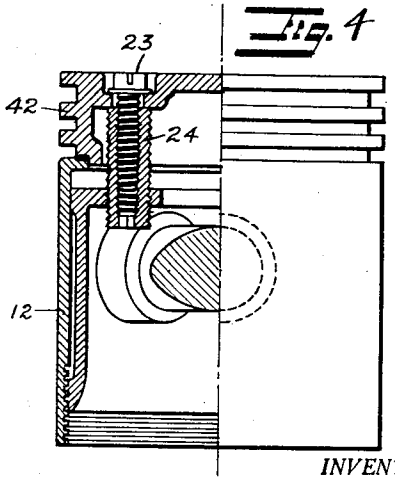


Fig. 4

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Patented Nov. 27, 1928. 1,693,280

UNITED STATES PATENT OFFICE.

JOHN C. LEARY, OF SAN FRANCISCO, CALIFORNIA.

PISTON.

Application filed November 16, 1925. Serial No 69,217.

My invention relates to improvements in pistons for use in reciprocating engines.

An object of the invention is to provide a piston of light but strong construction which will in a most simple and effective manner permit of adjustment between the wrist pin and the top of the piston whereby the compression space in the engine cylinder may be varied.

Another object is to provide a piston of the character described in which the adjustable parts may be readily and firmly locked together by manipulation from the head end of the piston.

A further object is to provide a piston in which the different portions thereof are made separate of each other so that each of the individual portions may be formed of materials best adapted for the particular functions of the portions, and at the same time allowing of a reduction in the weight with an increase in strength of the piston as a whole.

The invention possesses other objects and features of advantage, some of which, with the foregoing, will be set forth in the following description of the preferred forms of my invention which are illustrated in the drawings accompanying and forming part of the specification. It is to be understood that I do not limit myself to the showing made by the said drawings and description, as I may adopt variations of the preferred forms within the scope of my invention as set forth in the claims.

Referring to said drawings:

Figure 1 is a half sectional view and half elevation of a piston embodying my invention, the plane of the sectional portion being taken on line 1—1 of Figure 2.

Figure 2 is a combined transverse sectional and plan view of one-half of the piston, the plane of the section being indicated by the line 2—2 of Figure 1.

Figures 3, 4 and 5 are views similar to Figure 1, of modified forms of the invention.

Figure 6 is a plan view of one-half of the piston shown in Figure 5.

By reason of the fact that under the same conditions the proportion of oxygen in the fuel mixture drawn into the cylinder of an internal combustion engine, varies with the height of the engine above sea-level, it is of great advantage to adjust the compression space of the cylinder in accordance with such altitude so that the fuel mixture may be such as to allow of its complete combustion and thereby facilitate the most efficient operation of the engine.

I have found that a most effective manner of varying the compression space, without affecting the usually carefully worked-out balance and relation of the various elements defining the space, is by adjusting the distance between the wrist pin and the head of the piston, and it is a purpose of this invention to provide for such adjustment without unduly complicating the design of the piston, or increasing the weight thereof, and to allow of such adjustment without requiring the removal of the piston from the cylinder or the complete disassembly of the piston parts, and in a manner in several respects superior to that disclosed by me in a copending application, Serial No. 727,985, filed July 24, 1924.

The piston of my invention in addition to the advantages above set forth, permits, in an improved manner, the removal or replacement of the exterior wearing portions of the piston without the necessity of disturbing the crank-case and crank-pin bearings.

In the embodiment of my invention, as illustrated in Figures 1 and 2, the piston comprises an outer member 7 composed of the different exterior portions of the piston. These portions are, as here shown, made separate of each other and consist of a head 8, packing ring retainer 9, and skirt 12. By forming the head 8, retainer 9 and skirt 12 separate, I am permitted to construct such head of pressed steel, while the retainer or the skirt may be made of a cast metal, such as iron or an aluminum alloy, or the latter, as may be desirable under certain conditions, may be made of tubing or rolled steel. In this way said parts are each formed of a material best adapted to the performance of their particular functions, and the strength and durability of the piston thereby materially increased without a corresponding increase in the weight thereof.

Attachment between the head 8 and ring retainer 9 is preferably of a detachable nature, and as here shown, such attachment is effected by means of threaded portions 13 and 14 formed thereon. Securing of the skirt 12 to the other portions of the member 7 is arranged to be effected through the medium of an inner member 16 which is formed separate of the member 7 and functions as the retainer for the wrist pin 17, a bearing 18 for such pin being preferably formed integral with the inner member. The member 16 is arranged

within and adapted for axial displacement relative to the outer member, and is provided with a bearing face 18 and threaded face 19 respectively arranged to engage correspondingly formed portions 21 and 22 of the skirt 9.

The means for connecting the inner and outer members together form an important part of the present application, and as shown in this embodiment such means includes a plurality of sets of cooperating threaded elements 23 and 24. The element 23 which is tubular is threaded internally and externally—preferably oppositely and right and left-handed in the order mentioned. The externally threaded portion of the element 23 is arranged to engage in a correspondingly threaded aperture 26 provided in a flange 27 formed integral with the inner member. Arranged to engage the internal threads of the element 23 is the element 24 which is preferably in the form of a screw and is adapted to pass through an aperture 28 formed in the head 8, the latter being formed with a recess 29 in which is arranged to seat the head 31 of the screw. The element 23 serves in one sense as an adjustable spacer, and it will be noted that by varying the relation of the screw element and tubular element with respect to the inner member, that the spacing between the head of the piston and the wrist-pin will be changed accordingly and that in consequence thereof, the compression space in the cylinder will be smaller or larger in a given position of the connecting rod of the engine. It will further be noted that the upper extremity of the adjustable spacing element is arranged to abut the inner side of the head; in this manner when the screw element has been screwed down so that the head portion bears firmly against the base of the recess, the two elements will be locked together and to the head of the piston, and since the inner member is non-rotatable, it will be clear that the head and inner member will be effectively held against displacement when set in adjusted position.

