

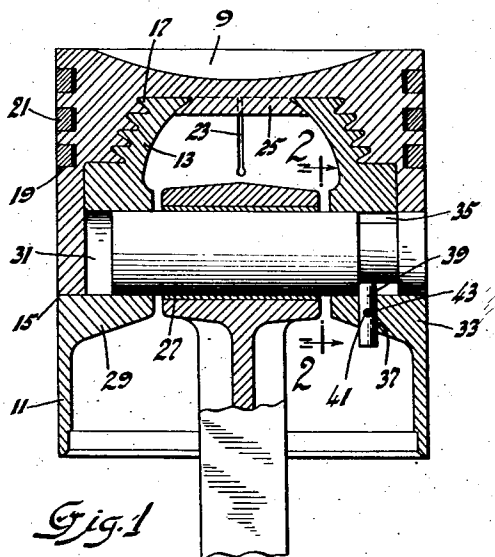
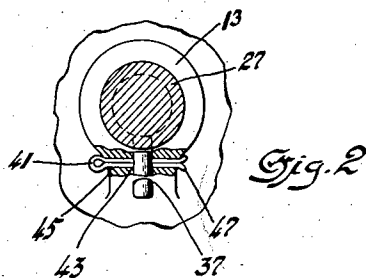
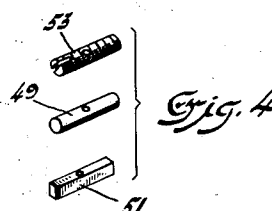
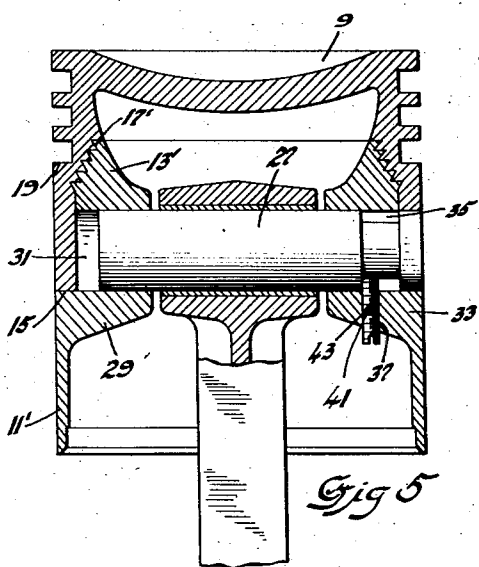
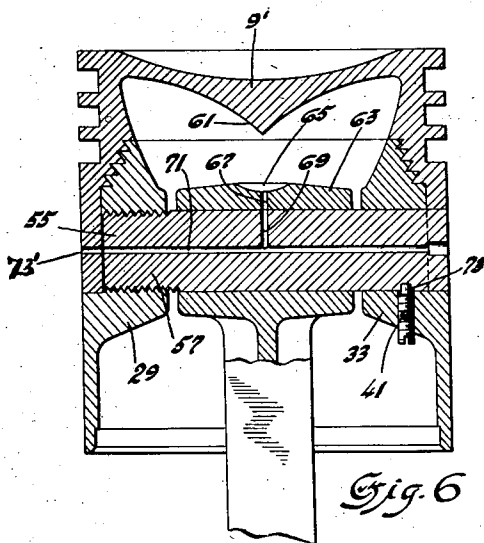
April 16, 1929.

F. H. LORD

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COMPOSITE PISTON

Filed Nov 20, 1926



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UNITED STATES PATENT OFFICE.

FRANK HOWARD LORD, OF DETROIT, MICHIGAN.

COMPOSITE PISTON.

Application filed November 20, 1926. Serial No. 149,665.

This invention relates to pistons, and is intended particularly for use with the cylinders of internal combustion engines although its usefulness in other relations will be understood.

In internal combustion engines used in motor vehicles and elsewhere it has been proposed to use aluminum pistons because of the light weight of the material. A disadvantage exists owing to the greater expansion of the aluminum than of the walls of the cylinders. The aluminum tends to seize within the cylinder walls and to avoid this the piston must be made with an undesirably large clearance. It has also been proposed to make a composite piston having an iron or steel skirt and an aluminum head. My invention is concerned with such a piston, and its object is to construct such a composite piston wherein the two metals are held tightly together and are prevented from separation when temperature changes tend to expand the aluminum away from the iron.

Another object is to so construct the upper part of the skirt portion of the piston, and to so relate the aluminum head to said upper part that the expansion of the aluminum shall automatically expand an upper extension of the skirt to maintain a close contact between the iron and the aluminum.

The invention also has among its objects an improved securing means for the wrist pin and an improved method of lubrication for the wrist pin bearing and the cylinder wall. Other advantages will appear from a reading of the following specification and an examination of the accompanying drawing.

In the drawing Fig. 1 is a vertical section through a preferred form of my novel composite piston.

Figure 2 is a section in line 2-2 of Figure 1.

Figure 3 is a view in perspective of a locking means.

Figure 4 shows details of the modified forms of locking means.

Figure 5 is a vertical section through a modified form of the piston and

Figure 6 is a vertical section through still another modified form.

