Aug. 5, 1930. C. A. MARIEN 1,772,103

PISTON FOR ENGINES

Filed Aug. 22, 1927

Fig. 1.

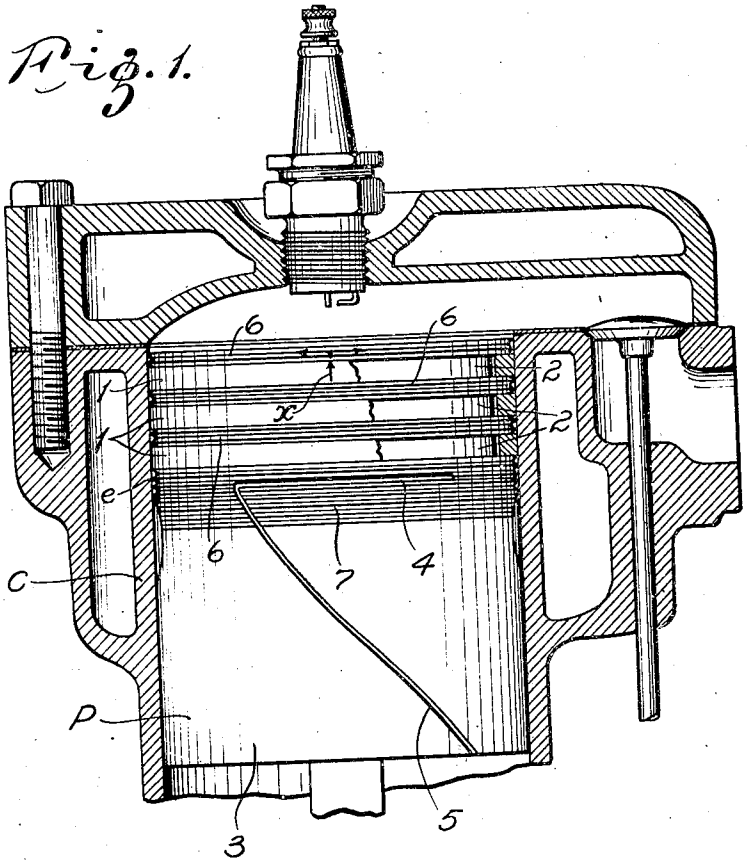


Fig. 2.

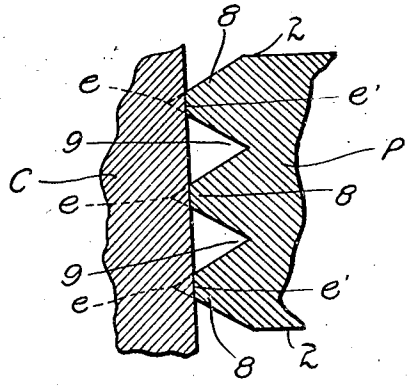
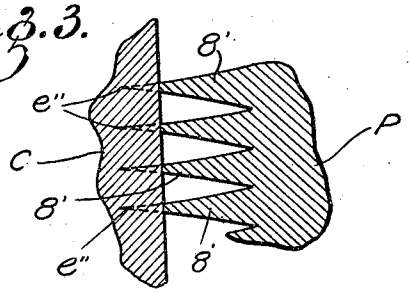


Fig. 3.



INVENTOR:
CHARLES A. MARIEN.
BY Harry A. Beiner
ATTORNEY.

Patented Aug. 5, 1930

1,772,103

UNITED STATES PATENT OFFICE

CHARLES A. MARIEN, OF ST. LOUIS, MISSOURI

PISTON FOR ENGINES

Application filed August 22, 1927. Serial No. 214,723.

My invention has relation to improvements in pistons for engines and consists in the novel features of construction more fully set forth in the specification and pointed out in the claims. The invention is particularly applicable to alloy pistons, that is, pistons that are made of an alloy of aluminium or some other metal which have recently come into very extensive use.

At the present time it is the practice in fitting pistons of this type for proper operation in the cylinders, to give the piston considerable clearance at the head, approximately twelve one-thousandths of an inch, and decrease this clearance downwardly toward the skirt of the piston at the lower end of which a clearance of perhaps two one-thousandths would be sufficient. In pistons of the type having a split skirt, the clearance is generally limited to the upper part of the piston, the expansion of the lower part being compensated for by the contractability of the split skirt. In fitting alloy pistons, great care must be exercised in grinding them to provide the proper clearance because different clearances are required for different makes of engines, and even for different engines of the same make. Consequently, it is only a fortuitous circumstance when the pistons are so ground as to fit the cylinders with the utmost precision.

It is the object of the present invention to provide a piston that will not require accurate grinding to insure the proper amount of clearance in the cylinder, but one that has its outer surface prepared in a manner that will enable the piston to work itself to a proper fit in the cylinder during the operation of the engine. This object is accomplished in the present case by forming on the outer surface of the piston a series of ribs or alternate ridges and grooves, the ridges extending annularly around the piston wall and being substantially V-shaped so as to present sharp edges outwardly similar to threads. These formations extend from the head of the piston downwardly as far as the slots in the case of a slotted piston, or in the case of a solid piston they may extend only down to the bottom of the skirt or to any intermediate point. The manner in which this ribbed surface accomplishes the above object, as well as its other advantages, will be better apparent from a detailed description of the invention in connection with the accompanying drawings, in which:

Figure 1 represents a section of the engine cylinder with my improved piston positioned therein; Figure 2 is an enlarged longitudinal section through the head of the piston showing the shape of the ribs on the piston wall; and Figure 3 is a section similar to that shown in Figure 2, but of a modified shape of rib.