The skirt 12, it will be understood, is held fixed to the other parts of the outer member 7, by means of the threaded portions 19 and 22 of the inner member and skirt respectively; rotation, however, as between said member and skirt is prevented by forming corresponding raised and indented portions on the mutually engaging surfaces 32 and 33 of the skirt and ring retainer 9.

When it is desired to change the adjustment of the compression space, the cylinder head is first removed. This is followed by withdrawing the screw elements 24 from the spacer elements. Now if a decrease in the compression space is wanted, the outer member is rotated with respect to the inner one in a direction, which, due to the engagement of the threaded portions 19 and 22, will cause the elevation of the outer member with respect to the inner. When the desired axial displacement has been thus effected and the apertures 28 register with the bore of the spacer elements, the latter are each rotated until the upper end thereof abuts against the piston head. Gripping of the spacing elements to effect the rotation thereof from the top end of the piston being here arranged to be accomplished by passing a key wrench or other suitable tool down through each aperture 28 and into the bore of the spacers whereby it may engage the square socket 36 provided in the bore. With the spacers thus screwed up against the piston-head, the elements 24 are inserted through apertures 28 and into the bores of the spaced elements and then rotated until the heads 29 set tightly against the piston head, thus locking the spacer elements in adjusted position and drawing the rather loose fitting threaded portions 19 and 22 together to hold the skirt firmly pressed against the ring holder 9

When it is desired to increase the compression space, the screw elements are removed, and the skirt and spacer elements are backed down the desired amount. The screw elements are then replaced to again lock the parts as previously explained.

It will now be obvious, that should it be necessary to remove or replace any of the exterior piston parts, such as for instance the piston rings, it is merely necessary to remove the screw element and lift out the ring-holder 9 through the top of the cylinder. When the new rings are disposed in the holder, the latter may then be readily returned to its proper position and the screw elements replaced. It will also be obvious that the skirt 9 may be easily withdrawn through the top of the cylinder.

In Figure 3, I have shown a somewhat modified form of the invention. In this embodiment, the ring retainer and skirt are formed as one member 41, thus obviating the necessity of the provision of the threaded portions 19 and 22, as well as eliminating the attendant necessity of adjusting the skirt in accordance with that of the spacer elements.

In the embodiment illustrated in Figure 4, the ring retainer is again formed separate of the skirt, but is formed integral with the piston head to thus provide a single member 42.

In Figures 5 and 6, there is a rather pronounced difference in design of the piston as compared with the other embodiments. In this embodiment, while the head and ring-retainer are formed integral, and the skirt formed separate of the retainer, the adjusting and locking means are different from that shown in the previously described forms. As here shown, variation in the distance between the wrist pin and piston top is effected by interposing a greater or lesser number of

spacers 43 between the opposing surfaces 44 and 46 of the inner member 16′ and skirt 12′. Attachment of the various parts of the piston in this form of the invention may be afforded by simply using screws 47 arranged to extend through the piston head and engage in tapped apertures 48 provided in the inner member.

I claim:

1. In a piston for a reciprocating engine, an outer shell arranged for engagement with the cylinder walls of the engine and having a closed head, a shell arranged within said first shell and adapted for longitudinal adjustment relative thereto, a wrist pin held in said second shell, a spacing member for adjustably positioning said shells, and means cooperating with said spacing member and operable through said piston head to lock said shells in adjusted position.

2. In a piston for a reciprocating engine, exterior and interior sections arranged for relative axial displacement, a wrist pin mounted in said interior section, a spacing member carried by said interior section and arranged to engage said exterior section to adjustably space said sections, and means engaging said spacing member to fixedly hold said sections together in adjusted spaced relation.

3. In a piston for a reciprocating engine, a member defining the top of the piston, a wrist pin, a member arranged to carry said pin and being adapted for displacement relative to said first member axially of the piston, and means to adjustably connect said members comprising cooperating threaded elements movable relative to each other and to said members.

4. In a piston for a reciprocating engine, a member defining the top of the piston, a wrist pin, a member arranged to carry said pin and to be displaced relative to said first member, an internally and externally threaded nipple engaged in said second member and extending toward said piston top, and a screw extending through said head and engaging said nipple.

5. In a piston for a reciprocating engine, an inner shell, an outer shell provided with an opening at the head end thereof and adjustably and coaxially mounted on said inner shell, means adjustable through said opening for longitudinally varying the relative positioning of said shells, and closure means for said opening.

6. In a piston for a reciprocating engine, a wrist-pin carrying member, a piston-top defining member, and means to adjustably secure said members together comprising threaded spacing elements engaging and extending through said carrying member, and cooperating thread elements engaging and extending through said first member and first element.

7. In a piston for a reciprocating engine, a wrist-pin carrying member, a piston-top defining member, and means to adjustably secure said members together comprising a tubular spacing element having internal right hand thread and external left hand threads, the latter being arranged to engage said carrying member, and a screw extending through said top defining member arranged to engage said internal threads of the spacing element.

In testimony whereof, I have hereunto set my hand, this 31st day of October, 1925.

JOHN C. LEARY.