Referring by reference characters to the drawing, and first to Figures 1-3 inclusive, numeral 9 represents an aluminum head cast upon an iron or steel skirt 11 to form a composite piston. The skirt 11 is at its lower end of appropriate size to move within the cylin-

der with sufficient clearance. The skirt portion 11 is formed with a reduced upper dome shape part 13 extending from a shoulder 15. Externally the dome is formed with several annular grooves as shown at 17, which the aluminum is to fill when the head 9 is cast upon the skirt. By this means a tight union between the head and skirt is obtained. The head is formed with ring grooves 19 for the usual piston rings 21.

It will be seen that the dome is open at the top and from the open top several slits are cut, one of which is shown at 23. Any desired number of slits may be made. At present I prefer to make four such slits thus dividing the dome shape part into four segments. The aluminum head encircles the dome and also, as is shown in Fig. 1, extends within the dome as at 25. Owing to the greater expansibility of the aluminum as compared with iron, the aluminum head 9 will tend to move away, when it expands, from the dome shaped part 13. The inner portion 25, however, is subject to the same expansion and by the provision of the slits 23 forces the segments of the dome outwardly so that the aluminum head remains in snug fitting engagement with the dome at the grooves 17.

A somewhat simpler form of the invention is shown in Figure 5. In this form the skirt portion 11' is extended upwardly as at 13', but the extension is shorter than that in the form already described. The grooves 17' are made use of as before but the extension is not made in the form of a dome and there is no part corresponding with 25 in the form first described.

In connection with these two forms I may use a floating wrist pin. This wrist pin is designated by numeral 27. The piston is formed with a boss 29 having an aperture 31 extending into the same. This aperture however does not extend to the outer surface of the piston. The boss 33 is similarly apertured and the opening extends to the outside of the piston. The wrist pin 27 is formed near one end with an annular groove 35. The boss 33 has an opening 37 through which is directed a retaining pin 39. This retaining pin enters the annular recess 35 and limits the axial movement of the wrist pin in the apertures of the bosses. Any convenient means may be employed for fastening the retaining means in position. I show a rod or wire 41 extended through a suitable opening 43 in the retaining means and through

openings 45 in the boss 33, the openings 45 registering with the openings 43. After being inserted in place the fastening means 41 may have its ends bent at an angle as shown at 47. The retaining means may have the shape shown in Figure 3 where it is rectangular in cross section. It may however, if preferred, be shaped as shown in any one of the details illustrated by Figure 4. It may be round in cross section as shown by numeral 49. It may be square in cross section as shown by numeral 51 or if preferred, the retaining means may be threaded as shown in 53. In each case the retaining means is formed with the openings 43 for receiving the fastening means.

With my improved piston I may, if it should be so desired, make use of a fixed wrist pin instead of a floating wrist pin. Such a construction is shown in Figure 6 where a wrist pin 55 is shown threaded at one end 57 into a threaded opening provided therefor in the boss 29. In this form of the invention the boss 33 has its aperture extended to the surface of the piston as before for the insertion of the wrist pin.

In connection with this fixed wrist pin I have shown a convenient means for lubricating the wrist pin bearing and also the cylinder wall. To this end I have shaped the inner wall of the piston 9' in such a way that it may have a depression 61 centrally positioned. Just beneath this depression 61 the connecting rod 63 is formed with a cup shaped pocket 65. From the cup shaped pocket a radial passage 67 is formed extending to the wrist pin. The wrist pin is formed with a similar radial passage 69 which may register with passage 67. The wrist pin also has a longitudinal passage 71 communicating with the passage 69. Longitudinal passage 71 extends throughout the length of the wrist pin and the passage 73' in the piston wall registers with passage 71. It will be seen that in this construction lubricant splashed about within the piston will be directed from the depressed portion 61 of the head 9' into the pocket 65. From pocket 65 the oil will flow through passage 67 to the bearing surface between the connecting rod and the wrist pin. When in the movements of the connecting rod the wrist pin passage 71 communicates with passage 69 lubricant

will also flow through 69 and through passage 71 out through the piston wall to the cylinder. In this form of the invention I also use the same retaining and fastening means previously described. The wrist pin is passed in through the open end of the boss 33 and secured in the other boss 29 by the threaded connection provided. One outward movement only is possible for the wrist pin and that is prevented by the effective retaining means already described. In this case, of course, a simple hole is provided at 73 to take the place of the annular groove of the other form.

By the arrangements described I have produced a composite piston wherein the more expansive aluminum may not become separated from the less expansive iron or steel. Together with such a piston I have provided a wrist pin which is very readily and securely positioned in a way which prevents any possible scoring of the piston walls. I have shown an adaptation of such a securing means to the case of a floating wrist pin and to the case of the fixed wrist pin, and in connection with the latter I have shown an effective lubricating means which will serve both to lubricate the wrist pin bearing and the bearing surfaces between the piston and the cylinder.

I claim:

1. A composite piston having a less expansive skirt and a more expansible head the skirt being extended in the form of a hollow dome into said head and externally engaging the head, said dome having one or more longitudinal slits and said head having a depressed portion entering said extension and engaging the inner wall of the dome whereby expansion of said head may maintain close contact of said dome and head.

2. A composite piston having an iron skirt formed with a hollow dome open at its top, said dome being externally grooved, an aluminum head surrounding said hollow dome, the metal of said head filling said grooves, said head extending also within the opening of said hollow dome.

3. The combination as recited in claim 2, the dome being divided into segments.

In testimony whereof I affix my signature.

FRANK HOWARD LORD.