Referring to the drawings, P represents my improved piston adapted for operation in the cylinder C, said piston being provided with the usual piston rings, 1, 1, 1 positioned in the ring grooves 2, 2, 2. In the present instance, the skirt 3 of the piston is split or divided by cross slots 4 and longitudinal slots 5 as well understood in the art. The function of the slots is to enable the skirt to be contracted as the piston expands under the heat of operation and enables the skirt of the piston to fit the cylinder walls snugly under practically all conditions of operation, as above pointed out, without specially providing for clearance. However, the upper part of the piston, that is the ring-lands 6, 6, 6, and the intermediate portion 7 of the piston immediately below the bottom groove 2, must be provided with clearance, as above pointed out, in order that the piston may neither bind as it expands under severe operating conditions nor wabble in the cylinder under other conditions. Under present practice, in order to make certain that the piston will not "hang up," sufficient clearance is provided for, with the result that this clearance is very often too much for the ideal operation of the piston, and a "piston slap" is introduced. I overcome these difficulties, as well as simplify very greatly the fitting of the piston, by providing the outer surface of the piston with the ribbed formations or alternate ridges 8 and grooves 9. The entire surface of each of the ring-lands 6 is ribbed as well as the surface of the piston below the bottom ring groove.

The shape of the ridges preferably follows that of an acute angle so that they may be sufficiently thin to wear down by contact with the cylinder wall. Obviously, the grooves 9 must be of such depth as to allow the ridges to wear down the full extent required for the piston to fit the cylinder with the proper amount of clearance for correct operation.

When the pistons are fitted into the cylinders, the ribs present sharp edges *e* to the cylinder wall (as shown dotted in Fig. 2), but after the engine has been operated, these sharp edges are worn off and the diameter of the contacting parts *e'* of the piston reduced (Fig. 2), until ultimately, with a continued operation of the engine, there has been sufficient metal worn from the edges to allow the piston to operate freely in the cylinder with the ideal clearance for the most effective performance. That part of the piston which undergoes the greatest expansion in the operation of the engine will, obviously, wear the most so that the entire piston will finally have the ideal amount of clearance within the cylinder. Thus, the proper amount of clearance for the piston in any particular type of engine does not have to be precalculated, but will result inevitably from the operation of the piston.

It is a matter of common knowledge that the piston rings are not always effective to prevent oil from working up into the combustion chamber as the oil occasionally will find its way around a ring; that is, as the ring works back and forth in the groove during the operation of the piston, the oil will enter the ring groove and pass behind the ring, ultimately being deposited on the top of the piston where it carbonizes. The oil may thus find its way into the combustion chamber at but a single point, as shown by the arrow *x* in the drawings, (Fig. 1). In the case of a smoothly finished piston, the oil will travel very readily over the piston surface after having once passed the rings; but in a piston that is grooved as herein described, the oil will encounter the grooves 9 and instead of travelling upwardly over the piston surface in the shortest line, it will spread into the groove 9 where it will be held together by its own cohesion, which resists a further upward travel. In cases where there is but a slight pumping of oil, the capillary attraction of the particles will be sufficiently strong to resist expulsion of the oil from the groove 9 and to this extent seal the leak.

In Figure 3 I show a modified form of ribs 8', said ribs being extended therein for a considerable distance inwardly from their outer edges *e''*. By making the ribs in this form, obviously, they will wear down much more readily than they would if they were more blunt.

Even though the piston should bind somewhat, the material worn from the piston as it is worked free would not score the cylinder because the material worn off would merely enter a groove 9 and not be ground over the cylinder wall.

Preferably the ring grooves 2 have adjacent to them grooves 9 and not ribs 8 so that the material that is worn from the edges *e* as the piston is ground in will not burr over into the ring grooves. This is shown clearly in Figure 2.

Having described my invention, I claim:

1. In combination with a cylinder of an engine, a piston fitted therein with negligible clearance, said piston having suitable formations on that part of its surface which is subjected to the greatest expansion in operation, said formations being adapted to wear to provide the proper clearance for working conditions.

2. A piston provided with ring grooves on the upper part thereof, and ring lands bounding said grooves, alternate grooves and ridges formed on the periphery of the lands.

3. A piston provided with ring grooves on the upper part thereof, and ring lands bounding said grooves, alternate grooves and ridges formed on the periphery of the lands, said ridges presenting sharp edges outwardly.

4. In combination with the cylinder of an engine, a piston of softer metal than the cylinder operable therein, said piston being provided with ring grooves on the upper part thereof, and ring lands bounding said grooves, suitable formations on the ring lands, said formations being adapted to wear to provide the proper clearance of the piston in the cylinder for working conditions.

In testimony whereof I hereunto affix my signature.

CHARLES A. MARIEN.